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Writing and Implementing Successful NSF S-STEM Proposals

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Abstract

For over 10 years, the National Science Foundation (NSF) has been funding S-STEM proposals. The S-STEM program "makes grants to institutions of higher education to support scholarships for academically talented students demonstrating financial need, enabling them to enter the STEM workforce or STEM graduate school following completion of an associate, baccalaureate, or graduate-level degree in science, technology, engineering or mathematics disciplines[1]." Currently, there are 1,148 active S-STEM grants at over 580 institutions of higher education in the United States[2].

At the authors' institution, three separate NSF S-STEM proposals have been funded since 2011. In this paper, the authors provide specific information on the approaches they used to write and implement successful NSF S-STEM proposals. The paper also provides details on the impact these programs are having at this institution, including strategies that have been successful in engaging students, enhancing student learning, and increasing self-efficacy and retention.

Background

East Carolina University (ECU) is a constituent institution of the North Carolina state system that is composed of sixteen institutions, consisting of every public educational institution that grants baccalaureate degrees in the state. ECU is the third largest institution in the system and is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools to award bachelors, masters, and doctoral degrees. Currently, ECU offers 100 bachelor's degree programs, 77 master's degree programs, 5 professional practice doctoral degree programs, and 16 research/scholarship doctoral programs.

More importantly, ECU has a large rural population, as well as a relatively high (≈20%) percentage of first-generation college students. Many of the counties from which ECU students come are economically disadvantaged, with over 15% poverty level. This background on the institution and its students is relevant, as S-STEM scholarships must be awarded to individuals who are FAFSA eligible[3]. It is important to ensure there will be a large pool of qualified (academically) and eligible (financially) students seeking the S-STEM funds. Competition for these funds increases the quality of the students to whom you provide scholarships, which in turn increases the likelihood that the participants are retained in the S-STEM program and at the institution.

In 2011, the Department of Engineering at ECU obtained $599,894 to support a program that expands engineering in the state, particularly among the rural population in one region of the state. In 2012, the Department of Biology at this same institution acquired $599,945 to fund biology and biochemistry students who are first-generation college students. More recently, in 2014, a faculty member in the Department of Chemistry, working with faculty from the Department of Physics, secured $620,833 to fund students majoring in chemistry or physics.

Proposal Commonalities and Recommendations

For all three proposals, there were a number of commonalities that the authors believe contributed to their success. Among these was a tie to STEM education and related literature that indicates how different types of activities and involvement impact students and their retention. For example, the work of Besterfield-Sacre et al.[4] indicates that an increase in confidence and improvement in communication skills can result from experiences that requires students to communicate with other students. Additionally, MacGuire and Halpin[5] note that, in reference to the work of Tinto[6], "once at the university, the quality of the individual's interactions with others has a strong impact on persistence (p. 6)". Related to the types of activities the authors included in their proposals, "vicarious experiences", such as shadowing and observing, and "verbal persuasion", such as the encouragement of faculty and other adults, have been shown to serve as significant contributors in the enhancement of self-efficacy[7].

All three proposals included a high GPA in order to stay in the program (3.0 or higher). In the initial proposal submitted by engineering in 2009, the GPA requirement was lower and the NSF review panel suggested the GPA be raised. In a follow-up discussion with a NSF Program Officer, the 3.0 minimum was suggested. While S-STEM funds are intended to assist FAFSA-eligible students, it is important that the students to whom the funds are awarded have a good academic background that will contribute to the probability that they will earn a college STEM degree. Since a 3.0 GPA may be difficult to achieve and maintain in college, particularly in STEM courses, it is also suggested to allow for a "recovery semester" if a participant has his/her GPA fall below the required minimum.

In the initial proposal submitted in 2009, there was no path for a participant to retain or regain his/her scholarship if he/she fell below the required GPA. At the recommendation of an NSF Program Officer, the 2010 proposal (and the subsequent proposals submitted by ECU) included a recovery semester that enabled a funded student to retain his/her funding as long as his/her GPA was only below 3.0 for one semester. While it is the case that some students have had to leave their S-STEM program at ECU due to a low GPA, it is also true that three engineering students and two biology students have been able to recover after one semester below 3.0 and remain in their respective S-STEM program.

Since there are occasions when students must leave an S-STEM program, it is important for a proposal to include a "substitution plan". This is a plan for finding a student to become a new member of the S-STEM program to replace a student who leaves. While this sounds simple, implementation experience has shown it can be tricky. For example, you need to have criteria by which you choose the new students. If your original cohort was formed from students coming straight out of high school, then the criteria you used to select them will necessarily be different than the criteria used to select a student from the existing college-student population. While the engineering program found it easy to determine students qualified from a merit basis (i.e., students with a 3.5 or higher), it was not easy to determine which of these students were FAFSA eligible. When writing the proposal, consider what criteria you will use to select students if a substitute is needed, but keep in mind that only your university's Office of Financial Aid will know FAFSA information. Maintaining good communication with one person in that office can be valuable, particularly as it relates to your proposed substitution plan.

Once you have made sure your proposal includes a GPA requirement, a path to recovery, and a substitution plan, you can focus on the activities your S-STEM program will include. All three S-STEM proposals from ECU included a number of out-of-classroom activities. These activities included a sailing trip aboard a faculty member's boat, a bowling competition between two of the S-STEM groups, a quiz bowl event for students from all three S-STEM programs, and an experience at an on-campus ropes challenge course. Faculty found that these programs helped build community and a sense of shared purpose, both of which help students succeed in STEM[8]. Additionally, as the work of Pascarella and Terenzini[9] indicates, students' participation in social and extracurricular activities, as well as peer and faculty interactions outside of the classroom have the most consistent positive impact on their engineering educational experience. The goal is that by building such a strong community, students will show more persistence. Research has shown that science major peers influence persistence [10].

Students in all of the S-STEM programs at ECU are either encouraged or required to join a living-learning community (LLC). These include the Engineering, Biology-Biochemistry and Chemistry-Physics LLCs. Living-learning programs have been shown to augment student success and participants' shared sense of responsibility[11, 12]. Along with the out-of classroom activities, these programs build and support the community atmosphere that provides support, and is most important for first-generation college and underrepresented groups[8].

While it is true that NSF would like to maximize the number of students impacted by S-STEM programs, the three programs at ECU have found that it is best to keep cohorts small. There are several reasons for this. First, from a logistics standpoint, scheduling meetings and activities with cohorts of more than 12 students can be difficult. When the engineering S-STEM program was in its second year, there was not a single hour during the school week, except for late on Friday afternoon, when none of the 13 students in the first two cohorts had class. While it is possible to move activities to after 5:00 p.m., we found that a number of students are involved in tutoring, student organizations, and team meetings for their classes during the evenings.

A second reason to keep the cohorts small is to reduce the probability that you will lose some of them. If applicants are selected for the S-STEM program based upon FAFSA eligibility and academic performance, then selecting only the top tier of applicants may help with retention, particularly as many of the STEM majors are very challenging for young students.

Lastly, maintaining smaller cohorts may assist with the students' ability to bond as a group. For two of the S-STEM programs at ECU, students are block scheduled so that they are in key classes with other S-STEM scholars. The goal is that more time spent together in both an academic setting and in the residence halls, through living-learning communities, will lead to group bonding. The relationship of interactions with others and persistence has been examined in the literature[5,6].

No matter what size cohorts your S-STEM program has or how events are scheduled to include as many participants as possible, it is important to follow up with students who miss scheduled events/activities. All students need to be held accountable and to understand that participation in program activities is expected. At ECU, some students' poor attendance at S-STEM program events has been a predecessor of poor academic performance and dismissal from the program. In order to be able to accurately summarize S-STEM activities for the end-of-year report, it is best to keep attendance records.

It is worth noting that the NSF values an institution's ability to sustain some of the aspects of the S-STEM program it has funded. At ECU, one of the sustainable aspects of the S-STEM program is a shadowing experience. For the engineering S-STEM program, each student is paired with a recent graduate who works locally, in order to shadow that engineer at his/her job for a half day. Survey feedback from this experience indicates the students who participate find it valuable. Table 1 below provides the 10 questions from the shadowing survey completed by participating students, along with average responses. Note that a 7-point Likert rating scale was utilized.

Table 1 – Shadowing Survey Questions and Average Responses

Q1	I feel this experience was a rewarding and valuable experience.	6.9
Q2	I now have a better understanding of what a full time job in engineering is like.	6.8
Q3	I gained new knowledge by participating in this experience.	6.8
Q4	This experience supported/enhanced my career goals.	6.6
Q5	I would describe my shadowing experience to other students as excellent.	6.6
Q6	I would recommend this activity for other engineering students.	7.0
Q7	This experience helped me better understand the connection between my academic courses and future career.	6.6
Q8	I came away from this experience with some ideas/plans I would like to implement in future talks with potential engineers.	6.4
Q9	The shadowing experience met my expectations.	6.5
Q10	I feel this activity should definitely be part of E3NC program.	6.9

While it may be tempting to use S-STEM scholarship funds to lure talented high school seniors to your program, we recommend that you do not offer more than $5k to incoming freshmen. Of the six students who have left the engineering S-STEM program to date, three of them were "lost" as freshmen. Similar results occurred in the biology program. Since our S-STEM program gives students a semester to recover, that means a year's worth of scholarship funds were awarded to a student who was not retained in the program. We believe that awarding smaller amounts to incoming freshmen (such as $3k - $5k) and then raising award amounts based on academic performance and FAFSA eligibility is a better approach. The chemistry/physics S-STEM program at ECU is using this approach, but the program is too new to have results on the impact.

Program Impacts

One of the biggest program impacts seen by the engineering S-STEM program at ECU, which is now in its fourth year, is the impact the leadership demonstrated by these students has had. As an example, among the first cohort of engineering S-STEM Scholars, one has served as a teaching assistant for six classes over the past six semesters, one has served as a lead peer tutor, personally assisting over 150 students over the past three years, and one is part of a university program that integrates service, learning, and mentorship.

An impact exhibited by all three S-STEM programs at ECU is the higher GPA participants have when compared to recent graduates in the same major. Table 2 below indicates the average GPA for the eight cohorts of students currently in these three programs. For the two programs that have been in existence a full year (engineering and biology), data on the average GPA of recent graduates is supplied for comparison purposes.

Table 2 – S-STEM Scholars' Average GPAs

Cohort	Size	Average GPA	Class of 2014 GPA
Engineering #1 (class of 2015)	5	3.70	3.11
Engineering #2 (class of 2016)	6	3.44	3.11
Engineering #3 (class of 2017)	5	3.60	3.11
Engineering #4 (class of 2018)	5	3.36	3.11
Biology #1 (class of 2016)	6	3.50	3.36
Biology #2 (class of 2017)	3	3.65	3.36
Biology #3 (class of 2018)	9	3.62	3.36
Chemistry/Physics #1 (class of 2018)	10	3.04	N/A

A published study of students from the United States Air Force Academy[13] found that peer effects are greater in mathematics and science courses and that students of lower ability benefit the most from having high quality peers in their classes. A similar study corroborated this affect at another university[10]. While it cannot be proven that this is also the case at ECU, one would expect there are benefits to having academically strong students in your program.

Another impact of the S-STEM programs at ECU is the implementation of a shadowing program that includes students outside of the S-STEM program. As noted in Table 1 above, 100% of the engineering students who participated in the shadowing experience said they would recommend this experience for other engineering students. During spring 2015, the Department of Engineering at ECU will set up a program that will enable engineering sophomores, juniors, and seniors the opportunity to shadow a local engineer. The shadowing program will be limited to students who have a 2.5 GPA or higher and who complete a brief application. Students must have an empty 4-hour block of time in their class schedule in order to shadow, as experience has shown that a half-day is needed to make the experience worthwhile.

S-STEM programs at ECU have also had an impact in the area of peer tutoring. As an example, over a three semester period, one of the S-STEM scholars who works as a peer tutor assisted approximately 40 students regularly (day appointments) and over 130 during evening drop-in appointment hours. As research has shown, peer tutoring and mentoring increases students metacognition skills, although careful training of mentors is advised[14]. In addition, well directed peer tutoring programs increased retention and the relative cost was considerably lower than counseling in order to achieve the same results[15].

While it is a not a requirement of S-STEM programs to serve underserved populations, all three programs at ECU do so. The engineering S-STEM program has 21 participants, and 16 of them are from counties in eastern North Carolina. Most of these counties are rural and poor, with some having poverty levels exceeding 24%[16]. The biology S-STEM program has 18 funded participants, 16 of whom are first generation college students and six of whom are from underserved populations. Of the 10 chemistry/physics S-STEM program participants, five are first generation college students and seven are from underserved populations. Like engineering's participants, a number of the participants for the biology and chemistry/physics programs are from eastern North Carolina. As indicated in Figure 1 below, we have succeeded in recruiting and funding a diverse population of scholars.

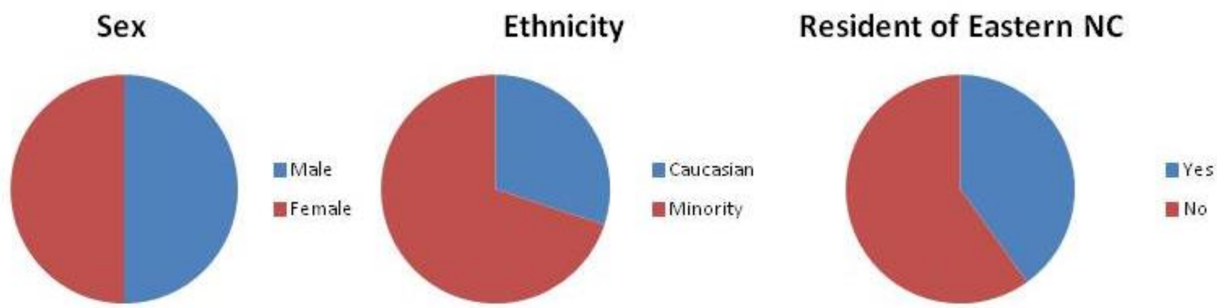

Figure 1: Aggregated Demographic Data: S-STEM Programs at East Carolina University

We believe that by serving students from disadvantaged communities and students whose parents did not have the opportunity to attend college, we are opening doors and providing a way for some of these individuals to attend a four-year college. A number of them might not have had the opportunity to do so without the S-STEM funding. Additionally, the financial support provided by the S-STEM scholarships allows participants to focus on their studies and, in many cases, not have to work part time. As a result, students are more committed to their academics and have more success in the classroom. Also, as can be seen from Table 3 below, our three S-STEM programs are retaining students, many of whom are from underrepresented groups, at a higher rate than the university overall is retaining students in all majors (Table 4). This has been an unexpected finding, as typically retention in STEM majors is not as high as in other majors. Therefore, our retention results are an important outcome.

Table 3 – ECU S-STEM Retention Rates

Cohort	Number of Students Retained	Percentage of Students Retained
Engineering #1	5 out of 6	83%
Engineering #2	8 out of 8	100%
Engineering #3	4 out of 6	67%
Engineering #4	N/A*	N/A
Biology #1	5 out of 6	83%
Biology #2	7 out of 9	78%
Biology #3	N/A*	N/A
Chemistry/Physics #1	N/A*	N/A

*Because retention is based upon students who remain enrolled into their sophomore year, these data are not available for the most recent cohorts from all three programs.

Table 4 – Typical Retention Rates at East Carolina University (2006 and 2007 as examples)

Cohort Year	Retention Rate (%) (Freshman to Sophomore)	
	STEM Majors	Non-STEM Majors
2006	73.3	78.8
2007	72.3	77.4

Strategies to Engage Students

Some of the goals of higher education are to increase retention of students, increase graduation rates and produce students with critical thinking skills. These metrics are particularly important in the STEM disciplines where retention rates are lower and students perceive the subjects as more difficult. While many colleges and universities have tried to introduce practices to improve critical thinking and problem solving ability in order to increase students' chances of success, it may be too late if students do not feel connected to the institution and are unwilling to persist when faced with a challenge. For this reason, a broad spectrum approach is likely to yield better results, and utilizing retention and persistence tools such as a freshman seminar coupled with strategies to improve thinking skills is a natural choice.

Many colleges and universities have incorporated some type of Freshman Seminar course in order to assist their incoming students with the adjustment to college life. The use of a freshman seminar has now expanded, as this approach has been shown to help students feel more connected to their institutions, and more informed about the resources available on campus. The net result of this is increased retention and higher persistence rates[17-19]. Also, as noted above, Living-Learning Communities (LLC), which tend to cater more to freshmen, can offer students opportunities to engage and may enhance their sense of belonging.

Problem-Based Learning (PBL) is another strategy that has been shown to engage students. Since the University of Delaware introduced problem based learning as an approach in their introductory science courses, many other institutions have adopted a similar model wherever possible. Research by Schmidt[20] indicates that PBL reinforces concepts by having students work independently or in small groups to draw upon prior knowledge to learn within a real-world context. The data obtained from using this type of approach indicate that students perform better at an introductory level and many of those skills carry over into higher level classes[21]. Tinto has also carried out extensive studies on PBL, or collaborative learning, at the University of Syracuse and found that these approaches show greatly increased student effort on a range of measures along with higher retention rates[22]. At ECU, all sections of freshman biology (BIOL 1100) are being taught using PBL. This approach is new, and data regarding its impact are not yet available.

Undergraduate research opportunities early in a student's program have been shown to support STEM learning gains, particularly for minority students[23]. As the PI of the biology S-STEM grant is the ECU's Director of Undergraduate Research, several of the S-STEM students started undergraduate research as sophomores and are continuing. Others began projects as juniors. Undergraduate research and living-learning programs are considered "high-impact" practices[24]. These are programs and practices that give today's college graduates what are universally understood to be skills and capabilities needed in all professions.

Additional methods for engaging students include shadowing/career exploration and involvement with others from their chosen profession. Shadowing someone performing his/her job can help students, as observing can be a very effective way to learn[25]. Shadowing has been implemented in the engineering S-STEM program, with the expectation that the shadowing experience enables students to have a clearer understanding of what engineers do and what skills are needed to be a successful engineer. Since fall 2011, the engineering S-STEM program has also invited its participants to attend lunch at semi-annual meetings with its advisory council. As previously noted, shadowing and observing, as well as encouragement from faculty and other adults can contribute significantly to improvement in self-efficacy[7].

The engagement of S-STEM Scholars at ECU as peer tutors was documented above. A similar technique which involves guided peer-questioning has also been shown to demonstrate positive results, with students able to offer more elaborate well-constructed explanations than those who did not engage in this activity[26]. These data would indicate that students are acquiring better critical thinking skills using this approach.

Cohort scheduling is carried out at programs such as the Meyerhoff Scholars Program at University of Maryland, which has had tremendous success in increasing the number of African Americans completing STEM degrees[8]. It is used as another strategy that strengthens the peer group. Cohort scheduling was done for STEM subjects with the first year of the biology S-STEM program. Surveys of the students afterwards indicated that the students wanted more cohort scheduling, so for the second and subsequent years, the practice has increased to as many courses in the first semester as possible.

Enhancing Student Learning, Self-Efficacy, and Retention

The approaches utilized in the S-STEM programs at ECU are ones which have been shown to enhance student learning, increase self-efficacy, and raise retention rates. Our programs have found success through living-learning communities, freshman seminar, engagement of students in activities outside of class, peer tutoring, shadowing, and cohort scheduling, among other approaches. In the chemistry/physics S-STEM program a living learning community passport was introduced. This tool is being used to track student attendance at living learning community, university and non-university events. Although we do not have control data to compare our cohort with, many of the students stated that they attended events they would not normally have considered attending and that they were surprised at how much they enjoyed them.

In conclusion, we believe that in order to secure an S-STEM award and get the most from the award, a flexible plan is required that incorporates resources and tools to help students succeed and to encourage them to persist. This is a complex challenge and it requires a strong, diverse, committed team from within the University. Faculty must allocate the time needed to plan and implement extracurricular events, keeping mind that as the size o f he S-STEM group grows, the complexity of scheduling events increases tremendously. It may become necessary to recruit new members to the faculty team if the roles of those on your proposal change (for example, if one moves into administration). It may also become necessary to modify your original plans if the activities you intended to employ are not feasible. Keeping the S-STEM students engaged and being available for them throughout the semester are both excellent ways to maximize retention and success of your S-STEM participants.

Bibliography:

[1] http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5257 downloaded on 1/6/2015.

[2] NSF Scholarships in Science, Technology, Engineering, and Mathematics: Active Awards, http://www.nsf.gov/awards/award_visualization.jsp?org=NSF&pims_id=5257&ProgEleCode=1536&RestrictActive=on&BooleanElement=true&BooleanRef=true&from=fund#region=US-WV downloaded on 1/21/15.

[3] www.fafsa.gov

[4] Besterfield-Sacre, M. Amaya, N.Y., Shuman, L.J., Atman, C.J., & Porter, R.L. (1998). Understanding student confidence as it relates to first year achievement. *28th Annual Frontiers in Education* 1, 258-263.

[5] MacGuire, S. & Halpin, G. (1995). Factors related to persistence in engineering: results of a qualitative study. Presentation at *Mid-South Research Association Meeting*, Biloxi, MS.

[6] Tinto, V. (1993). Leaving College. 2nd edition, Chicago: University of Chicago Press.

[7] Ponton, M.K., Edmister, J.H., Ukeiley, L.S., & Seiner, J.M. (2001). Understanding the role of self-efficacy in engineering education". *Journal of Engineering Education* 90(2), 247-251.

[8] Maton, K. I. & Hrabowski III, F.A. (2004). Increasing the number of African American PhDs in the Sciences and Engineering: A Strengths-Based Approach. *American Physiologist* 59, 547-556.

[9] Pascarella, E.T., & Terenzini, P.T. (2005). How College Affects Students: A Third Decade of Research, v2. San Francisco: Jossey-Bass.

[10] Ost, B. (2010). The role of peers and grades in determining major persistence in the sciences. *Economics of Education Review* 29, 923-934.

[11] Tinto, V. (2003). Learning better together: he impact of learning communities on student success. In *Promoting Student Success in College, Higher Education Monograph Series* (pp. 1-8). Syracuse University, NY.

[12] Inkelas, K.K., & Weisman, J.L. (2003). Different by design: an examination of student outcomes among participants in three types of living learning programs. *Journal of College Student Development* 44, 335-368.

[13] Carrell, S.E., Fullerton, R.L., & West, J.E. (2009). Does your cohort matter? measuring peer effects in college achievement." *Journal of Labor Economics* 27(3), 439-464.

[14] De Backer, L., Van Keer, H., & Valcke, M. (2014). Promoting university students' metacognitive regulation through peer learning: the potential of reciprocal peer tutoring. *Journal of Higher Education*, DOI 10.1007/s10734-014-9849-3.

[15] Topping, K.J. (1996). The effectiveness of peer tutoring in further and higher education: A typology and review of the literature. *Higher Education* 32(3), 321-345.

[16] United States Federal Govt. 2010, http://quickfacts.census.gov/qfd/states/37/37147.html downloaded on 1/30/15.

[17] Upcraft, M. L., & Gardner, J.N. (1989). The Freshman Year Experience. Helping Students Survive and Succeed in College. Jossey-Bass Inc., San Francisco, CA.

[18] Gordon, V.N., & Grites, T.J. (1984). The freshman seminar course: helping students succeed." *Journal of College Student Personnel* 25(4), 315-320.

[19] Shanley, M.G., & Witten, C.H. (1990). University 101 freshman seminar course: a longitudinal study of persistence, retention, and graduation rates. *NASPA Journal* 27(4), 344-352.

[20] Schmidt, H.G. (1983). Problem-based learning: rationale and description". *Medical Education* 17, 11-16.

[21] Duch, B. J., Groh, S.E., & Allen, D.E, eds. (2001). The Power of Problem-based Learning: A Practical" How To" for Teaching Undergraduate Courses in Any Discipline. Stylus Publishing, LLC.

[22] Tinto, V. (2003). Promoting student retention through classroom practice." *Enhancing Student Retention: Using International Policy and Practice, an international conference sponsored by the European Access Network and the Institute for Access Studies at Staffordshire University.* Amsterdam.

[23] Lopatto, D. (2007). Undergraduate research experiences support science career decisions and active learning. *Cell Biology Education-Life Sciences Education* 6, 297-306.

[24] Kuh, D.D. (2008). High-impact educational practices: What they are, who has access to them, and why they matter. American Association of Colleges and Universities, Washington, DC.

[25] Bandura, A. and Walters, R. (1963) Social learning and personality development. Holt, Rinehart, and Winston, New York.

[26] King, A. (1990) Enhancing peer interaction and learning in the classroom through reciprocal questioning. *American Educational Research Journal* 27(4), 664-687.