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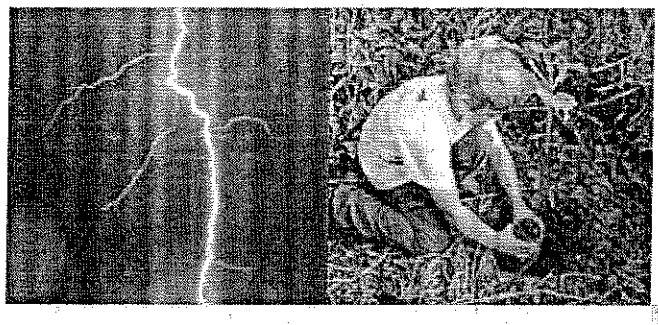
NOYCE FOUNDATION



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ANNUAL REPORT

INFORMAL SCIENCE
MATH
LEADERSHIP
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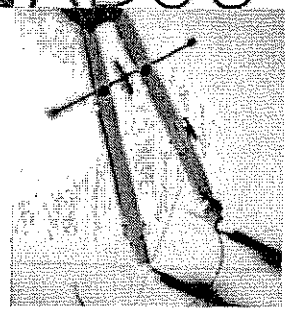
EVERY CHILD A READER & WRITER

The Noyce Foundation

The Noyce Foundation was created by the Noyce family in 1990 to honor the memory and legacy of Dr. Robert N. Noyce, co-founder of Intel and inventor of the integrated circuit which fueled the personal computer revolution and gave Silicon Valley its name.



Although he was an individual of daunting talents and intellect who was honored by his academic and industry peers around the world, Bob Noyce also remained a hun man who believed fervently in democracy. In everything the Noyce Foundation und to promoting the qualities that Bob Noyce embodied: optimism, creativity, risk takin

In recognition of Bob's concern about the shrinking pipeline of students interested a related careers, the Noyce Foundation has focused on math, science, and supporti policy. Much of our focus has been on improving instruction in math, science, and e schools. As schools focused on math and literacy in response to No Child Left Behi behind, we emphasized support for out-of-school science programs that show prom engaging students' interest through middle school, a time when students tend to ma subjects that interest them. Our informal science initiative includes support for leade science centers.

For a complete list of recent grants please see the annual report.

For more information about Robert Noyce read:
The Man Behind the Microchip:
Robert Noyce and the Invention of Silicon Valley
a 2005 biography by Leslie Berlin.

4 What does the math department need to know about this grant?

Personnel

Shyra Tedesco (Ivy Tech, Biology) (PI)

Dr. Tedesco is an Assistant Professor in the Department of General Education – Math & Sciences at Ivy Tech Community College – Madison Campus. As the NINT advisor and instructor in a wide variety of courses required by the pre-nursing curriculum—including Anatomy and Physiology 1 & 2, Microbiology, Chemistry, and Math—she has direct classroom and advising contact with talented STEM students eligible for the Noyce program, which will allow her to present STEM teaching as an alternative to applied health and also to identify promising Noyce Scholar-candidates.

As a former Research Assistant Professor in the Department of Pediatrics at the University of Cincinnati College of Medicine, she also has ample experience to oversee the bridge training from Ivy Tech's pre-professional STEM curriculum to Hanover's liberal arts curriculum, which is more research-oriented and intended to prepare students for graduate study. Dr. Tedesco has also taught the Chemistry II course as an adjunct at Hanover College, providing her with insight into the level of preparation required for transfer to a Hanover science major. She continues to bring Ivy Tech Anatomy and Physiology students to the Hanover cadaver lab for training and maintains cooperative relationships with several Hanover STEM faculty.

Kay Williams (Hanover College, Education) (co-PI)

Dr. Williams spent twenty years teaching mathematics in Colorado before becoming associate instructor at the Indiana University School of Education and completing a Ph.D. with a specialty in curriculum studies. As Director of Teacher Education at Hanover College, she is well positioned to oversee the complete experience of Noyce Scholars majoring in STEM and seeking secondary certification. Some of our Partner LEAs are already familiar with her as supervisor of student teaching, providing a ready-made regional network.

In her last few years at Hanover, Dr. Williams has redesigned several of the Noyce Program core courses, including Secondary Curriculum, Instruction, & Assessment, Secondary Methods, Teaching Diverse Learners, and the Student Teaching experience.

Program Coordinator

The Noyce Program will employ a program coordinator at 25% effort to manage program logistics. The coordinator will be attached to the Rivers Institute at Hanover College, which conducts the STEM outreach programs that will give Noyce interns their first experience with teaching and, for some, recruit them to a teaching career. The Rivers Institute mission is multi/interdisciplinary, so Rivers staff already interact with all the STEM departments as well as Education.

Affiliated Science/Education Faculty (unfunded collaborators):

Debbie Hanson, Hanover College, Chair of Education

Dr. Hanson currently serves as an Associate Professor and chair of the Hanover College Department of Education and is integral to the project-based pedagogy approach employed at Hanover College. She will guide Noyce Scholars in better understanding the nature of scientific inquiry in the secondary classroom and also in forming and sustaining communities of practice. Her experience as a former general science teacher at Seymour Middle School in Seymour, IN, where she assisted professional development as a

Mentor Teacher (supervising first year teacher), Student Teacher Supervisor, Cadet Teacher Supervisor, and Department Head, will enable us to better understand and serve the development needs of Noyce Scholars. In collaboration with a local elementary school, Dr. Hanson conducted Science Training Actively Reaches Students (STARS) training in hands-on instruction for teachers, which was funded by a federal Math & Science Partnership grant to encourage K-8/collegiate partnerships. Most recently she served as an outside expert in biology education for Scientific Modeling for Inquiring Teachers Network (SMIT'N) summer development programs and conducted the two-week STARS professional development program for local K-6 teachers.

Craig Philipp, Hanover College, Chair of Chemistry

Dr. Philipp is former chair of the Chemistry Department and current Division Head for the Natural Sciences (as recommended by a division-wide faculty vote). He brings 14 years of industrial research and management as well as significant course development experience and maintains an active research agenda in collaboration with students. He also conducts one of the more popular high school Summer Academy sessions on forensic science and will use Noyce interns to assist with that program. As a former member of the faculty development committee, he is able to identify the best STEM faculty to guide Noyce Scholars in the kind of experimental, project-based science curriculum that will produce exemplary STEM teachers.

Affiliated Faculty in the Disciplines

Biology: Darrin Rubino (Ph.D.), Associate Professor; Walter Bruyninckx (Ph.D.), Professor; Luke Starnes(Ph.D.), Assistant Professor

Chemistry: Steve Boone (Ph.D.), Associate Professor; Stephen Steiner (Ph.D.), Professor

Geology: Ken Bevis (Ph.D.), Associate Professor; Heyo Van Iten (Ph.D.), Professor; Pete Worcester (Ph.D.), Professor

Mathematics & Computer Science: Nancy Rodgers (Ph.D.), Professor of Mathematics; Michael Bradshaw (Ph.D.), Assistant Professor of Computer Science; Carl Jagels (Ph.D.), Associate Professor of Math & Computer Science; Yefim Katsov (Ph.D.), Professor of Mathematics; Haris Skiadas (Ph.D.), Assistant Professor of Mathematics; Barbara Wahl (Ph.D.), Professor of Mathematics & Computer

Physics: George Nickas (Ph.D.), Professor of Physics & Astronomy; Leonidas Pantelidis (Ph.D.), Associate Professor of Physics

Education: Deborah Hanson (Ph.D.), Assistant Professor of Education; Jonathan Dee (Ph.D.), Instructor of Education and Director of Teacher Education

Cooperating LEAs

Our Partner LEAs are distributed across the region in all directions up to 50 miles from the Hanover College campus where the Noyce Program will be based, covering a significant portion of the rural interior of the Louisville/Indianapolis/Cincinnati triangle. Partners are particularly enthusiastic about the STEM outreach activities afforded by recruiting internships, but they also recognize the potential of this program to improve STEM instruction in the long term. Since the primary program goal is to place highly qualified teachers with STEM degrees in our region's secondary classrooms, student teaching, mentorship, substitute assignments, and other training activities will take place mostly in district/corporation high schools. But middle and elementary schools will also benefit from access to the STEM outreach programs that will employ potential Scholar Interns. Letters of commitment are attached.

Scott County (Indiana) District #2 (Superintendent Phillip K. Deardorf)

Scottsburg Senior High School is 20 miles west of the Hanover campus. It has a free & reduced lunch rate of 44%, although the rate is 52% across the district. Scott County District #2 also operates Scottsburg New Tech High School, which uses an educational model founded on project-based learning, the "smart" use of technology, and a culture that promotes trust, respect, and responsibility. We expect many Scholars will complete observations, substitute assignments, or student teaching at New Tech to practice employing the project-based model of STEM instruction.

Bartholomew County (Indiana) Consolidated School Corp (Superintendent John B. Quick)

Columbus North High School is 50 miles northwest of the Hanover campus; Columbus East High School is 46 miles from campus. Columbus in Bartholomew County has a high population density, but much of the rest of the county is relatively rural. Though the district-wide free & reduced rate is 43%, Bartholomew Consolidated has several high poverty schools—Clifty Creek Elementary (69%), Lillian Schmidt Elementary (67%), and Taylorsville Elementary School (65%)—and faces the same lack of co-curricular resources as the highly-rural corporations in our region.

Jennings County High School (Principal Tim Taylor)

Jennings County High School in North Vernon, IN, is 28 miles north of the Hanover campus. The district-wide free & reduced rate is 61% with two very high poverty schools: Sand Creek Elementary at 78% and the Early Learning Center at 71%. The High School already employs a Hanover graduate and also has a pre-existing partnership with Ivy Tech to offer dual credit courses. We anticipate that their advice on promoting the Ivy Tech/Hanover College articulation agreement will enable us to advise partner LEAs on how the increase the number of their high school seniors using Ivy Tech as a bridge to a baccalaureate—ideally at Hanover College.

Trimble County (Kentucky) Board of Education (Instructional Supervisor Rebecca S. Moore)

Trimble County High School is 18 miles southeast of the Hanover campus. Overall Trimble County schools have a free & reduced lunch rate of 57% with a 52% rate at Trimble County High School. Trimble County is directly across the Ohio River from Jefferson County, Indiana, and Hanover College, yet we are only beginning to build partnerships there. We hope this program will demonstrate the effectiveness of interstate partnerships where the similar needs of rural areas unites communities more than state borders divide them.

Gallatin County (Kentucky) Schools (Superintendent Dorothy B. Perkins)

The county seat of Warsaw in Gallatin County, KY, is 38 miles east of the Hanover campus. Overall the district has a free & reduced lunch rate of 68%. Gallatin County High School has a free & reduced lunch rate of 61%. By some routes, Gallatin County is also exactly 38 miles from downtown Cincinnati, OH, yet the suburban resources of northern Kentucky rarely reach it. Gallatin County will be valuable in advising us on structuring our training to serve counties just outside of suburban areas.

Narrative

Background & Technical Need

Hanover College and Ivy Tech Community College-Madison are located in Jefferson County, Indiana, a mostly-rural county in the center of a triangle formed by the cities of Louisville, Indianapolis, and Cincinnati—roughly 100 miles distant from each other. Many institutional resources available to K-12 students in these cities and their suburbs—after-school programs, museums & zoos, cultural attractions— are inaccessible to Jefferson and its adjacent counties: Clark, Scott, Jennings, Ripley, Dearborn, Ohio, and Switzerland Counties in Indiana and Trimble, Carroll, Gallatin, Henry, and Owen Counties across the Ohio River in Kentucky. Moreover, well-qualified STEM teachers from the region frequently seek employment in these larger metropolitan districts where pay is greater.

We propose a Robert Noyce Scholarship Program that recruits and trains highly-qualified STEM teachers to serve at regional high-need LEAs for the terms required by their scholarships and beyond, and, at the same time, provides immediate enhancement of regional STEM education resources by recruiting Noyce Scholars through service learning opportunities. An articulation agreement signed between Hanover College and Ivy Tech Community College of Indiana has paved the way for a Noyce Scholarship program that recruits talented STEM students who otherwise might not consider a career in teaching. Ivy Tech students, who tend to be non-traditional and less geographically mobile, will likely serve our region far beyond their Noyce teaching commitments. This program will produce 16 new science and mathematics teachers with degrees in STEM disciplines and training in the best practices of science and mathematics education. Our scholarship program will run five years with program outcomes tracked to the tenth year when Noyce Scholars finish their teaching commitments. Ideally, the cooperative relationships developed with regional LEAs in the course of grant activities will promote greater regional cooperation and allow us to find additional funding for future service learning and professional development opportunities.

The partnership of Ivy Tech, Hanover College, and LEAs that includes STEM outreach activities and teacher professional development programs for K-12, bridge programs for Ivy Tech students, enhanced training in STEM education for Hanover students, and, if funded, the Noyce Scholarship Program, is known informally as the Southern Indiana STEM Community (SISC). An *institutional goal* for this program is to develop our joint capacity to provide innovative teacher preparation programs that produce master science & mathematics teachers and, as a consequence of our institutions' recent transfer agreement, to create bridge programs from an associate-level degree at Ivy Tech to a baccalaureate program at Hanover College. *Long-term outcomes* of SISC activities will be to increase STEM achievement in southern Indiana/north central Kentucky K-12 schools using outreach and teacher professional development programs, to place better-prepared local STEM teachers in rural Indiana/Kentucky schools, and to retain them to teaching over the long term.

The *HHMI Bulletin* notes that STEM education is a particular problem for rural districts because smaller tax bases frequently don't provide funding for adequately equipped and supplied classrooms. Fewer businesses are available to donate money or equipment, fewer STEM professionals live nearby to share expertise, and fewer universities and museums are available to provide curriculum support (Widener 2010). Rural districts also have difficulty attracting and

retaining STEM teachers with disciplinary degrees—particularly when surrounded by large districts with greater resources and relatively higher salaries, as our region is. We expect a broad regional partnership that, where possible, combines resources to alleviate this lack.

The biennial report *Why Rural Matters 2011-12: Statistical Indicators of the Condition of Rural Education in the 50 States* (Strange 2012) found that "Indiana's student population is increasingly rural, and that the poverty rate is growing among these rural students." In the first decade of the new millennium, Indiana added almost 14,000 rural students to its schools with a 9.5% increase in the number of rural students in poverty and a 156.6% increase in the number of Hispanic students. In absolute numbers, Indiana has the 15th highest number of rural students in the nation. The report also notes that Kentucky has the 10th highest percentage of rural students, and that its "[r] ural enrollments are characterized by high rates of poverty, rural mobility, and many students qualifying for special education services (highest in the nation in special education rates)." Moreover, large districts and schools in Kentucky mean higher transportation costs relative to instructional costs. Moreover, the number of rural schools and students in the state is growing as well.

All these factors impact student learning. The U.S. Department of Education *National Assessment of Educational Progress* (NAEP 2009) science assessment saw scores of rural students decline from 4th to 12th grade. In other words, secondary students do less well in science at precisely the time they are preparing for college. Fewer students in the STEM pipeline means fewer students pursuing advanced STEM degrees, biomedical careers, and STEM teaching positions.

Our *Noyce Program* goals include recruiting to teaching talented STEM students who might not otherwise consider careers in education, training Noyce Scholars in the best practices of STEM teaching, and providing early support to retain graduates to teaching in our region's high need LEAs. We will employ service learning internships as one strategy to attract such students. Offering STEM students and potential Noyce Scholars paid internships to do K-12 STEM outreach with Hanover's current K-12 outreach programs will enable us to provide potential Noyce recruits their first teaching experiences and to expand our current program offerings to Partner schools and districts, which can effect immediate improvements in the region's K-12 STEM instruction.

Research Description (Plan of Work)

Recruiting

We identify two important pools for recruiting Noyce Scholars: pre-med students at Hanover College, who switch majors at a relatively high rate and often leave the sciences entirely when they do so, and *nursing interest* (NINT) students at Ivy Tech, who may not gain admission to the highly competitive nursing program despite high academic achievement. The latter group will be important to attracting a pool of applicants committed to

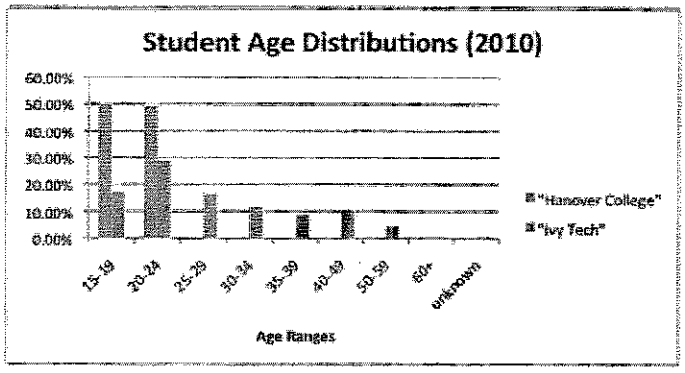


Figure 1: Comparison of Ivy Tech/Hanover Student Populations by Age

teaching in the region because many are non-traditional students who are geographically settled with local family connections and children.

Ivy Tech Community College offers a growing pool of such applicants as well as opportunities to recruit more minority teachers. Statewide, non-traditional age Ivy Tech students surpassed traditional age students in 2008 and have continued to widen the gap (See **Figure 1** (previous page) for a comparison of Ivy Tech/Hanover age distributions.). From 2006 to 2010, the number of students engaged by Ivy Tech statewide increased 54.4% overall, with a 65.5% increase in full-time enrollment to 66,300 students and the greatest gains in the non-traditional population (+63.4% non-traditional vs. +45.8% traditional students). Minority enrollment grew faster than Caucasian enrollment (+42.7%) for every racial & ethnic category with the largest gains among multiracial students (+144.7%), Hispanics (+73.7%) and African-Americans (+70.7%). Because of huge growth in enrollment, Ivy Tech nursing programs have become even more highly selective. Of the 112,229 Ivy Tech students statewide in 2010 there were only 2,607 nursing majors. Ivy Tech-Madison accepts only 25 students in each cohort. Many well-qualified students with 4.0 GPAs miss admission by a few points on the Test of Essential Academic Skills (TEAS), which is required for application.

increased environmental science, bio chem major

Hanover College enrolls just over 1000 students in 32 liberal arts majors. Its educational approach produces graduates who proceed to post-baccalaureate and professional study at greater rates than their peers at other schools; in the last two years an average of 30% of all graduates continued to graduate or professional schools. In STEM the record is even better; over the last ten years, half of Chemistry majors (average class cohort 9.4) and 48% of Biology majors (average class cohort 16.9) have continued to advanced degree programs. However, many matriculating students who declare an interest in the pre-medical curriculum become discouraged by the introductory Biology/Chemistry sequence and never declare STEM majors. In many ways, Hanover students may be easier than Ivy Tech students to reach, since most of the service learning internships will be based on the Hanover College campus, and Noyce-affiliated STEM faculty will be able to identify potential recruits in lower division classes and provide contact information to program faculty/staff.

<table>
<tr><th>K-12</th><th colspan="3">College Years 1-2 (Ivy Tech or/and Hanover)</th><th rowspan="2">Complete Ivy Tech AA degree</th></tr>
<tr><td></td><td>Year One</td><td>Year Two</td><td>Year Three (option)</td></tr>
<tr><td>Potential Noyce Scholars (1st/2nd year Hanover/Ivy Tech students) engage K-12 students with STEM outreach.</td><td colspan="2">Ivy Tech & Hanover pre-nursing & health science students participate in K-12 STEM outreach activities intended to recruit Noyce Scholars.</td><td rowspan="3">Ivy Tech students who need to complete the Hanover Liberal Arts Degree Requirements (LADRs) to finish the baccalaureate with a two-year residency are provisionally admitted to the SISC Robert Noyce Scholarship Program and fulfill the LADRs at Ivy Tech.</td></tr>
<tr><td>Secondary teachers & Noyce Scholars engage in STEM professional development.</td><td>Scholarship opportunities advertised in intranet postings & newsletters and on departmental bulletin boards.</td><td>Ivy Tech/Hanover students apply to the SISC Robert Noyce Scholarship Program</td></tr>
<tr><td>Cooperating teachers in Partner LEAs identify seniors talented in STEM for targeted recruiting.</td><td>PI/Co-PI/Affiliated Faculty advertise scholarship opportunities in intro STEM classes, orientations, and advising.</td><td>Applications reviewed and applicants notified by early May.</td></tr>
</table>

Figure 2: Recruiting activity timeline.

Figure 2 summarizes recruiting activities for students at various academic levels. The primary strategy will be aggressive outreach to students at both institutions who initially intend to pursue biomedical careers but who either switch to non-science majors (Hanover) or fail to gain entrance to highly competitive nursing programs (Ivy Tech). The PI advises NINT students at Ivy Tech-

Madison and already offers them a list of alternatives to nursing in the first advising meeting (EMT, phlebotomy, etc.); she will be able to make students aware of STEM teaching and the Noyce program option as they commence their study. Hanover College STEM faculty also have committed time for a Noyce recruiting visit the first day of basic STEM classes. In pre-nursing advising and introductory STEM classes we will offer applications to internship programs. We anticipate that, although students may not initially be interested in teaching as a career alternative, they will be interested in paid internship opportunities. We suggest the combination of knowing about alternatives to nursing or medical school and internship STEM teaching experiences can overcome both students' false optimism about their biomedical career choices and the resulting lack of a back-up career strategy. Indeed, some students experiencing teaching for the first time may discover that educating people in STEM disciplines is more rewarding to them than pursuing research or applied science careers.

Competitive service learning internships with current Hanover College programs will enable STEM majors, pre-med students, and NINT students to engage in formal and informal STEM teaching with various K-12 groups, giving many a first teaching experience. Because Hanover students are a highly traditional population and Ivy Tech students are mostly non-traditional, we will offer a variety of commitment options to accommodate potential candidates from both institutions, including full-time summer internships and part-time internships during the academic year.

Summer internships will be offered through one new and four existing programs at the Rivers Institute at Hanover College. Students will apply on a rolling basis using mechanisms already in place, and awards will be made in cooperation with Noyce program faculty/staff to facilitate outreach program schedules.

- *River Camp for Kids* is a day camp that provides informal science education for children ages 4-12. Interns help plan and set up the camps, deliver curriculum, monitor campers, clean up after activities, and provide the camp coordinator with initial logistics assessments to assist with future program planning.
- The *High School Academy* offers residential experiences of college life to high school juniors and seniors. Interns will assist professors in conducting learning camps in ecology, global climate change, fitness & exercise science, computer science, forensic science, and the health sciences.
- Students with a particularly high interest in the Noyce Program may apply to intern with the Rivers Institute *Teacher Academy*, which offers in service K-12 teacher professional development in hands-on STEM pedagogy and consists of a summer workshop with fall follow-up meetings. Interns will assist *Academy* faculty in preparing and delivering the summer workshop and the five fall semester follow-up experiences. Since the *Teacher Academy* is also a vital program to support Noyce Scholars in their first years of teaching, interns will have opportunities to network with regional STEM teachers, identify mentors, and discover the workings of the Noyce program from graduate participants.

sustained by EBU?

For potential scholars who cannot commit blocks of time during the summer, which may include many Ivy Tech students with job & family commitments, the Noyce program will also offer part-time internships during the academic year.

- On Hanover's campus, interns may assist with the Rivers Institute *Campus Field Trips* where they help plan lessons and deliver curriculum using the resources of the Hanover College campus, including science labs, a natural history museum, educational hiking trails, and an *Environmental Science Education Center*. The *Campus Field Trip* program serves up to 1200 students per year and has grown an average of 29% each year over the last two years.
- Off site, the second academic year option will be the *Science Squad* outreach team, a new program designed specifically to address lack of lab resources at Partner LEAs. Using kits and equipment assembled beforehand, interns will travel in teams to regional K-12 schools and deliver self-contained science lessons based on curriculum from the *I-STEM Network*, a statewide partnership to improve K-12 STEM learning. Under the supervision of Noyce-affiliated faculty, interns will choose roles within the team, deliver lessons, and perform other educational outreach in the schools. Scheduling of *Science Squad* visits will be made through the same system that administers the *Campus Field Trips*, and day-to-day supervision will be the responsibility of the Noyce Program coordinator. Partner LEAs are particularly enthusiastic about this program because the distance to quality museums and other sites restricts the number of field trips they can plan in a year.

Of course, simply participating in education outreach does not, by itself, constitute recruiting. Therefore, the Noyce Program coordinator will track for follow-up by the PI/Co-PI interns paid by grant funds as well as others identified as potential Scholars. The PI/Co-PI or staff will make subsequent contact to remind former interns of Noyce Scholarship application deadlines. Over the life of the grant, to improve the internship programs as a recruiting tool, interns will complete pre-program assessments gauging their level of interest in teaching as a profession. Afterward they will complete assessments that address both the quality of the internship experience and the change (if any) in their attitude toward teaching. As the grant proceeds, this formative evaluation will be vital to modifying the internships to be maximally effective recruiting experiences.

To supplement direct student contact in classes and advising sessions, we will advertise internships and the Noyce Scholarship Program on STEM department bulletin boards, in intranet postings, and in various organizational newsletters. These methods may recruit Ivy Tech students from locations other than Madison, since the articulation agreement covers not only the southeast Indiana region and the Ivy Tech-Madison campus that is the partner on this application, but also the thirteen other Ivy Tech regions around the state, where students will not have the opportunity for internship experiences but may desire to pursue a STEM teaching career. Note that all fourteen Ivy Tech regions have nursing programs with applicant pools from which to draw. These students will attend be resident at Hanover and may choose to move to and teach in one of our region's LEAs.

Application & Selection

Students will generally apply to the Noyce Scholarship Program during their second year. Ivy Tech students will submit an application to Hanover College; Hanover applicants will make their College application materials available through the Hanover Admissions Office. All students will apply to the education department, submitting departmental application forms, a transcript, scores from the PRAXIS I test, and professor recommendation letters. Noyce Program applicants will focus the required essay on their experience in STEM and their reasons for applying to the Program. Finalists will complete a personal interview with one or more members of the selection committee. The

program coordinator will collect and file application packets, distribute them to the selection committee, and route College & Department of Education materials to the appropriate offices.

The PI, co-PI, and a rotating committee of Program-affiliated faculty will select Scholars using a review panel discussion, numerical scoring, and cut scores similar to the NIH review process. Successful participation in a Noyce Internship as a first or second-year student will receive consideration in the selection. All academic factors being equal, additional consideration will be given to financial need (particularly for Ivy Tech students, who often-but-mistakenly dismiss attending Hanover as "too expensive") as well as to increasing the representation of minorities, persons with disabilities, and under-represented genders relative to specific teaching areas. Over the life of the program, every effort will be made to reserve scholarship slots for Ivy Tech and Hanover applicants in proportion to the student populations at each institution. That ratio currently stands at 1.26 Ivy Tech-Madison students per 1 Hanover student. We may admit more Ivy Tech students if we receive higher than anticipated numbers of applications from very highly qualified applicants.

While unpredictable longer-term staffing needs and budget allocations in individual school districts & corporations—not to mention Scholars' changing life circumstances—make it impractical to require Noyce Scholars to fulfill their teaching commitments in our region, the committee will also consider applicants' personal ties to the region, since Ivy Tech students are more likely than Hanover students to be geographically immobile and to serve the region long beyond their four-year teaching commitment.

Admission & Advising

Once admitted to the program, Noyce Scholars will receive full tuition support awarded for one year at Hanover College with renewal contingent on satisfactory progress. Over the two-year period, Scholars will complete a baccalaureate degree in STEM and secondary teaching certification. STEM majors available to Noyce Scholars are biology, chemistry, physics, mathematics, computer science, and geology. Scholars will also complete the Education courses, cross cultural experience, and professional portfolio required by the Department of Education as well as a student teaching rotation, CPR & first aid certification, PRAXIS testing, and other work necessary to apply for secondary teaching licensure in the states of Indiana and Kentucky. We will recruit four cohorts of four students each in grant years 1-4, as the fourth cohort will graduate in grant year five. We will also phase out grant support for recruiting internships in year three.

Many of our target Ivy Tech students would not be able to complete the program without full tuition support, so we have prioritized larger scholarships over a greater number of Scholars. Because we will recruit Scholars in proportion to institutional enrollment (roughly 3 Ivy Tech students to 2 Hanover students), and because Ivy Tech students are less geographically mobile than Hanover students, we anticipate a more sustained impact on Partner LEAs from higher retention to teaching in the region.

Because Ivy Tech primarily delivers professional and technical programs and Hanover College offers a traditional liberal arts curriculum, some Ivy Tech students may need additional lower level STEM courses designed specifically to prepare them for a baccalaureate major that emphasizes

theory and research; others may need additional courses at Ivy Tech to fulfill Hanover's Liberal Arts Degree Requirements (LADRs). To avoid losing particularly promising applicants, we may grant a few Ivy Tech students conditional admission to the Noyce Scholarship Program. These may enroll in Hanover's core science classes *for majors* for additional preparation for upper division courses and also complete their LADR requirements during a bridge year at Ivy Tech. In those cases, the Hanover College Registrar will waive tuition and fees for conditional Noyce Scholars registered and paying tuition at Ivy Tech who attend a Hanover College class. Ivy Tech will list the course on the transcript under the articulation agreement's equivalent designation, e.g., Hanover *BIO 165* (Concepts in Biology) will be listed on the Ivy Tech transcript as Ivy Tech *BIOL 101* (Introductory Biology). Conditionally admitted Scholars will meet with the PI/Co-PI to plan a schedule that allows them to complete the degree and certification within the grant period. Therefore, we will only allow conditional admission in years 1-3 of the Noyce Program. We anticipate no more than four students admitted conditionally over the life of the grant.

Scholarship offers will be made in May of each academic year. All admitted Scholars (both regular and provisional) will attend a one week summer Noyce Program orientation. Scholars will meet with the PI and co-PI as well as their major advisor in the discipline and make a schedule for completing both the baccalaureate degree in STEM and secondary certification within the two-year time frame. This schedule will include a plan of coursework and student teaching as well as scheduling of pre-professional testing and other licensure requirements. Noyce Scholars entering the senior year will attend the orientation to provide peer mentoring to incoming Scholars, who will also tour Partner LEAs and meet relevant faculty and administration at Hanover College, Ivy Tech, and the Partner LEAs.

As they progress through the program, Scholars will maintain mentor relationships with the PI/Co-PI and a faculty member in their STEM discipline. At least once each semester all Noyce-affiliated Scholars and faculty will meet in a group with the PI/Co-PI for program updates and informal program assessment. This meeting will include time for socializing with the intent of promoting group cohesion. Between these meetings, the program coordinator will track Scholar contacts with the PI/Co-PI and Noyce-affiliated staff and ensure that Scholars are meeting the deadlines of their individualized plans. The coordinator will contact Scholars who miss a deadline, fall below the required GPA, or otherwise fall behind schedule, and set up a meeting for the PI/Co-PI and or appropriate Noyce-affiliated faculty and staff to assess the Scholar's situation and offer assistance and support.

Academic Programs

Noyce Scholars will enter the Program as 3rd-year students at Hanover College. For a complete timeline of the Scholar experience please see **Figure 3** (next page). Hanover students will progress directly from their lower division courses; Ivy Tech students will complete an associates degree to certify the equivalent of Hanover's LADRs general education curriculum. Once admitted to the Noyce Program at Hanover College, Noyce Scholars will choose from among majors in biology, chemistry, physics, mathematics, computer science, and geology. STEM areas certified by both the Indiana and Kentucky Departments of Education are biology, chemistry, earth and space science (geology major), mathematics (mathematics or computer science major), and physics.

Hanover's academic year consists of two conventional terms and an abbreviated, intensive May term often reserved for independent study, study abroad, or in depth study of special topics. In practice, Scholars will complete the STEM major in three regular terms. In addition, Scholars will complete five education courses in preparation for student teaching: "Inquiry in Education" (two-semester seminar)," "Foundations of Education," "Instruction for Diverse Learners," "Curriculum, Planning, & Assessment," and "Secondary Methods" (in the discipline). The fourth regular term is reserved for full-time student teaching. Independent work during the May term can supplement Scholar preparation with intensive work in disciplinary research or fulfillment of the cross-cultural experience requirement of the Education program. The final May term may be used for activities related to licensure, e.g., PRAXIS II testing, licensure application, etc.

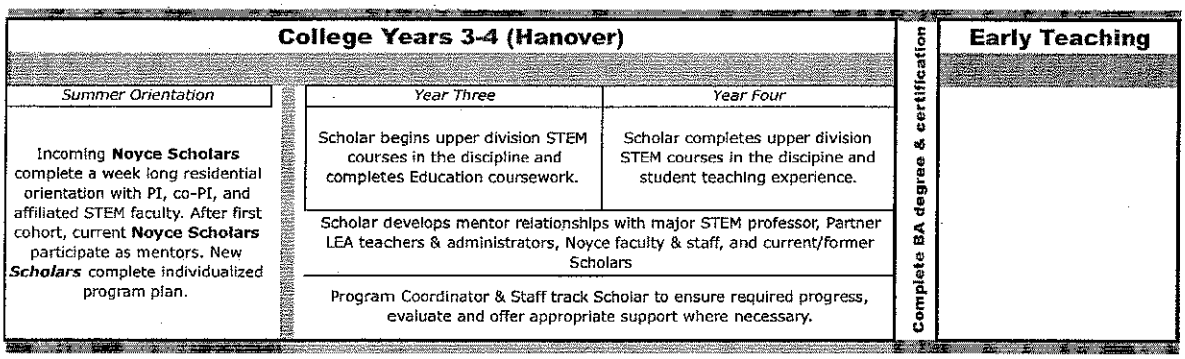


Figure 3: Noyce Scholar Timeline

To qualify for placement as a student teacher in the fourth regular term, a Noyce Scholar must maintain a 2.67 GPA in all courses with satisfactory progress toward completing the STEM degree and successfully complete practice teaching in cooperating schools in our Partner LEA districts & school corporations. Other requirements include finishing the methods coursework in education, a formal interview addressing professional dispositions, achieving a portfolio score of 2, and receiving a clear records check (required by law for all personnel working in K-12 schools).

By early January of the junior year, Scholars will complete a preference form for the Field Work Coordinator, who will consult with administration at Partner LEAs and place Scholars according to a balance of preference and district need.

After determining placement, the Education Department establishes a signed agreement with each school district/corporation. Candidate preparation for a student teaching assignment includes: 1) living arrangements on or off campus according to the cooperating school's calendar 2) adjustments in campus meal plans 3) application for a Spicer Phillips scholarship that assists with transportation or rent expenses 4) completion of a criminal history check according to cooperative school requirements 5) attendance at the Department's student teaching orientation and introduction to the teacher mentor by the Master Teacher representing the Partner LEA 6) and student membership with the National Education Association (NEA) for liability insurance coverage (see www.nea.org)

Hanover College prepares the student teacher for certification and a teacher licensure anywhere in the United States, but Partner LEAs will have the right to make the first offers of employment to graduating Noyce Scholars based on district/corporation need. Criteria for teacher certification includes a Bachelor's degree, passing scores on PRAXIS II teacher placement exams, completion of student teaching, first aid and CPR certification, a final portfolio score of 3, a clear records check,

and a completed cross- cultural experience. The program coordinator will track scheduled completion of these activities.

Early Teacher Support

In addition to post-graduation mentoring through the Hanover College education department and district or state-mandated professional development programs, Scholars will maintain contact with Noyce-affiliated science faculty at Ivy Tech and at Hanover. Beyond the expiration of the grant in years 5-10, we will provide professional support for Scholars as they fulfill their teaching obligations and also assess Scholar & Noyce Program performance. As NSF funds expire after year 5, the institutions and the SISC will take responsibility for performance tracking in years 6-10.

Professional development support mechanisms offered by Hanover College include participation in the Rivers Institute's *Teacher Academy* program for at least two summers following graduation. The *Teacher Academy* provides teachers with authentic inquiry activities so that they can lead their students in 'doing science' with project-based learning. *Academy* cohorts meet for one week during the summer and for five follow-up activities during the subsequent semester, allowing Program faculty and staff to maintain frequent contact with Scholars for at least two years after graduation. As mentioned above, this program serves as both recruiting tool through internships and early support mechanism for graduates.

We will also cooperate with Partner LEAs in delivering state-mandated professional development for early teachers. The Indiana Department of Education supports teacher professional development by requiring a Professional Growth Plan (PGP) for certification renewal. Teachers and administrators collaborate in staying up to date on the latest educational reforms and pedagogy by attending conferences and workshops, participating in curriculum development committees & school improvement plans, and taking additional coursework. The PGP summarizes and evaluates these experiences for application towards licensing renewal. One PGP point is given for every contact hour an educator is actively involved in a professional development activity, and a total of 90 PGP points is required for submission of a renewal application. During a Noyce Scholar's first and second year of teaching, program personnel will collaborate with the Scholar and administrators (particularly where the Scholar is teaching in one of our Partner LEAs) to help graduates craft the best individualized PGP.

In Kentucky, teachers in the first year enroll in the Kentucky Teacher Internship Program (KTIP). KTIP provides assistance to new teachers with the goal of helping new teachers be successful their first year in the classroom. Administered by the Kentucky Professional Standards Board, a first-year teacher collaborates with school administrators and a master teacher to complete a year-long Teacher Performance Assessment (TPA), which collects selected evidence of and personal reflection upon the teacher's work. The TPA catalogs a new teacher's efforts to analyze student learning as well as performance on Kentucky teacher standards using a reflective process that accounts for lesson plans, student work samples with evaluative comments, video recorded lessons, anecdotal records, and observation notes; it recognizes that continuous and critical self-study of planning and instructional practice is one of the most important keys to effectiveness. KTIP includes formative assessment on classroom teaching and the intern's ability to address professional responsibilities and summative assessment of ability to plan effectively and enhance students learning. Noyce personnel will be available for formal consultation with Partner LEAs and informal consultation with graduates teaching in Kentucky districts outside the Partnership.

Program Administration

This proposal is a joint activity of Hanover College and Ivy Tech Community College-Madison (both located in Jefferson County, Indiana, adjacent to the Ohio River and north-central Kentucky) designed to take advantage of a recently-signed transfer agreement, which covers Hanover College and the entire Ivy Tech system. The Hanover College grants development office will manage the post-award on behalf of the partnership with payments for Ivy Tech's salary & program activities stipulated by memorandum of agreement and made to Ivy Tech-Madison by sub-contract. Payments to Ivy Tech student interns will be made directly by Hanover College using mechanisms already in place for internship and outreach programs.

To insure Scholars fulfill the teaching commitment required by NSF, the *SISC Robert Noyce Scholarship* will be offered to students as a "forgivable loan" with a semester's loan forgiven for each year of teaching. Thus, each Scholar who successfully completes the two-year program will teach for at least four years. Loan forgiveness will be contingent upon the graduate teaching in a high-needs school district and completing the commitment within eight years of graduation. Students who do not complete the teaching commitment will be required to repay the remainder of the loan with interest and fees. The scholarship contract will be administered by the Hanover College financial aid office, which already maintains a relationship with a private loan servicing company to service campus-based loans.

Perhaps the most vital link for insuring improved STEM education in our region is a regional core of five high-need Partner LEAs: Scott County School District #2 (IN), Bartholomew Consolidated School Corporation (IN), South Dearborn Community School Corporation (IN), Trimble County Schools (KY), and Gallatin County Schools (KY). Partners will advise us regarding activities and pedagogies with the best potential to enhance Noyce Scholar training, supply mentors and student teaching opportunities for Scholars, and offer Scholars substitute teaching opportunities where appropriate to enhance their training. In return, Partner LEAs will receive priority for *Teacher Academy* slots and other SISC-conducted teacher professional development opportunities in project-based math and science instruction, participate in Hanover campus-based educational outreach like the *Field Trips* and other programs, and receive priority for STEM outreach programs employing Noyce-funded interns, including the *Science Squad* site visits. We anticipate that many of our program graduates will fulfill their teaching commitments at Partner LEAs.

Intellectual Merit

If a major problem with rural STEM education is lack of resources for adequately equipped spaces, few extra-curricular educational opportunities for out-of-school time, and limited teacher professional development, etc., then a broad-based consortium like the SISC that shares resources can help solve that problem. Our program leverages recruiting activities with service learning internships that provide needed professional development for in service teachers and supplemental instruction both in the schools (*Science Squads*) and out of school/off-site (*Field Trips, River Camps*). Off-site activities also take advantage of underused resources on the Hanover College campus: a natural history museum with collections dating to the mid-19th century; a ¼-mile education trail with dedicated learning stations; an *Environmental Education Center*.
Rural schools also have long struggled with attracting and retaining teachers. A nationwide survey of rural school superintendents conducted by the American Association of School Administrators

and the Appalachia Educational Laboratory found that superintendents identified low salaries and social and geographic isolation as the main factors responsible for their difficulties in recruiting and retaining teachers (Schwartzbeck et al., 2003). By targeting Ivy Tech NINT students, a group both geographically immobile and already engaged in a career-oriented course of study, our program circumvents the so-called "isolation" of rural districts by choosing candidates who already have deep local and regional connections. Moreover, cooperation among institutions of various types at different educational levels (elementary & secondary schools, districts, community colleges, and colleges) enhances what Matsumoto & Brown-Welty (2009) call the "multiple formal and informal linkages with institutional entities outside of the school" they link to improved education outcomes.

We have also adopted a pedagogical model recommended in 1996 by the National Research Council in its *National Science Education Standards* (NSES) as the best method of improving science teaching in the U.S: inquiry-based education. Despite some strides in adoption, much work remains to be done. The 2005 National Assessment of Educational Progress (NAEP) found Indiana elementary students scored only slightly above the national average in science, and basic proficiency declined from 4th to 8th grade. In addition, overall scores declined from 2000-2005 (U.S. Department of Education 2008). This negative trend in science learning persists into high school where the 2007-08 school year saw only half of Indiana students take Chemistry courses and only a quarter take Physics or Advanced Science (Indiana Department of Education 2009a).

To counter these trends, the I-STEM Resource Network Strategic Plan for Science Education Reform also advocates the "promise [of] a growing statewide alignment [and] a unified vision for science education" founded upon the inquiry-based science pedagogy we favor. Our regional *SISC*, which includes Indiana and Kentucky counties as well as a variety of districts and institutions, offers the possibility of such a "unified vision" that begins with collaboration on the training of Noyce Scholars and follows from the conviction that *SISC* partners are equal. Leading to multiple collaborative, informed program decisions from salary support for the PI and Co-PI to allocation of Noyce Scholarships in proportion to institutional enrollment. Each Partner has resources to offer and a part to play: Hanover College prepares competent scientists and effective teachers; Ivy Tech provides economical lower division preparation to talented students limited by geography, socio-economic status, or family and work commitments; Partner LEAs bring a deep commitment to providing the best education to all K-12 students as well as an understanding of and commitment to developing and refining the best classroom practices. Input from all Partners and a "unified vision" is vital to our program success.

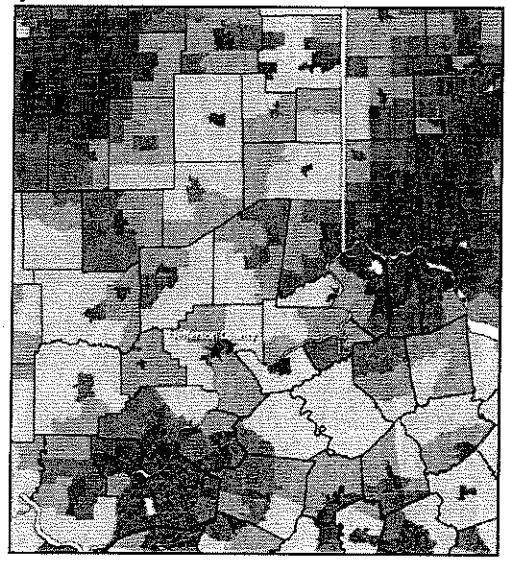


Figure 4: Population Distribution in the Indianapolis/Louisville/Cincinnati Region.

Broader Impacts

As **Figure 4** (previous page) shows, Hanover College and Ivy Tech are located within a rural triangle formed by Indianapolis (top left), Louisville (bottom left), and Cincinnati (center right). These cities are a little over 100 miles distant from each other; our partnership is closest to Louisville at 57 miles. Though population density in the city of Madison is in the 200.0 to 999.9 people per square mile range, note that much of Jefferson County and all of Trimble County, KY across the river are much less dense at 50.0-88.3 people per square mile. Moreover, large sections of both Jefferson and adjacent counties (Clark, Jennings, Ripley, Dearborn, & Switzerland in Indiana & Carroll, Henry, and Owen counties in Kentucky) have an even lower density with 15.0-49.9 people per square mile. Though we will not partner with schools, districts, or school corporations in all of these counties, we will offer STEM outreach across the region once Partner LEAs have scheduled their visits. Eventually the SISC will incorporate as many of the rural schools/districts/corporations as wish to join, and Noyce Program graduates may elect to work at regional districts/corporations other than the Partner LEAs.

Anchored by the Noyce Program, we expect the SISC to enhance regional infrastructure for both research and teaching. It begins with the stronger partnership of Ivy Tech and Hanover College made possible by the articulation agreement. Historically, Ivy Tech students have a perception that they may not be competitive for transfer to a Hanover College baccalaureate program or that such a program is unaffordable to them, despite a high "discount rate" at Hanover. We suggest that perception will change as students see their peers transfer to Hanover in the Noyce Scholarship Program. Institutional contacts and advising procedures developed as the result of Noyce recruiting protocols can also smooth the transition from an associate to a baccalaureate program and may encourage higher educational aspirations for place-bound students who cannot transfer to state institutions like Indiana University.

Evaluation & Dissemination

In addition to all the common mechanisms of evaluating students and early teachers (course grades, student teaching evaluations, completion of tasks required for licensure, PGP/KTIP portfolios, etc.), we will ask administration & staff at Partner LEAs to provide survey feedback on the quality of teacher preparation our program offers. Surveys will be collected online by the program coordinator and processed by the PI/Co-PI beginning in year three of the grant and finishing in year ten of the Program, five years after the grant expiration.

Already in conjunction with the *Teacher Academy* and other programs, affiliated faculty present findings at the Hoosier Association of Science Teachers, Inc. (HASTI) annual meeting. The PI/Co-PI plan to present findings related to Noyce-funded activities. As we identify particularly effective strategies for recruiting, training pre-service teachers, and conducting in-service professional development to improve rural STEM instruction, we will seek to publish in appropriate venues such as the *Journal of Research in Rural Education* or *The Rural Educator* and to present at the National Rural Education Association meeting—conveniently scheduled for Cincinnati in October of 2012.

Southern Indiana Science Community (SISC) Noyce Scholarship Program

Project Summary

Ivy Tech Community College, a public two-year institution, and Hanover College, a private four-year liberal arts institution, will use a recently signed transfer articulation agreement to produce 16 new science and mathematics teachers with degrees in STEM fields and training in the best practices of inquiry-based science instruction. Hanover College students who express an interest in a pre-medical curriculum and Ivy Tech students in the pre-nursing program offer two heretofore-untapped recruiting pools. Targeted advising and a suite of service learning opportunities will provide these students early exposure to STEM teaching as a career alternative, at the same time immediately enhancing instruction at Partner LEAs with STEM outreach programs and additional resources. Our program will serve the largely rural region inside the triangle formed by Louisville, Indianapolis, and Cincinnati—each roughly 100 miles apart.

Intellectual Merit

A broad-based consortium like the one we envision (a 2-year college, a 4-year college, and six LEAs) can help solve several perennial problems with rural STEM education: lack of resources for adequately equipped instructional spaces, few extra-curricular educational opportunities for out-of-school time, limited teacher professional development, and difficulty recruiting well-qualified teachers. STEM interns performing outreach will bring "facilities" to Partner schools with pre-packaged curriculum units and also offer out-of-school programs; support for early career graduates will also provide development for teachers at our Partners; many of our recruiting targets are non-traditional, geographically immobile students who will remain to teach in the region for much of their careers. We will train Scholars using the pedagogical model recommended in 1996 by the National Research Council in its National Science Education Standards (NSES) as the best method of improving science teaching in the U.S, inquiry-based education, which is also in use at some Partner high schools.

Broader Impacts

Recruitment though STEM outreach internships offers the immediate bonus of enhancing education at partner LEAs, while the Scholarship Program adds the longer term benefit of providing a stable STEM teaching cohort in the region. Generally less mobile than their Hanover counterparts, Ivy Tech students are likely to spend their entire careers in our region. As students see their peers transfer to Hanover in the Noyce Scholarship Program, institutional contacts and advising procedures developed as the result of Noyce recruiting protocols can smooth the transition from an associate to a baccalaureate program and may encourage higher educational aspirations for place-bound students who cannot transfer to distant state institutions like Indiana University.

Each Partner has resources to offer and a part to play: Hanover College prepares competent scientists and effective teachers and provides facilities for out-of-school STEM outreach; Ivy Tech provides economical lower division preparation to talented students limited by geography, socio-economic status, or family and work commitments; Partner LEAs bring a deep commitment to providing the best education to all K-12 students as well as an understanding of and commitment to developing and refining the best classroom practices. Input from all Partners in building a "unified vision" of how to work together will be vital to our program success.

Budget Justification

Southern Indiana STEM Community (SISC)Robert Noyce Scholarship Program

Section A: Key Personnel — $59,162 (4% of budget)

The PI and Co-PI salary support is 12% and 7% of base salary respectively with an additional 12% of the salary support amount allocated for fringe benefits. Because of the difference in base salaries and to emphasize the equality of the institutional partnership, PI & Co-PI have agreed to salary support based on a dollar amount rather than a percentage of the base. Amounts are adjusted for an annual 3% merit and/or cost of living raise. Salaries are designated for the academic year (AY) because most training (course work, student teaching, etc.) and recruiting takes place during the AY. Of course, both the PI & Co-PI will conduct the week summer long orientation for Noyce Scholars, which may be scheduled outside their AY contracts. The PI also teaches during the summer on a per course basis and will oversee activities, which is common practice in a community college setting.

Section B: Other Personnel — $108,146 (8% of budget)

The Program Coordinator will be on a 12-month contract and will manage internships and information flow during both the summer and AY science outreach programs. This position is key to a seamless Scholar experience from initial contact to post-graduation follow-up. The coordinator will be housed at the Rivers Institute at Hanover College, which is an interdisciplinary public outreach unit of the College and is responsible for carrying out the internship recruiting programs. The STEM outreach program coordinators (who are funded by sources other than this grant) also reside at the Rivers Institute. Rivers Institute programs run for twelve months, though Hanover College does not hold classes during the summer. Thus, housing the coordinator in a department could hinder timely oversight of Noyce-funded interns as well as collection of evaluation data and planning for the summer orientation.

Master Teachers from each of the five Partner LEAs will advise the Noyce faculty and staff on effective training procedures, liaise with school administration, teachers, and student teaching supervisors, and also supervise Noyce Scholars working at the partner LEA. We anticipate selecting Master Teachers in collaboration with principals at our school partners. Those selected will receive a flat $1500 stipend for each academic year.

Section C: Equipment — $0

Section D, Travel — $15,000 (1%)

The PI/Co-PI, Master Teachers, Superintendents, and other collaborators associated with the Program will need to travel among LEAs to coordinate program activities and to attend meetings at the Hanover College & Ivy Tech campuses, so we have allotted a modest amount to reimburse participants for travel at the current Hanover College rate of $0.51/mile.

Section E, Participant/Trainee Support Costs — $1,225,254 (85% of budget)

By far, two-year undergraduate scholarships for Noyce Scholars comprise the largest portion of the budget. Because many of our target Ivy Tech students would not be able to complete

the program without full tuition support, we prioritize larger scholarships over recruiting a greater number of Scholars. Though Hanover students are more likely to continue into the 3rd & 4th years with smaller scholarships, distinguishing between Hanover & Ivy Tech students subverts the equality of the partnership, which is a vital component in getting students to recognize that progression from a 2-year to a 4-year institution is not a matter of "moving up" but of moving forward. Moreover, Hanover's traditional student population (and a target population initially intending to attend medical school) may be more reluctant to commit to four years of teaching without a strong financial incentive.

Because we will recruit Scholars in proportion to institutional enrollment (roughly 3 Ivy Tech students to 2 Hanover students), and because Ivy Tech students are much less geographically mobile than Hanover students, we anticipate a more sustained impact on districts in our region, as the former will not only complete their teaching commitments in the region but are likely to continue teaching in the same schools long after their commitment is fulfilled.

Internships with educational outreach programs are a key component of attracting STEM majors who might not otherwise consider teaching, giving them a "first try" in the classroom. Many Hanover College students already pursue summer internships with the programs described in the narrative, and additional internship funding will allow us to expand the scope of these programs to include Ivy Tech students and to better serve both potential Noyce Scholars and our LEA Partners, who will avail themselves of the programs and services to immediately improve STEM education opportunities in their districts.

We have allocated 4% of the budget to support the summer *Teacher Academy* professional development program. The majority of these funds will be paid as stipends to teachers who attend the week long summer experience and at least four subsequent semester follow-up days—usually scheduled on a Saturday. This program serves both as an internship venue where potential Noyce Scholars can network with in-service teachers and, more importantly, as early teaching support for Noyce Scholars after graduation.

Travel support in this category will be used when *Science Squad* teams take mobile lessons on-site to Partner LEAs. Teams will ordinarily use Hanover College vans at the standard rate—currently $0.35 per mile.

Section F, Other Direct Costs —$27,800 (2% of budget)

A small portion of the budget has been allocated for additional student costs, including need-based support for Noyce Program applicants who must take the PRAXIS I exam prior to applying, and funding for a textbook library of books that may be shared and reused for all five years of the program and beyond. We have also included a small budget to conduct the summer orientation for admitted Noyce Scholars to cover the cost of facilities, duplication, and personnel support.

In addition, about $5,000 in materials and supplies will be necessary in the first year of the *Science Squad* program to cover a small data projector and laptop computer, oscilloscope software and probes for the electricity and acoustics lessons, and some renewable supplies and worksheet duplication costs.

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