

DAVIDSON



Opening Wide the Gateways: Enhancing Student Learning and Promoting Inclusion in the Quantitative Disciplines

Davidson College Quality Enhancement Plan

Submitted to the Commission on Colleges for Review by the On-Site Committee
October 17-20, 2016

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Executive Summary

Opening Wide the Gateways is a reflection of Davidson's Statement of Purpose, a culture of action informed by assessment, and the value the College places on an inclusive community. The plan recognizes an intentionally changing student profile and the important role faculty will continue to have in creating an academic environment in which all students can thrive.

Davidson's Quality Enhancement Plan focuses specifically on disciplines where we have seen differential performance between majority and underrepresented students and where the literature about the positive effects of inclusive pedagogical practices is robust. The experiences of Davidson faculty strongly suggest that connecting new pedagogies to gateway courses in six quantitatively-oriented departments would lead to measureable improvement in learning outcomes.

Specifically, the QEP focuses on:

- the quantitatively-oriented disciplines of Biology, Chemistry, Economics, Mathematics/Computer Science, Physics, and Psychology,
- gateway courses in those disciplines that serve as an introduction to concepts and analytical methods that build sequentially, and
- learning outcomes in those gateway courses that are critical to achievement in the discipline and that reverberate throughout more advanced work in it

In addition to discipline-specific learning outcomes (these are detailed below), we specifically target *application learning* in the gateway courses. Application learning refers to skills that enable students to apply information learned in one context to new situations. These skills are crucial to later success and students who struggle with them tend to falter.

In addition to the discipline-specific learning outcomes described in the following pages, the QEP defines a broad application learning outcome that functions as a bridge between discipline-specific learning outcomes discipline and those that bring extrapolate beyond it. It is:

- All students will be able to recognize under what conditions theories, models, or quantitative evidence should be applied and to use them appropriately to explain phenomena or solve problems.

Opening Wide the Gateways is further concerned with how instructors in the quantitative disciplines can foster diversity and inclusion in their gateway courses. Enhancement of student learning will go hand-in-hand with the enhancement of faculty knowledge of inclusive pedagogical practices. Two important components of faculty participation are the May Workshop and the learning community in which instructors can share experiences, discoveries, successes, and challenges.

The QEP's assessment will depend on a multi-method, multi-year protocol. In addition to assessment of learning outcomes, a program evaluation will look at the overall learning environment and the degree to which a sense of inclusive community is fostered.

Davidson is fortunate to have the resources and organizational structure that the QEP requires for success. Our most important resource is the campus community's commitment to inclusivity and academic success of all students.

Selecting Davidson's Quality Enhancement Plan

The topic of Davidson's Quality Enhancement Plan emerged naturally from ongoing campus planning and assessment, and reflects a collective understanding of campus priorities. The process by which the focus of the plan was determined, and decisions around resources, implementation, and assessment were made, involved faculty, relevant staff, and students. At every step, feedback was solicited, ideas were incorporated, and revisions shared. The QEP submitted here has been formally endorsed by faculty, students via the Student Government Association, the Principal Executive staff representing all divisions of the College, and the Board of Trustees.

Identifying the Issues

Davidson engages in on-going institutional assessment that reflects campus values and determines programmatic priorities. As demonstrated in the narrative for Core Requirement 2.5, there is a clear path from mission to strategic planning to annual goal setting, and assessment is used to determine where programs are succeeding or where changes must be made to ensure they do.

Davidson was well-positioned, therefore, to note the emergence of the issues that would form the basis of the QEP. Although some research has been conducted specific to the QEP, much of what set its direction has been part of campus planning for many years. As the general topic became a focused plan, the specific analyses enabled us to make decisions about its implementation in the context of the broader learning environment.

Historical Background and Strategic Direction

As a College founded by the Presbyterian Church, Davidson strives to avoid all forms of narrowness and parochialism, in terms of both the people whom it invites into its fold and the scope of its members' scholarly concerns. To fulfill its mission, therefore, it must extend its loyalty — as its Statement of Purpose says — “to the whole of humanity;” it must welcome “students, faculty, and staff from a variety of nationalities, ethnic groups, and traditions,” and it must value the diverse identities of each student it admits, “recognizing the dignity and worth of every person.” That recognition of each person's dignity and worth grounds Davidson's abiding commitment—again, in the words of the Statement of Purpose—to seek “students of good character and high academic ability, irrespective of economic circumstances.” This Statement of Purpose, revised into its present form in 2005, emphasizes just how crucially important it is to embrace a diverse and vibrant population into its community.

Davidson's Statement of Purpose further articulates the important role faculty play in creating an environment that supports learning for all students:

In fulfilling its purpose, Davidson has chosen to be a liberal arts college, to maintain itself as a residential community of scholars, to emphasize the teaching responsibility of all professors, and to ensure the opportunity for personal relationships between students and teachers. ... Davidson believes it is vital that all students in every class know and study under mature and scholarly teachers who are able and eager to provide for each of them stimulation, instruction, and guidance.

In the selection of its faculty, Davidson “seeks men and women who respect the purpose of the college” and, especially those, “whose interest in students and teaching is unfeigned and profound.”

An understanding of true diversity evolves over time. Diversity at Davidson was defined in its earliest days in terms of its openness to Christian denominations beyond Presbyterian. In the 1930s, admission was opened to other religious traditions as well. African-American students first enrolled in 1964, and women in 1973. Taken in their historical context, these signposts of a changing understanding of what constitutes a diverse campus render unsurprising the College’s recognition that further changes are necessary, especially if the College wishes to grant all students prepared for Davidson’s rigorous academics full access to the rich education available to them here.

As a consequence, demographic diversity of all kinds has increased at Davidson, and especially so in the past decade, reflecting a series of changes grounded in strategic planning.

The Davidson Trust

In March of 2007, the College’s Board of Trustees approved the financial aid policy now known as The Davidson Trust, making Davidson the first private liberal arts college in the country to eliminate loans in financial aid packages. Together with its policies regarding need-blind admission and meeting 100% of demonstrated need, Davidson ensured access to all qualified students without regard for family income.

Strategic Planning 2007-2011

The financial aid policy change had taken place under President Robert Vagt. When President Thomas Ross was inaugurated in August of 2007, he undertook a comprehensive strategic planning process that further codified Davidson’s commitment to access. Among the objectives of the plan presented to the Davidson campus in 2009 were those that expanded enrollment and educational opportunities for students from groups that have been historically underrepresented at the College. Among those with direct relevance to discussion around the QEP were the following.

Strategic Objective I: Extend the reach and effectiveness of academic work at Davidson to activities both on campus and in the wider community.

Of the sixteen strategies articulated to achieve this objective, the one most germane to the selection of our QEP topic (Strategy 6) recommends the creation of a Center for Teaching and Learning that works both to support students with special needs and promote student achievement in—among other subjects—mathematics and science. Now a vital and expanded resource for the campus community, the Center for Teaching and Learning was opened in August 2011.

Strategic Objective IV: Diversity and Inclusivity: Create an inclusive community and curriculum that promote understanding and acceptance of diversity in a broad sense while encouraging access [and] support for [underrepresented students].

Among the strategies articulated for meeting that objective, four were especially germane to the selection of our QEP topic:

- Expand enrollment of and opportunities for underrepresented students (Strategy 4)

- Ensure excellent mentoring of all students (Strategy 7)
- Provide ongoing support to first-generation students and their families through targeted programs throughout their four years at Davidson (Strategy 8)
- Cultivate, in new and existing courses, a curriculum that meets the needs of a diverse and inclusive student body (Strategy 15)

Strategic Direction and Campus Aspirations 2011-Present

When Carol Quillen arrived as Davidson's new president in 2011, she renewed the College's commitment to ensure that all students, including those from historically underrepresented groups, gain full access to all that the College has to offer. With this commitment in mind, she undertook to create new partnerships around admissions with such community-based organizations as the POSSE Foundation and the Questbridge Program. Moreover, President Quillen also emphasized the role of the Center for Teaching and Learning as a resource not only to aid student learning, but also to encourage the sharing of pedagogical innovation and insight among faculty. All of these initiatives aimed to realize the College community's shared aspirations, as articulated by President Quillen early in her tenure. Among these shared aspirations, two stand out as guiding principles that motivate the QEP. The first is reimagining the liberal arts in such a way as to foster inclusive pedagogical practice; the second is commitment to educational excellence and access—a commitment characterized by Davidson's becoming an ever more diverse community in which inclusivity is a commitment and broad practice.

Assessments Leading to the QEP

In recent years, as it has worked to deepen that commitment to diversity and inclusivity, the College has taken steps to assess the extent to which it stills falls short of its aspiration to be fully inclusive. While the selected QEP has given us the opportunity continue that assessment, the College had already begun such assessment before the QEP topic was selected.

Teagle Research. In 2011, Davidson used a two-year Teagle grant to assess the ways in which students use academic support, particularly within the Center for Teaching and Learning (CTL). Focusing initially on first-generation students, we discovered significant differences not only in their use of the CTL but in their perceptions of classroom interactions. For example, several such students shared stories of professors who announced that they only rarely give a letter grade of "A". Such a pronouncement actually decreased the first-generation students' willingness to seek out academic assistance from such professors, since to do so would, in the students' minds, confirm what they perceived as professors' low expectations of them. By contrast, study participants who were not first generation students perceived such professors' pronouncement as a challenge to do well and were more likely to ask questions in class, take advantage of office hours, or make use of academic support, including the CTL. The Teagle study thus made it clear that more must be done to broaden student access to the help that their professors might offer them.

As we would find in a later analysis of GPA, first-generation status was a less salient component of GPA differentials than race or ethnicity.

Differences in Probable and Actual Major by Race/Ethnicity. Prompted by questions about perceived differences in changes between intended major and actual major by

race/ethnicity, an analysis revealed that such patterns did exist. We looked at what entering students indicated as probable majors between 2003 and 2013, and the major at graduation for those same students. For White students, there was a decrease of approximately 20% between intended and graduating majors in the natural sciences or mathematics. For students from underrepresented groups, the decrease was 31%.

Perceptions of Campus Inclusivity. In Fall 2014, the President appointed a task force of the Implementation and Strategy Initiatives group to study the ways the campus environment fosters, or hinders, a sense of inclusivity. Among the early focus-group findings (Appendix A Inclusivity Focus Groups Transcript Analysis) was that classroom dynamics can play an important role in encouraging, or dampening, students' participation in class discussion. Here too, the professor's role in establishing these dynamics proved crucial in influencing not only the students' likelihood of success in the class, but also their continuing interest in the discipline.

Research Specific to the Quality Enhancement Plan

Once the topic of the QEP had been identified, work began on the analyses that would help us focus in on a plan with campus-wide implications for student learning.

GPA Analysis

We began by looking at the majors of graduates from 2010 to 2014 (at that time, the most recent classes on which we had full data). We initially asked two questions of these data:

- Is there a relationship between choice of major and race/ethnicity?
- Within majors, is there a relationship between overall GPA and race/ethnicity?

We found disproportionate representation across majors by race/ethnicity. Limiting the analysis to majors with at least 25 graduates in the five-year period of the analysis, 13% of graduates in these majors were African-American or Latino, a percentage consistent with overall enrollment of those two groups. In the natural sciences, however, African-American or Latino students were only 7% of graduates. When Economics and Psychology—majors in the social sciences with similar quantitative orientation—were included, the percentage was 9%. The largest percentage, 13%, was in Psychology.

Underrepresented Students in Quantitatively-Oriented Majors 2010-2014

Natural Sciences	Number of Majors	African-American /Latino Majors	Percent
Biology	211	22	10%
Chemistry	51	2	4%
Mathematics and Computer Science	98	2	2%
Physics	28	2	7%
Total Natural Sciences	388	28	7%

Social Sciences	Number of Majors	African-American /Latino Majors	Percent
Economics	172	13	6%
Psychology	198	26	13%

Total Quantitatively- Oriented Majors	758	67	9%
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In some of these majors, the percentage of underrepresented graduates was particularly small. Chemistry included two African-American graduates during this five-year period and no Latino graduates. Mathematics graduates included a single African-American and a single Latino student.

Underrepresented students were disproportionately drawn to Sociology (46% of this major's graduates), Anthropology (41%), and Hispanic Studies (21%).

The small number of underrepresented students for some majors (Physics, Mathematics and Computer Science) precluded comparisons of GPA. For majors where these comparisons were possible, White students had higher GPAs than underrepresented students in each case.

Average GPA at Graduation for Selected Majors 2010-2014

Major	African American	Latino	White	Differential: White-Underrepresented	
				African American	Latino
Anthropology	2.94	2.89	3.27	0.33	0.38
Biology	3.17	3.00	3.36	0.19	0.36
Economics	2.57	3.22	3.39	0.82	0.17
English	3.03	3.11	3.34	0.31	0.24
Hispanic Studies	2.99	3.34	3.40	0.41	0.06
Political Science	2.80	3.08	3.27	0.47	0.19
Psychology	2.91	3.10	3.31	0.40	0.21
Sociology	2.89	3.01	3.14	0.25	0.13

Although complicated by small numbers limiting one or both of the above analyses, the pattern emerging was this:

- Underrepresented students initially interested in the sciences or mathematics were more likely than other students to change to a major outside the natural sciences.
- Underrepresented students were less likely to be among graduates in the natural sciences and Economics.
- Of the majors with the largest GPA differentials between underrepresented and White students, many were quantitatively-oriented disciplines.

Grade Analysis for Quantitatively-Oriented Gateway Courses

Finding a relationship in both movement away from quantitative fields and in graduating GPAs led us to a third question:

Can these relationships be traced back to the first experience in a discipline, the gateway course?

We looked at the course grades in the gateway courses taken by the same group of graduates in the previous analysis. We began with the departments where differences had emerged most starkly between underrepresented students and majority students (changes in probable major, graduating major, GPA). We then narrowed in on the departments with clearly defined gateways, that is, introductory courses that are part of a sequence and count for major credit. This focus brought us to four majors in the natural sciences and two in the social sciences.

- | | |
|-------------|--------------------------------|
| • Biology | • Mathematics/Computer Science |
| • Chemistry | • Physics |
| • Economics | • Psychology |

Among these six majors, there are ten courses that serve as gateways. Two (in Physics) were excluded from further analysis because fewer than 10 graduates between 2010 and 2014 had taken them. In the remaining eight gateway courses, underrepresented students had lower average course grades than majority students.

Average Course Grade in Gateway Courses 2010-2014

Course	African American	Latino	White	Differential: White-Underrepresented	
				African American	Latino
BIO 111	2.32	2.80	3.06	0.75	0.27
BIO 112	2.49	3.07	3.20	0.71	0.13
CHE 115	2.45	2.76	3.26	0.81	0.50
ECO 101	2.04	2.46	3.07	1.04	0.62
MAT 112	2.44	2.79	3.14	0.70	0.35
MAT 130	2.54	2.92	3.09	0.55	0.18
PHY 120	2.50	2.64	3.16	0.66	0.52
PSY 101	2.57	2.69	3.20	0.63	0.51

Taken together, these analyses pointed to dampened interest, and lower performance, among students from underrepresented groups in quantitatively-oriented majors at Davidson when compared to White students.

Bringing the Research Together

Why was this the case? Davidson admits students who not only show academic promise but who have demonstrated high academic achievement. There is, of course—even among students with excellent standardized test scores and who have taken the most advanced courses in their high schools—a range of interests and strengths. But those differences were not distributed across all students. We noted a pattern; not it should be said, a perfect correlation between interests or academic performance and race/ethnicity, but enough predictability to make us gather together all the material that touched on these questions and look closely again.

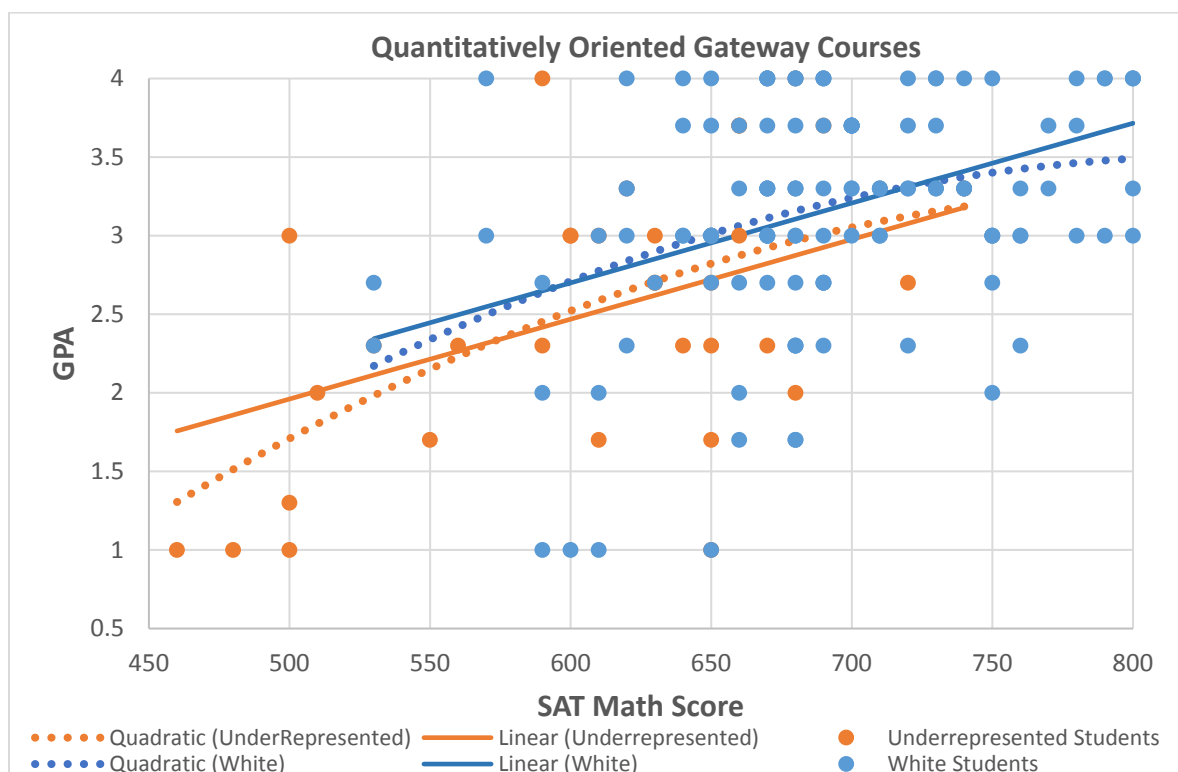
Given the nature of these six disciplines, and myriad studies that have looked at the relationship between mathematical preparation and college performance, we began there. Were there, in fact, sufficient differences in mathematical preparation by race/ethnicity to account for differences in grades in the gateway courses for these departments?

All students admitted to Davidson have shown the potential to achieve at high levels of academic rigor. All are expected to have chosen the most challenging academic program of study available to them at the high school level in preparation. Differences exist among high schools in terms of what level of preparation they can offer, with the possibility that not all students enter Davidson with equal exposure to advanced courses in mathematics. Given the quantitative focus of the gateway courses that are part of Davidson's QEP, a question understandably arose: Is performance in these courses a function of preparation? An analysis looked at the observed

differences in performance, as measured by course grades, and differences in preparation, for which the SAT quantitative test provides a proxy.

High school grades as a measure of preparation presented problems. Variations in rigor, material, or grading standards could not be measured. We chose to use the SAT Math test as a proxy for preparation because it is a standardized instrument and because, more than the Critical Reading or Writing tests, it depends on exposure to and understanding of a particular set of concepts.

We found that, on average, underrepresented students scored lower than majority students. Even when SAT Math is held constant, there was still a statistically significant difference (at the 10% level) in course grade by race/ethnicity. That is, even when students from underrepresented groups and majority students had nearly identical scores on the SAT Math test, underrepresented students were more likely to earn a lower course grade. This result holds even if we assume a quadratic model. With the quadratic model, however, the difference in course grade by race/ethnicity is no longer statistically significant at the 10% level. The lack of statistical significance for the quadratic model could potentially be attributed to the small sample size of 34 underrepresented students and 125 majority students. For both models, predicted grade points are on average lower by about 0.2 for underrepresented students even after controlling for SAT Math scores.



Linear Model:

$$\widehat{Grade} = -0.347 + 0.005^{***} SATMath - 0.231 * UnderRepresented$$

$$\bar{R}^2 = 0.247$$

Quadratic Model:

$$\widehat{Grade} = -6.386^{**} + 0.0236^{**} SATMath - 0.000014^{**} SATMath^2 \\ - 0.189 \text{ UnderRepresented}$$

$$\bar{R}^2 = 0.258$$

*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels (one-sided) respectively.

We understood that differences in preparation might exist that aren't captured in the SAT Math test. Further, we acknowledged that there were positive reasons that some underrepresented students might change their minds about majoring in the sciences, including that the overlap between race/ethnicity and first-generation status might have led those students to think in terms of known careers (in medicine, for example) but who, on fuller exposure to the range of the liberal arts, found that other disciplines spoke more compellingly to their passions or life plans

We were also aware, based on campus assessments of diverse learning environments, workshops on inclusive classrooms, and presentations on micro-aggressions, that other elements might certainly be in play.

In the aggregate, however, this was clear: We admit students who have shown every sign that they are capable of doing the work of any major at Davidson. When students do not do as well as we—or they—expected, or when they are discouraged from pursuing an interest, it is incumbent on the College to address those issues, whatever the source.

The significant scholarly literature on inclusive pedagogy—which is especially robust in the sciences—as well as the experiences of Davidson faculty strongly suggest that connecting new pedagogies to gateway courses in these six quantitatively-oriented departments would lead to measureable improvement in learning outcomes. Research on diverse learning environments also suggested that all students, across races and ethnicities, would show such improvement.

The Focus of the Quality Enhancement Plan

Davidson's Quality Enhancement Plan, therefore, has arisen naturally from campus planning and assessment. It recognizes an intentionally changing student profile that has become more inclusive in terms of race and ethnicity. It is focused on learning outcomes in disciplines where the impact will be especially clear and where changes in the learning environment has the potential to reverberate across the College. The QEP will focus on:

- the quantitatively-oriented disciplines of Biology, Chemistry, Economics, Mathematics/Computer Science, Physics, and Psychology,
- gateway courses in those disciplines that serve as an introduction to concepts that build sequentially, and
- learning outcomes in those gateway courses that are critical to achievement in the discipline and that reverberate throughout more advanced work in it

Since a final course grade is determined by the extent to which the sum total of all learning outcomes are achieved, choosing the outcomes on which to focus for the QEP was an important decision. How this decision was made, and the specific learning outcomes that will be assessed, is discussed in detail in the following chapter.

While the selection of our QEP topic, *Opening Wide the Gateways*, is largely motivated by a desire to enhance the learning experience of underrepresented students of color, it also grows out of the conviction, supported by research, that diverse classrooms that deploy the strategies of inclusive pedagogy enhance the learning of all students. According to Amy Stuart Wells, Lauren Fox and Diana Cordova-Cobo, whose Century Foundation study summarizes current research on the impact of diversity upon learning, “exposure to diversity enhances critical thinking and problem-solving ability, while also improving several other attributes related to academic success, including student satisfaction and motivation, general knowledge, and intellectual self-confidence.”¹ More specifically, Wells, Fox and Cordova-Cobo delineate how increased diversity in the classroom reaps benefits specifically for “nonminority” white students in so far as it reduces white students’ implicit bias which, if left unaddressed, leads to increased “efforts to manage negative thoughts [engendered by negative stereotypes]” that in turn “inhibit mental capacity by occupying the brain’s executive function and depleting cognitive resources related to attention and control.”²

In the case of Davidson’s QEP, such enhanced learning in the gateway course benefits everyone. More than that, success in gateway courses makes it more likely that students will take courses beyond the gateway, thus rendering those more advanced courses more diverse as well.

While *Opening Wide the Gateways* aims to promote diversity and inclusion on our campus, its focus is much more specific since it is concerned with how that diversity and inclusion can be fostered *by instructors in their classrooms*—and more specifically in the classrooms of gateway courses in the quantitative disciplines. In this way, it distinguishes itself from the myriad other initiatives on Davidson’s campus that are also intended to foster inclusion and academic achievement among underrepresented student populations.

These latter initiatives include STRIDE (Students Together Reaching for Individual Development and Education), a peer-mentoring program designed to support first-year multicultural students with their adjustment to Davidson; POSSE, which offers students from Miami intending to major in the sciences a two-week summer immersion program, a faculty mentor in the sciences, and research and internship opportunities in science fields; Strategies for Success, an academic mentoring program; and the RISE (Research in Science Experience) summer program, which has involved underrepresented science students in genomics research.

Although distinct from the QEP, these programs offer additional support for it, and resources for them are already in place.

A Consultative and Participatory Process

As demonstrated above, the Davidson College Quality Enhancement Plan is built on a foundation of purpose, planning, and assessment. Further, the process that led us to its topic emphasizes the contributions of campus constituencies, the importance of ongoing communication, and the value accorded discussion both within and across faculty, student, and administrative bodies. The

¹ Amy Stuart Wells, Lauren Fox and Diana Cordova-Cobo, *How Racially Diverse Schools and Classrooms Can Benefit All Students* (The Century Foundation, February 9, 2016), https://s3-us-west-2.amazonaws.com/production.tcf.org/app/uploads/2016/02/09142501/HowRaciallyDiverse_AmyStuartWells-11.pdf (accessed June 30, 2016), 9.

² *Ibid.*, 9

involvement of all campus constituencies in conversations around an inclusive academic environment long pre-date even the earliest conversations specific to the QEP.

Strategic Planning

Of the working groups developing material and conducting research leading up to the 2009 strategic plan, two have direct bearing on the environment that produced the QEP. They included wide representation of the campus community.

- Working group on the integration of teaching and learning. This group considered, among a wide range of issues, the driving forces for change in the campus learning environment and their broad implications with respect to Davidson's mission.
- Working group on diversity and inclusion. This group developed guiding principles that emphasized education and engagement around issues of diversity as well as the need for infrastructure supporting it.

Once the strategic plan had been finalized and approved, the charges of several implementation teams also helped create the foundation for the QEP.

- Team 4. Center for Teaching and Learning. The team was charged with recommending the design of the Center for Teaching and Learning, including its programming and relationship to existing campus programs. It was composed of seven faculty; five staff from instructional technology, the library, student academic support, and college relations; and a student representative. Final responsibility for the implementation of this strategy was shared by the Vice President for Academic Affairs and the Vice President for Student Life.
- Team 6. Academic and Personal Advising. This team was charge with ensuring excellent mentoring of all students. Members included six faculty, the assistant dean of faculty, staff representing information technology and residence life, and two students. Final responsibility was again shared by the Vice President for Academic Affairs and the Vice President for Student Life.
- Team 12. Diversity and Inclusion Across Campus. This team was responsible for determining the components of a Multicultural Center on campus (which has now been established) and the development of diversity education programming. Its members included four faculty; staff representing admission, student life, counseling, and the chaplains' office; and two students. Final responsibility was again shared by the Vice President for Academic Affairs and the Vice President for Student Life.
- Team 13. Admission. Many of the actions recommended by this team in response to its charges directly affected the changing demographic profile at Davidson. Chief among them was enhancing the relationship between admission and community-based organizations that work with underrepresented student populations; increasing funding for campus visits by students, counselors, and directors of community-based organizations; increasing financial aid; and directing advising support to the preparation and achievements of underrepresented students. Members included two faculty; staff from admissions, financial aid, student life, and

student financial services; and two students. Final responsibility rested with the Vice President for Admission and Financial Aid.

Faculty and the Office of Academic Affairs

The Vice President for Academic Affairs and her three associate deans had a series of meetings between March and May 2014 to discuss broad ideas for a QEP. The context they brought to these conversations was the previous strategic plan and the College aspirations and institutional priorities President Quillen had articulated since arriving at Davidson in 2011. A number of learning enhancement topics were considered at this stage (digital, blended, and research-focused learning; and inclusive pedagogy). Throughout the process that resulted in the College's QEP, ideas were actively sought and incorporated.

Faculty

An invitation to faculty for feedback on these or other ideas added more detail, after which the VPAA brought them to the department chairs for further discussion and feedback. A second round of feedback from faculty occurred at the end of the Spring 2014 semester.

After the initial stages of data collection related to the QEP proposal, aggregate data on GPA by race/ethnicity were provided to departments. (Student identifying information was masked and departments saw only their own aggregate data.) Additional discussions within departments followed, and a second faculty meeting included discussion of the QEP proposal on its agenda.

Faculty endorsed the QEP through a motion in October 2015: "The Davidson College faculty endorses the proposed QEP for its focus on inclusive pedagogy and continuous improvement of student learning as a reflection of college priorities."

Students

During the same Spring 2014 semester in which initial conversations were happening with faculty and among the deans, the VPAA met with the Student Government Association. Students were most enthusiastic about digital learning and inclusive pedagogy.

When the topic narrowed to inclusive pedagogy, the chair of the QEP committee and the two student members met with the Organization of Latino American Students, the Black Student Coalition, and POSSE students to present the proposal and solicit feedback.

The SGA endorsed the QEP through a motion in April 2016.

Administrative Staff

In May 2016, the chair of the QEP committee met with the Administrative Advisory Group to present the QEP proposal and answer questions. Although the group had no formal role in its implementation, the focus of the QEP aligns with College priorities around inclusivity in which many members do play active roles.

The AAG endorsed the QEP during that meeting.

Principal Executive Staff

Representing the major divisions of the College, the Principal Executive Staff had been apprised of conversations occurring with faculty and staff and were thus able to consider the ways in which a QEP would affect, and be supported by, all areas of campus.

Presented with the final proposal, PES confirmed its endorsement of the QEP in May 2016.

Board of Trustees

The Trustee Committee on Teaching, Learning, and Research was kept apprised of the discussion of QEP topics and was able to provide thoughts and feedback as the plan developed. The full Board of Trustees was presented with a summary proposal at its last meeting in the Spring 2016. The Board offered its endorsement of the QEP at that meeting.

Implementation and Strategic Initiatives

Implementation and Strategic Initiatives (ISI) is a cross-divisional group convened by the President to consider and act on a range of campus priorities. In Fall 2014, the President appointed a subgroup to study the ways the campus environment fosters or hinders a sense of inclusivity. Members included the Associate Dean of Faculty, two faculty members, the Director of the Multicultural Center, the Associate Dean of Students, Registrar, General Counsel, the Director of Instructional Technology, and two students.

After the determination of the general focus of the QEP, this inclusivity task force functioned for a period as the QEP committee. In that role, the committee met with its constituencies—faculty, staff, students—individually and in groups, about possible projects that would fall under the rubric of inclusive pedagogy. Having received feedback from each constituency, the committee articulated two options for the QEP.

- To improve student learning by instituting a college-wide curricular change requiring faculty to develop—and students to take—one course that centered in some way on issues of diversity and social inequality.
- To improve student learning in already existing courses and to do so with the additional aim of narrowing the GPA differential that exists between underrepresented domestic students of color and other students.

Data were collected that confirmed the latter disparity. Further, the inclusivity task force speculated that the curricular change proposed in connection with the first option would more likely lead to the development of courses in departments such as Gender and Sexuality Studies, Africana Studies, Sociology and Anthropology—departments that, relative to others, had already succeeded in attracting and sustaining a diverse student body. The second option, therefore, was perceived as more transformative and was the recommendation of the inclusivity task force in November 2014.

The QEP Committee

Work related to the QEP had diverged sufficiently from the original work of the inclusivity task force to warrant its own committee. Since it was clear that responsibility for executing this QEP would fall squarely on the shoulders of the teaching faculty, it was thought important to involve faculty more intimately in the QEP's development at this point. A faculty member was appointed chair of the QEP committee, and other faculty and staff members were invited to join the committee. The faculty included two from natural sciences departments and a third faculty member from the natural sciences was added over the course of the following year. Additionally, in early 2015 the Associate Vice President for Planning and Institutional Research was named as co-chair of the QEP committee to assist departments in both articulating and assessing their desired learning outcomes.

Summary

The topic of Davidson's Quality Enhancement Plan follows logically from campus planning, is focused on student learning, and reflects participation across all constituencies in its development. As such, we are confident in its probability for success not only in the components of the plan itself but in its potential positive effect beyond the formal participants and time period.

Literature Review and Best Practices

It is no secret that what most call the “achievement gap” between majority white students and underrepresented students of color at America’s predominantly white colleges and universities continues to concern educators at every level. In much of the literature, however, the term “achievement gap,” especially when it is used in conjunction with college (as opposed to K-12) settings, refers to a gap in graduation rates.³ Yet because Davidson can boast a high graduation for all students, regardless of race or ethnicity, it sees this gap more in terms of academic performance as measured by grade averages. Additionally, “grade-point differential” is our preferred term here, instead of the more usual “achievement gap”. Preference for this former term derives from our inability to know how much of this differential is actually owing to deficits in student achievement. It is possible that other factors, such as the unconscious bias of instructors in evaluating student work, may also contribute to at least part of this gap. Indeed, there may be additional factors that account for this gap. In light of these considerations we prefer “grade-point differential” because it is a term that simply names the phenomenon without making a judgment on its chief cause.

Opening Wide the Gateways is grounded in what is a now burgeoning scholarship on inclusive pedagogy and practice. In large measure, this scholarship concludes that while an underrepresented student’s lackluster performance may partly be due to inadequate high school preparation, other environmental factors at predominantly white institutions (PWIs) conspire to affect student performance. One such factor is what social psychologist Claude Steele has termed “stereotype threat,” which occurs when any person believes that he or she is subject to being viewed through the lens of a popular and derisive cultural stereotype.⁴ Anxiety about fulfilling this stereotype and the intense desire to avoid doing so function together to put so much pressure on the person that he or she is unable to do what is necessary to excel in a particular task. One scholar has likened this phenomenon to that of an athlete’s “choking” in a high-stakes competition.⁵ It may be that so much mental energy is devoted to not failing in a particular task that too little is left for the task itself. It is important to note that stereotype threat is something that anyone might experience. Steele’s early experiments examined the effect of stereotype threat on women’s performance on a mathematical exam. That performance suffered when women believed the exam was being used as a diagnostic to determine whether their mathematical ability differed from men’s.⁶ Nor is stereotype threat limited to underrepresented populations. In one

³ See, for example, Doug Lederman, “Closing the College Achievement Gap,” *Inside Higher Ed* (October 31, 2007), <https://www.insidehighered.com/news/2007/10/31/system> (accessed July 11, 2016).

⁴ Claude M Steele, *Whistling Vivaldi: And Other Clues to How Stereotypes Affect Us* (New York: W.W. Norton & Company, 2010).

⁵ Gerardo Ramirez and Sian L Beilock, “Writing About Testing Worries Boosts Exam Performance in the Classroom,” *Science* 331, no. 6014 (2011): 211-13.

⁶ Claude M Steele, *Whistling Vivaldi: And Other Clues to How Stereotypes Affect Us* (New York: W.W. Norton & Company, 2010), 29-43.

study, white participants who were given a golf task performed worse than did control participants when the golf task was framed as diagnostic of "natural athletic ability."⁷

Another environmental factor that has been shown to affect performance of underrepresented students of color are "racial microaggressions".⁸ Unlike stereotype threat, which occurs in the mind of a subject who *believes* she is being negatively stereotyped, even if she is not, microaggressions occur when someone, usually from the white majority population, sends a subtly denigrating message to a person belonging to a different race. The sender of such a message often does so unconsciously or may consciously send the message in such a way that is intended to be complimentary, but the message serves to remind its recipient that he or she is being perceived and typed as a racialized other. Stereotype threat results from the sum total of one's life experience of being negatively stereotyped and culminates in the fear or anxiety of confirming that stereotype. As such, it occurs in the mind of the racialized subject. A racial microaggression, by contrast, has as its trigger a concrete event. Perhaps it is a fair to say that a lifetime's experiences of actual racial microaggressions foster stereotype threat.

While stereotype threat and racial microaggressions cannot be eliminated in PWIs, social psychological research has shown that their pernicious effects can be mitigated through particular teaching practices. Such practices include, but are not limited to:

Promoting an incremental rather than a fixed view of intelligence/ability: This is less a teaching intervention than an insight. It has been observed that underrepresented students of color are less well represented in disciplines that emphasize that their best practitioners have a sort of natural genius for the discipline in question. When professors emphasize that success in a discipline requires innate or natural genius, underrepresented students of color tend to stay out of that discipline. To counter this trend, it is suggested that teachers need to emphasize to students that success in their field is not determined by natural brilliance, but rather by persistent stepwise progress and repeated practice. Teachers need to stress that the student has what it takes to succeed.⁹

Providing a brief period before a test during which students write about any anxiety they may be feeling about it: This writing exercise has been shown experimentally to enhance anxious students' exam performance. In this intervention, the instructor gives students five minutes before

⁷ Jeff Stone et al., "Stereotype Threat Effects on Black and White Athletic Performance," *Journal of Personality and Social Psychology* 77, no. 6 (1999): 1213-27.

⁸ Cf. Daniel Solórzano, Miguel Ceja and Tara Yosso, "Critical Race Theory, Racial Microaggressions, and Campus Racial Climate: The Experiences of African American College Students," *Journal of Negro Education* 69, no. 1-2 (2000): 60-73; Derald Wing Sue et al., "Racial Microaggressions and Difficult Dialogues on Race in the Classroom," *Cultural Diversity & Ethnic Minority Psychology* 15, no. 2 (2009): 183-90; and Tara J Yosso et al., "Critical Race Theory, Racial Microaggressions, and Campus Racial Climate for Latina/o Undergraduates," *Harvard Educational Review* 79, no. 4 (2009): 659-90.

⁹ Carol S Dweck, *Mindset : The New Psychology of Success* (New York: Random House, 2006); Sarah-Jane Leslie et al., "Expectations of Brilliance Underlie Gender Distributions Across Academic Disciplines," *Science (New York, N.Y.)* 347, no. 6219 (2015): 262-65; C M Mueller and C S Dweck, "Praise for Intelligence Can Undermine Children's Motivation and Performance," *Journal of Personality and Social Psychology* 75, no. 1 (1998): 33-52; and Aneeta Rattan and Catherine Good, "It's Ok—Not Everyone Can Be Good at Math": Instructors with An Entity Theory Comfort (and Demotivate) Students," *Journal of Experimental Social Psychology* 48, no. 3 (2012): 731-37.

an exam to write about any anxieties that they may be experiencing at the moment. After this period, they proceed with the test normally. Results show that student performance improves for those students who are indeed anxious about the upcoming test or assessment, but not for those who are not. In explaining why this intervention is effective, experts suggest that writing about anxiety and facing it directly tends to offload its consequences in the actual testing situation. That is, writing about anxiety serves to dissipate anxiety so that the mind can focus more intently on the task at hand rather than wasting energy trying to fight through anxiety.¹⁰

Incorporating an exercise of self-affirmation before a test: Like the previous pre-test writing exercise, this one takes five minutes and ask students to write down what qualities they have that have helped them to excel in their academic work and in their lives thus far. Again, this exercise has been shown to enhance the test performance of students who are suffering from worry and self-doubt, but does little for students who are already self-confident.¹¹

Reducing experiences of isolation, tokenism, bias and devalued identity through embracing multicultural viewpoints rather than those that purport to be neutral with respect to gender, race or ethnicity: Many instructors believe that in order to be objective and fair, they need to teach in a way that is race neutral. That is, they prefer to talk about human subjects in general, refusing to mention their racialized, gendered class and other identities. A biology or psychology instructor, however, who carefully notes demographic identities of a sample of human subjects communicates to students that he or she is sensitive to the fact that these identities matter. A study, for example, on the incidence of asthma in middle-aged men may purport to be neutral but if it fails to specify that the men studied were relatively affluent and thus could afford to live some distance from pollution-emitting industries, then it is not very useful to understanding asthma incidence in more highly polluted environments. Moreover, if students discover the identity of the actual population that was studied, they may rightly become skeptical of a science or social science that is seen at best as irrelevant and at worst as harmful to people in different circumstances than the group studied.¹²

Promoting active learning in the classroom: It is now well established by research that classrooms in which active-learning techniques are deployed result in better and more engaged learning. One active-learning intervention that seems to have helped African Americans disproportionately is

¹⁰ Gerardo Ramirez and Sian L Beilock, "Writing About Testing Worries Boosts Exam Performance in the Classroom," *Science* 331, no. 6014 (2011): 211-13.

¹¹ Jeff Schimel *et al.*, "Not All Self-affirmations Were Created Equal: The Cognitive and Social Benefits of Affirming the Intrinsic (vs. Extrinsic) Self," *Social Cognition* 22, no. 1: Special issue (2004): 75-99; Valerie Jones Taylor and Gregory M Walton, "Stereotype Threat Undermines Academic Learning," *Personality & Social Psychology Bulletin* 37, no. 8 (2011): 1055-67; and Geoffrey L Cohen *et al.*, "Reducing the Racial Achievement Gap: A Social-psychological Intervention," *Science (New York, N.Y.)* 313, no. 5791 (2006): 1307-10.

¹² Hazel Rose Markus, Claude M Steele and Dorothy M Steele, "Colorblindness As a Barrier to Inclusion: Assimilation and Nonimmigrant Minorities," *Daedalus* 129, no. 4 (2000): 233-59; Kimberly Tanner and Deborah Allen, "Cultural Competence in the College Biology Classroom," *CBE Life Sciences Education* 6, no. 4 (2007): 1055-67; and Gloria Ladson-Billings, "But That's Just Good Teaching! The Case for Culturally Relevant Pedagogy," *Theory into Practice* 34, no. 3 (1995): 159-65.

that of the moderately structured classroom, which involves three elements: graded preparatory assignments, extensive student in-class engagement, and graded review assignments.¹³

Promoting a culturally inclusive pedagogy. This intervention aims to encourage each student to relate a course's content to his or her lived cultural context. Recognizing that American society, and even classrooms in PWIs, are increasingly multicultural, good teachers now try to represent these multicultural perspectives and concerns in class readings, lectures and examples given to elucidate the subject at hand. In quantitatively-oriented disciplines, this might involve framing these disciplines as people-oriented and concerned with real world problems.¹⁴

Promoting frequent assessment and allowing for assignment resubmission: Paying special attention to student classroom performance during the first six weeks of an entering student's first semester is crucially important for ensuring that all students remain engaged in the course. The practice of having a mid-semester midterm as the first major assessment a student receives in a course can discourage students who do poorly and feel that there is little opportunity for them to improve significantly before the semester's end. Earlier and more frequent assessments can help students see early on where they are having difficulty. In addition, frequent testing is useful not only to instructors as a diagnostic assessment tool, but also to students as a reinforcement to what has been learned.¹⁵

Encouraging team-study and collaborative work: Uri Treisman's study on the comparative performance of students of different ethnicities in a first-year calculus class showed that African American students tended to study alone, while Asian American students were more likely to study collaboratively. In addition, the Asian American students studying in this way experienced their study sessions as social events as well as academic, thus blurring the conventional lines between academic and social-recreational activity. Their strategy yielded superior performance. Treisman concluded, and subsequent studies proved, that working in teams and studying collaboratively increased not only academic performance, but also the affective bond that students form toward studying that subject.¹⁶

Promoting Pedagogical Transparency: Being more explicit with students about the rationale behind syllabi, classroom activities, and every aspect of an assignment—including its purpose,

¹³ Sarah L Eddy and Kelly A Hogan, "Getting Under the Hood: How and for Whom Does Increasing Course Structure Work?," *CBE Life Sciences Education* 13, no. 3 (2014): 453-68.

¹⁴ Gloria Ladson-Billings, "Toward a Theory of Culturally Relevant Pedagogy," *American Educational Research Journal* 32, no. 3 (1995): 465-91; Gloria Ladson-Billings, *The Dreamkeepers: Successful Teachers of African American Children* (San Francisco, Calif.: Jossey-Bass Publishers, 2009).

¹⁵ *Putting Students on Track with Early, Frequent, Low-Stakes Assessment*, Teaching and Learning Toolkit (Mount Pleasant, Michigan: Central Michigan University's Quality Initiative and Center for Excellence in Teaching and Learning, November 9, 2015), https://www.cmich.edu/office_provost/facit/Documents/Writing%20Intensive%20Initiative/Early%20Frequent%20Assessment%20-%20November%209%202015.pdf; Philip A Jensen and James N Barron, "Midterm and First-Exam Grades Predict Final Grades in Biology Courses," *Journal of College Science Teaching* 44, no. 2 (2014): 82-89.

¹⁶ Uri Treisman, "Studying Students Studying Calculus: A Look at the Lives of Minority Mathematics Students in College," *The College Mathematics Journal* 23, no. 5 (1992): 362-72.

the skills and knowledge it requires, and the specific criteria by which it is graded—has been shown to improve performance of underserved students.¹⁷

Summary

Opening Wide the Gateways aims to be a QEP that is not only firmly grounded in the relevant literature and practice of inclusive pedagogy, but that also requires of every participating instructor deep reading and study of this literature. Crucial to the enhancement of student learning in this QEP is the enhancement of faculty learning in pedagogical practice. And along with this learning come ever more sophisticated and effective ways of teaching gateway courses to an ever-diversifying student population.

¹⁷ Mary-Ann Winkelmes *et al.*, “A Teaching Intervention That Increases Underserved College Students’ Success,” *Peer Review* 18, no. 1/2 (2016): 31-36. <http://aacu.org/peerreview/2016/winter-spring/Winkelmes>. This entire special issue of *Peer Review* is devoted to transparency and problem-centered learning.

Student Learning Outcomes

Brief Review: Mission, Institutional Planning, and the QEP

Davidson's Statement of Purpose articulates the importance of the role faculty play in creating an environment that supports learning for all students:

In fulfilling its purpose, Davidson has chosen to be a liberal arts college, to maintain itself as a residential community of scholars, to emphasize the teaching responsibility of all professors, and to ensure the opportunity for personal relationships between students and teachers. ... Davidson believes it is vital that all students in every class know and study under mature and scholarly teachers who are able and eager to provide for each of them stimulation, instruction, and guidance.

Further:

In the selection of faculty, the college seeks men and women who respect the purpose of the college, who are outstanding intellectually, who have the best training available in their fields of study, and whose interest in students and teaching is unfeigned and profound.

The value placed on inclusivity is found in the Statement of Purpose as well:

As a college that welcomes students, faculty, and staff from a variety of nationalities, ethnic groups, and traditions, Davidson values diversity, recognizing the dignity and worth of every person.

The mission of the College has been reflected in all aspects of planning and setting of institutional priorities. The Davidson Trust, which eliminated loans in financial aid packages; the College's 2009 strategic plan and the establishment of the Center for Teaching and Learning; and the current aspirations grounding the dual goals of educational excellence and access have both changed the profile of Davidson students and supported greater diversity across a wide range of demographics, economic circumstances, life experiences and future dreams.

These are the foundations on which the assessments that led to the current QEP are built.

Assessments Leading to the QEP

Davidson engages in assessment at the institutional, departmental, and program level. Some of those assessment activities, not directly related to the QEP at the time, have been influential and informative during the development of the QEP. Additionally, as the direction of the QEP became clearer, other, directed assessment activities helped clarify the learning objectives on which it would focus.

These assessments are described in detail in the earlier chapter on how Davidson arrived at its QEP and summarized below.

Teagle Project on inclusive academic support. Research on first generation students (Appendix B Focus Groups of First-Generation Students), many of whom were also students of color, showed that there were differences in how students perceived the role of tutoring, the writing center, and faculty when they encountered academic difficulties. They were more likely to interpret professors' expectations as discouraging, making them less likely to ask questions.

Intended majors/actual majors/differences by race/ethnicity. We looked at what entering students indicated as probable majors and the major at graduation for those same students. For majority students, there was a decrease of approximately 20% between intended and graduating majors in the natural sciences or mathematics. Students of color were significantly more likely to change their minds about majoring in the natural sciences or mathematics.

Perceptions of campus inclusivity. This research by the President-appointed task force found that the dynamic set by the professor in the classroom, especially regarding the value ascribed to student contributions, had an effect on student confidence and contributions in the classroom.

GPA analysis. We looked at the overall GPA of graduates. Of the majors with the largest differentials between underrepresented and majority students, many were quantitatively-oriented disciplines.

Grade analysis for gateway courses. We looked at the course grades in the gateway courses taken by graduates. In all ten courses, underrepresented students had lower average course grades than majority students.

Relationship between preparation in mathematics and gateway course performance. Based on the above findings, a question arose: Is performance in these courses a function of preparation? We found that even when the SAT mathematics score was held constant, differences in performance persisted.

Results Relevant to the QEP

Representing work across multiple years, analyses of a wide variety of data, and the involvement of all campus constituencies, the results of these assessments illuminated a clear path.

- Of the large number of students who enter Davidson planning to major in the natural sciences and math, underrepresented students disproportionately ultimately choose majors in other disciplines.
- Although all students tend to do well at Davidson, underrepresented students did less well in quantitatively-oriented courses than majority students.
- Achievement in those courses does not appear to be a function of mathematical preparation.
- The classroom environment has the potential either to discourage the highest levels of learning or to be the catalyst for it, particularly for students more vulnerable to exclusion.

How then, to change that environment such that all students meet the learning outcomes of these courses? Where should efforts be focused for greatest effect, measureable progress, and the possibility that success would reverberate beyond a particular course?

Learning outcomes decision

As noted earlier, there is a significant body of research on inclusive pedagogy that led to the campus' confidence that implementing the proposed QEP would have a demonstrable impact. A

first step in determining the learning outcome focus was to better understand what the discipline-specific learning outcomes had in common across the quantitatively-oriented gateway courses.

All learning outcomes in the gateway courses in the six participating departments were analyzed and categorized. The resulting categorization formed the basis for part of a workshop held in May with faculty from the first two departments participating in the QEP. During that workshop, the faculty reviewed literature and met—as a group and individually—with inclusive pedagogy scholar Professor Nilanjana Dasgupta (Appendix C Nilanjana Dasgupta CV) sharing and analyzing their experiences in the gateway classroom.

There was consensus that particular Application learning outcomes should be the focus. This category is consistent with Mayer and Wittrock's "transfer" learning which occurs "when a person's prior experience and knowledge affect learning or problem solving in a new situation. Thus, transfer refers to the effect of knowledge that was learned in a previous situation...on learning or performance in a new situation."¹⁸ There were several reasons for this focus. The Application learning outcomes are:

- Related to areas where students often had difficulty, exhibiting variations in performance that lent themselves to measurement of progress and providing impetus to improve
- Foundational for future work in the discipline, meaning that mastery conferred an additional benefit of greater confidence and better performance in future coursework in the discipline
- The most common across the participating departments

The gateway courses for the six QEP disciplines are:

Biology 111: Molecules, Genes and Cells¹⁹
 Biology 112: Organisms, Evolution & Ecosystems
 Biology 113: Integrated Concepts in Biology I
 Biology 114: Integrated Concepts in Biology II
 Chemistry 115: Principles of Chemistry
 Economics 101: Introductory Economics
 Mathematics/Computer Science 113: Calculus II
 Physics 120: General Physics I

¹⁸ Richard E Mayer and Merlin C Wittrock, "Problem-Solving Transfer," in *Handbook of Educational Psychology*, ed. David C Berliner and Robert C Calfee (New York: Macmillan Library Reference USA, Simon & Schuster Macmillan, 1996), 47-62.

¹⁹ The recommended first-year Biology sequence is two courses. A major must take *either* BIO 111 or 112 *and* BIO 113 or 114. Students who take BIO 111 will not receive credit for BIO 113, and vice versa. The same rule applies for BIO 112 and 114. Students need not take this two-course sequence in any particular order. That is a student may follow BIO 114 as a first course with BIO 111, or vice versa. So, any of BIO 111-114 may serve as this discipline's gateway course.

Physics 130: General Physics with Calculus²⁰

Psychology 101: General Psychology

Biology and Economics will be the first two departments participating in the QEP and, as such, have selected their specific learning outcomes as follows.

Biology

Biology 111 (Dr. Karen Bernd)

Students will be able to:

- Analyze data with basic descriptive statistical methods
- Interpret scientific figures and other forms of data

Biology 112 (Dr. Mark Barsoum)

Students will be able to:

- Reconstruct phylogenies using character matrices and apply phylogenetic principles to understand animal diversity and systematics
- Analyze the roles of biotic and abiotic factors in population structure and dynamics, supported by the mathematics of exponential and logistic growth

Biology 114 (Dr. Kevin Smith)

Students will be able to:

- Evaluate biological data to address predictions and hypotheses and answer scientific questions
- Apply skills of scientific exploration including critical thought, data collection and analysis, quantitative analysis, and communication of complex information

Economics

Economics 101 (Dr. Clark Ross, Dr. Fred Smith, and Dr. Dylan Fitz)

Students will be able to:

²⁰ PHY 120 is the first-semester algebra-based introductory physics course and students in this course need not have taken calculus as a prerequisite. Those taking PHY 130, the first-semester calculus-based introductory physics course, do need to have calculus as a prerequisite or co-requisite. Each course is followed by a second course, PHY 220 or PHY 230, respectively. In the transition between the first and second course of each sequence, students may switch tracks with the instructor's permission. That is, a student who took the calculus-based PHY 130 may take the algebra-based PHY 220 as the second course in the sequence. Similarly, a student who took the algebra-based PHY 120 may take the calculus-based PHY 230 as the second course. The PHY 120/220 sequence is designed chiefly for non-majors; the 130/230 sequence is designed chiefly for Physics, Mathematics and Chemistry majors and those students interested in pursuing careers in Engineering.

- Interpret critical microeconomic and macroeconomic concepts—demand and supply in the competitive output market and aggregate demand and aggregate supply in the macro economy—and to apply basic economic policy tools in these contexts.
- Distinguish between positive and normative economic concepts and arguments.

Chemistry, Physics, Mathematics and Computer Science, and Psychology

We expect that the same considerations that made the Application learning outcomes the best choice in the first year of the QEP will likely hold true in subsequent years as the other four departments begin their work. However, an important part of Davidson's QEP is the year-long learning community by which participating faculty share results and experiences, and through which they are encouraged to learn as much from what doesn't work as what does. That body of knowledge will inform choices made in subsequent years. Although this creates some additional work in terms of logistics, particularly around data collection, it is also a strength of the QEP.

Participating departments will work with the QEP advisory committee and the Office of Planning and Institutional Research to modify discipline-specific learning outcomes assessment and data collection should the category of learning outcomes change.

A Learning Outcome Across the Disciplines

The ongoing assessment across all disciplines and years will focus on a broad Application learning outcome. It is important as an outcome on its own but it also functions as a bridge between the two learning outcome categories that precede and succeed Application in terms of grounding the discipline (Recognition) and bringing knowledge to bear on questions beyond it (Extrapolation).

All students will be able to recognize under what conditions theories, models, or quantitative evidence should be applied and to use them appropriately to explain phenomena or solve problems.

Faculty in participating departments will map discipline-specific learning outcomes to a rubric based on the overarching learning outcome.

Indirect and Programmatic Outcomes

In addition to the learning outcomes on which the QEP is focused, a number of additional outcomes are anticipated.

- An environment of inclusivity conducive to all students performing at their highest academic ability. This environment, as detailed in the chapter on assessment, should be reflected in facilitated student conversations which will be evaluated for evidence of language of inclusivity and the effect of an inclusive environment on other aspects of students' academic life.
- Closing the gap between underrepresented students and others in terms of GPA and course performance. Analysis of GPA and gateway course grades should reveal no statistically significant differences by race/ethnicity.

Implementation of the Quality Enhancement Plan

To enhance student learning in the gateway courses of quantitatively-oriented disciplines, the QEP has set forth the following steps to be implemented over the course of the next five years.

Setting Expectations for Participating Faculty

In each of the six participating departments, three faculty members who regularly teach sections of that department's gateway course either have been or will be selected to participate in the QEP. Eighteen faculty are thus slated to participate in the program. Each faculty participant will:

- Undergo training in inclusive pedagogical practices
- Determine the learning outcomes on which assessment will be focused in the department's gateway course(s)
- Implement a set of inclusive pedagogical practices based on training and facilitated research, and in consultation with other participating faculty
- Map selected student learning outcomes to specific assessments
- Collect data on the selected student learning outcomes
- Perform planned formative assessments during the semester
- Work with the Office of Planning and Research (and eventually with the Academic Assessment Analyst) to complete summative assessment of learning objectives
- Actively participate in the year-long learning community through the Center for Teaching and Learning
- Adjust and refine teaching practices as warranted by assessment results and information shared among all participating faculty

These expectations are met in the following ways.

Inclusive Pedagogy Training Workshop

Each faculty member will participate in a week-long workshop during the May preceding the start of their department beginning implementation. A critical component of that time is discussion with other participating faculty. Based on common readings, and both individual and shared experiences, faculty will share ideas about promising pedagogical interventions and how various pedagogies intersect with learning goals.

Over the course of two days during this week, faculty will meet—individually, by department, and as a group—with an external facilitator with expertise in inclusive pedagogy. They will be able to focus on challenges they face in their departments' gateway courses as well as inclusive pedagogy more generally.

By the end of the workshop, faculty will have made decisions regarding:

- Interventions to employ in upcoming gateway courses
- Learning outcomes to be assessed
- Assessment protocols

A sample workshop agenda is included in Appendix D

Learning Community

Between September and April, formal meetings of each year's participating faculty will be scheduled through the Center for Teaching and Learning and facilitated by the Associate Dean of Faculty. As is true of the May workshop, a critical component of these meetings is discussion among faculty. The goal is for faculty to share achievements and setbacks, provide insights, and make—and hear—suggested modifications to increase or build on successes.

Both during these scheduled meetings and in informal meetings throughout the academic year, faculty will also converse with others supporting the QEP, particularly those involved with assessment. Various student groups may be invited to provide feedback and offer ideas.

Schedule of Participation

Rather than faculty from all six participating departments beginning implementation of the QEP simultaneously, we have chosen to have two departments begin each year for the first three years of the plan. This decision is based on two considerations.

- Although the principles of inclusive pedagogy apply across disciplines, in their application we are asking faculty to be especially cognizant of the ways discipline requirements, course content, and student expectations intersect. The support afforded those faculty during this intense early stage, particularly individual and departmental attention during the May workshop, increases the probability of success.
- The process as envisioned is iterative and recursive. There must be time for each group of faculty participants to consider how to incorporate what each preceding group has discovered and how to make their own discoveries available to the next. Each instance of accumulated knowledge strengthens the foundation.

During the five years of the QEP, departments commit to offer a specified number of gateway sections. That number is a function of the years in which the department is formally part of the QEP. However, the expectation remains that departments will continue to offer these sections beyond the timeframe of the QEP, with provisions for normal fluctuation in faculty teaching them.

The schedule and course commitment is as follows.

- May 2016
 - Biology. Ten sections of Biology 111/112/114 over five years
 - Economics. Ten sections of Economics 101 over five years
- May 2017
 - Physics. Eight sections of Physics 120/130 over four years
 - Psychology. Eight sections of Psychology 101 over four years
- May 2018
 - Chemistry. Six sections of Chemistry 115 over three years
 - Mathematics/Computer Science. Six sections of Mathematics 112/113/130 over three years

Note: If, during Years 1 or 2, a departmental colleague who has already participated in the May Workshop and/or learning community cannot fulfill the commitment to complete the requisite

number of courses contributing to the departmental total, another departmental member may undergo the training described above during either Year 2 or Year 3.

Assessment

By the end of the May workshop, faculty will have outlined an assessment protocol that will be part of the overall assessment plan. Assessments outlined by Biology and Economics, as well as the overall assessment plan, are detailed in the chapter on assessment.

Results of formative assessments will be used by faculty during the semester to evaluate the effect of pedagogical interventions on an ongoing basis, enabling modification of practices in real time. At the end of each semester, faculty will provide data specific to learning outcomes to the Office of Planning and Institutional Research for analysis. Results will be provided to each department. Results across departments and over time will be the responsibility of the Office of Planning and Institutional Research.

Year 1: Learning Outcomes and Pedagogical Innovations

Biology and Economics participated in the Inclusive Pedagogy Training Workshop this past May. As a result, they have already determined learning outcomes and pedagogical innovations. These are presented in the following pages to illustrate the results of the workshop and the departmental plans for the academic year.

Learning Outcomes and Pedagogical Innovations for Gateway Courses in the First Two Participating Departments

Biology

Biology 111 (Dr. Karen Bernd)

Learning outcomes

Students will be able to:

- Analyze data with basic descriptive statistical methods
- Interpret scientific figures and other forms of data

Pedagogical practices

Cultural relevance interventions

- Reword and reorganize the syllabus so that the *cultural relevance* of course content is more prominent in that document.
- Organize course units around selected 'big picture'/'real world' themes and review those themes to highlight what students would find culturally relevant
- Include more references from different cultural contexts and life experiences and ask students identify examples of how course content is relevant to their own lived experience.

Metacognition and pedagogical transparency interventions

- Preface course assignments with the pedagogical reasons for doing them.
- Address previous students comments and criticisms on course evaluations out loud, thus clarifying for current students clear reasons for assignments for which previous students saw no rationale. For example,
 - "Previous students found this approach helpful so I am continuing to do it."
 - "Our goal here is X and we work toward that goal by doing Y."
 - "Previous students commented that they didn't see why we did Y. This is the reason behind it."
 - "Previous students indicated that an assignment like Q was seemed like busywork. This is the reason behind that assignment and this is how I have changed it so that you will get this benefit from it."
- Ask students to comment on how a just-completed unit or exercise helped (or did not help) them to achieve the learning outcomes that it was meant to help them achieve.

Interventions to remove stereotype threat and promote growth mindset

- *Remove stereotype threat*: When administering to students the departmental assessment tool, ask for students' demographic information (e. g., gender, ethnicity, parents' education, AP/IB classes taken) *after* they complete the content section. This is a change from previous practice. This intervention will be deployed not just for BIO 111, but for all 100-level Biology courses.
- *Promote growth mindset paradigm*: Share with all students—and not just those who come for help—anecdotes about the process of learning, emphasizing the every student can

master course material through the stepwise progress that comes through patient, regular and steady practice.

Biology 112 (Dr. Mark Barsoum)

Learning outcomes

Students will be able to:

- Reconstruct phylogenies using character matrices and apply phylogenetic principles to understand animal diversity and systematics
- Analyze the roles of biotic and abiotic factors in population structure and dynamics, supported by the mathematics of exponential and logistic growth

Pedagogical practices

Cultural relevance interventions

- Teach certain topics, especially in evolution and ecology, using more popular science articles as texts for discussion. These always include real-world examples and problems that are relevant to current issues of concern in the political, social, economic, and scientific sphere.
- Highlight the importance of what we discuss in these areas to our lives –now or in the future – in particular. Connect them to human health and disease when possible (because so many students are interested in that and may be aiming toward a career in health/medicine).

Metacognition and pedagogical transparency interventions

- During the first week of class, spend time in lecture on study strategies. Give advice based on what cognitive science research says about how we learn and how best to study and retain knowledge. Transparently tell students what I'm telling them, where it comes from, and why I'm telling it to them as we discuss study strategies.
- Explain why I utilize active learning methods in class, again citing the literature in science education.
- Ask students to honestly assess and reflect on their learning through:
 - Minute papers/muddiest point papers at the end of most class meetings
 - Group work that asks students to compare their thoughts with those of other students and convince each other of their answer if there is disagreement
 - After frequent assessments (like my clicker quizzes/discussion questions) and less frequent assessments (like reviews), have students reflect on whether they believe they really knew the assessed material as well as they thought they did prior to the assessment. What categories of material or types of questions gave you the most trouble on the assessment? How can you better prepare for these kinds of assessments and material next time? What study strategies (see above) can be implemented or implemented more effectively to improve?
 - Revision and resubmission of some assessments, accompanied by the reflections described above so that the change in learning and understanding (the cognition) and the reflection on the learning process (metacognition) occur hand-in-hand.

This form of practice of metacognition is what might allow students to get better at it and ultimately be able to do it on their own. Bonus is that performance improves and students hold a growth mindset throughout the semester.

- Possibly additional self-assessments and prompts to promote metacognition, as described in Tanner (2012).

Biology 114 (Dr. Kevin Smith)

Learning outcomes

Students will be able to:

- Evaluate biological data to address predications and hypotheses and answer scientific questions
- Apply skills of scientific exploration including critical thought, data collection and analysis, quantitative analysis, and communication of complex information

Pedagogical practices

Cultural relevance interventions

- Allocate specific time to the discussion and consideration of Ethical, Legal, and Social Implications (ELSI) of biological topics. The text used includes ELSIs, but previously considered optional and would only provide limited time for discussion of some of them. May work toward discussing some ELSIs before covering the material in class so that students have a motivation to think about the material differently before we discuss it.
- Along the lines of the last point, assign some reading prompts and specific questions for out-of-class work related to the ELSIs to get students thinking about them before coming to class.
- Incorporate "researcher biographies" into the class material. In our May Workshop, Prof. Dasgupta suggested assigning this as student work so that the students conduct the research on the researcher biographies.

Metacognition and pedagogical transparency interventions

- Incorporate short "Today I Learned" writing assignments throughout the semester at the end of some class sessions to encourage metacognition and contemplation of what clicked and didn't click and where, when, and how students' learning best took place.
- Include group concept-mapping exercises. Concept mapping has been shown to help students identify their areas of weak understanding of complex topics and talking through these concept maps with others might facilitate more peer instruction, thus supplementing more teacher-centered forms of learning.
- Include metacognitive prompts after in-class quiz/group activity questions. E.g., "How did your ideas compare to those of your neighbors?" "What was confusing to you about this problem?" Ask how much students agree/disagree with the statement, "I learned a lot in doing this assignment."

- At the beginning of the semester, allocate more time to discuss how and why I teach the class the way I do and how (and why) students should work and prepare in the class. Offer frequent reminders along these lines throughout the semester.

Economics

Economics 101 (Dr. Clark Ross, Dr. Fred Smith, and Dr. Dylan Fitz)

Learning outcomes

Students will be able to:

- Interpret critical microeconomic and macroeconomic concepts—demand and supply in the competitive output market; and aggregate demand and aggregate supply in the macro economy, and to apply basic economic policy tools in these contexts.
- Distinguish between positive and normative economic concepts and arguments.

Pedagogical practices

Syllabus and first day interventions

- *Syllabus*. Include a statement on reasons to study economics, highlighting its interest and relevance to all aspects of American life.
Include a statement about how to succeed in the study of economics.
- *In class first day*. Explain the importance of persistence and making stepwise progress in small increments in accordance with the growth mindset paradigm.
Emphasize the importance of students visiting the instructor in his or her office and candidly discussing their candidly identifying the points of greatest frustration and difficulty in trying to learn the material.

In-class interventions

- Devote more class time to students engaging in *group work* on problems.
- Devote entire class sessions to the *discussion of a pressing socio-economic problem* (e. g., income distribution, discrimination, unemployment).
- Give more, but shorter assignments (e .g., instead of a few long problem sets, give more short quizzes).
- Write about *test anxiety* immediately before the test.
- Encourage students to *redo poorly done work* in order to enhance their mastery of course content, improve their course average and increase their confidence in being able to do the work of an economist.

Timetable

The timetable for Davidson's Quality Enhancement Plan is built on two critical components of that plan.

- A learning community in which faculty share knowledge and experiences, setting a foundation that strengthens each subsequent year
- Ongoing assessment that enables modification of details in service of the overall goal of more effective student learning

The workshop held this past May was the start of this work. It was there that participating faculty were able to make tackle ideas and issues that led to the central decision to focus on a particular category of learning outcomes. In discussion facilitated by a scholar in the field of inclusive pedagogy, they applied research in that field to the content of their own disciplines (in the case of this first workshop, Biology and Economics) so that they could bring new techniques to their classrooms beginning the first day of the Fall 2016 semester. These first participants will be able to bring understanding of the initial stages and the insights gained from later experience as the plan progresses.

The timeline for Davidson's Quality Enhancement Plan follows.

YEAR 1

(May 1, 2016 – April 30, 2017)

May 2016

Weeklong Inclusive Pedagogy Workshop

- Facilitated by Nilanjana Dasgupta, Professor of Psychology, University of Massachusetts—Amherst
- Faculty in Biology (3) and Economics (2) attended presentations on
 - inclusive pedagogy by Professor Dasgupta,
 - assessing learning outcomes by English Professor Shireen Campbell,
 - racial microaggressions by Director of Multicultural Affairs Tae-Sun Kim,
 - GPA differential in the quantitative gateway courses by Biology Professor Kevin Smith.
- Faculty read the literature on inclusive pedagogy in the Zotero database prepared by QEP Committee Chair Trent Foley and Information Literacy Librarian James Sponsel.
- Faculty convened with members of their own department to discuss pedagogical interventions to implement in their gateway courses.
- Participants convened in plenary sessions to discuss common learning outcomes to assess and common interventions to implement.

Summer 2016

Preparation for Gateway Courses

- Biology and Economics participating faculty prepare their gateway-course syllabi, incorporating inclusive pedagogy throughout the fall/spring semesters.
- Faculty work with Linda LeFauve, Associate Vice President for Planning and Institutional Research, to finalize data collection plans for assessing the impact of those pedagogical changes.
- The Information Literacy Librarian develops an annotated bibliography around best practices in inclusive pedagogy. Note: This bibliography will grow throughout the five years. The Center for Teaching and Learning website will highlight readings throughout this time period.

Fall 2016

Pedagogy and Learning Community

- The Biology and Economics QEP faculty incorporate inclusive pedagogy in Fall gateway courses.
- The Biology and Economics QEP faculty participate in an Inclusive Pedagogy Learning Community that will be convened by Verna Case, Associate Dean of Faculty and QEP Coordinator, and the Information Literacy Librarian. The group will meet five times during the fall semester. In the Learning Community sessions participating faculty will:
 - share the successes and challenges they faced when implementing the inclusivity changes they had planned,

- discuss one or two selected readings and determine their relevance for future pedagogical interventions.
- The Associate Dean/QEP Coordinator convenes two meetings of the QEP Advisory Committee to update them on Learning Community activities.

Assessment

- The Biology and Economics QEP faculty collect assessment data and work with the Office of Planning and Institutional Research for analysis.
- Student focus group facilitators trained.

Preparation for Following Year

- Based on feedback from faculty participants, the Associate Dean/QEP Coordinator selects readings for the workshop in May 2017.
- The Associate Dean/QEP Coordinator identifies and invites a leader in the field of inclusive pedagogy to participate in the May 2017 workshop.
- Search begins to hire an Academic Assessment Analyst whose duties will include consulting with QEP participating faculty to help them develop and maintain ongoing assessment.

Spring 2017

Pedagogy and Learning Community

- The Biology and Economics QEP faculty incorporate inclusive pedagogy in Spring gateway courses.
- The Biology and Economics QEP faculty continue their Inclusive Pedagogy Learning Community with the Associate Dean/QEP Coordinator and the Information Literacy Librarian. The group will meet four times during the spring. During these Learning Community sessions, participating faculty will:
 - share the successes and challenges they faced as they implemented the pedagogical interventions they had planned,
 - discuss one or two selected readings and assess their relevance for future pedagogical interventions.
- The Associate Dean/QEP Coordinator convenes two meetings of the QEP Advisory Committee to update them on Learning Community activities.

Assessment

- The Biology and Economics QEP faculty collect assessment data and work with the Office of Planning and Institutional Research for analysis.
- The Office of Planning and Institutional Research conducts and summarizes assessments across participating departments.
- Trained student facilitators conduct focus groups with students.
- Diverse Learning Environments survey deployed.

YEAR 2

(May 1, 2017 – April 30, 2018)

May 2017

Weeklong Inclusive Pedagogy Workshop

- Facilitated leader in field of inclusive pedagogy
- Faculty in Physics and Psychology attend presentations on
 - inclusive pedagogy,
 - assessing learning outcomes,
 - racial microaggressions,
 - issues that may have arisen from previous year's Learning Community
- Faculty read the literature on inclusive pedagogy in the Zotero database prepared by Associate Dean of Faculty and Information Literacy Librarian.
- Faculty convene with members of their own department to discuss pedagogical interventions to implement in their gateway courses.
- Participants convene in plenary sessions to discuss common learning outcomes to assess and common interventions to implement.

Summer 2017

Preparation for Gateway Courses

- Physics and Psychology participating faculty prepare their gateway-course syllabi, incorporating inclusive pedagogy throughout the fall/spring semesters.
- Faculty work with Linda LeFauve, Associate Vice President for Planning and Institutional Research, to finalize data collection plans for assessing the impact of those pedagogical changes.
- The Information Literacy Librarian develops an annotated bibliography around best practices in inclusive pedagogy. The Center for Teaching and Learning website will highlight readings.

Assessment

- Biology and Economics faculty use assessment of learning outcomes from previous academic year and determine new interventions to incorporate for upcoming year.

Fall 2017

Pedagogy and Learning Community

- The Physics and Psychology QEP faculty incorporate inclusive pedagogy in Fall gateway courses.
- The Physics and Psychology QEP faculty participate in an Inclusive Pedagogy Learning Community that will be convened by Verna Case, Associate Dean of Faculty and QEP Coordinator, and the Information Literacy Librarian. The group will meet five times during the fall semester. In the Learning Community sessions participating faculty will:

- share the successes and challenges they faced when implementing the inclusivity changes they had planned,
 - discuss one or two selected readings and determine their relevance for future pedagogical interventions.
- The Associate Dean/QEP Coordinator convenes two meetings of the QEP Advisory Committee to update them on Learning Community activities.

Assessment

- The Physics and Psychology QEP faculty collect assessment data and work with the Office of Planning and Institutional Research for analysis.
- Student focus group facilitators trained as needed.

Preparation for Following Year

- Based on feedback from faculty participants, the Associate Dean/QEP Coordinator selects readings for the workshop in May 2018.
- The Associate Dean/QEP Coordinator identifies and invites a leader in the field of inclusive pedagogy to participate in the May 2018 workshop.

Spring 2018

Pedagogy and Learning Community

- The Physics and Psychology QEP faculty incorporate inclusive pedagogy in Spring gateway courses.
- The Physics and Psychology QEP faculty continue their Inclusive Pedagogy Learning Community with the Associate Dean/QEP Coordinator and the Information Literacy Librarian. The group will meet four times during the spring. During these Learning Community sessions, participating faculty will:
 - share the successes and challenges they faced as they implemented the pedagogical interventions they had planned,
 - discuss one or two selected readings and assess their relevance for future pedagogical interventions.
- The Associate Dean/QEP Coordinator convenes two meetings of the QEP Advisory Committee to update them on Learning Community activities.

Assessment

- The Physics and Psychology QEP faculty collect assessment data and work with the Office of Planning and Institutional Research for analysis.
- The Office of Planning and Institutional Research conducts and summarizes assessments across participating departments.
- Trained student facilitators conduct focus groups with students.
- Diverse Learning Environments survey deployed.

YEAR 3

(May 1, 2018 – April 30, 2019)

May 2017

Weeklong Inclusive Pedagogy Workshop

- Facilitated leader in field of inclusive pedagogy
- Faculty in Chemistry and Mathematics/Computer Science attend presentations on
 - inclusive pedagogy,
 - assessing learning outcomes,
 - racial microaggressions,
 - issues that may have arisen from previous year's Learning Community
- Faculty read the literature on inclusive pedagogy in the Zotero database prepared by Associate Dean of Faculty and Information Literacy Librarian.
- Faculty convene with members of their own department to discuss pedagogical interventions to implement in their gateway courses.
- Participants convene in plenary sessions to discuss common learning outcomes to assess and common interventions to implement.

Summer 2018

Preparation for Gateway Courses

- Chemistry and Mathematics/Computer Science participating faculty prepare their gateway-course syllabi, incorporating inclusive pedagogy throughout the fall/spring semesters.
- Faculty work with Linda LeFauve, Associate Vice President for Planning and Institutional Research, to finalize data collection plans for assessing the impact of those pedagogical changes.
- The Information Literacy Librarian develops an annotated bibliography around best practices in inclusive pedagogy. The Center for Teaching and Learning website will highlight readings.

Assessment

- Biology, Economics, Physics, and Psychology faculty use assessment of learning outcomes from previous academic year and determine new interventions to incorporate for upcoming year.

Fall 2018

Pedagogy and Learning Community

- The Chemistry and Mathematics/Computer Science QEP faculty incorporate inclusive pedagogy in Fall gateway courses.
- The Chemistry and Mathematics/Computer Science QEP faculty participate in an Inclusive Pedagogy Learning Community that will be convened by Verna Case, Associate Dean of Faculty and QEP Coordinator, and the Information Literacy Librarian. The group will meet

five times during the fall semester. In the Learning Community sessions participating faculty will:

- share the successes and challenges they faced when implementing the inclusivity changes they had planned,
 - discuss one or two selected readings and determine their relevance for future pedagogical interventions.
- The Associate Dean/QEP Coordinator convenes two meetings of the QEP Advisory Committee to update them on Learning Community activities.

Assessment

- The Chemistry and Mathematics/Computer Science QEP faculty collect assessment data and work with the Office of Planning and Institutional Research for analysis.
- Student focus group facilitators trained as needed.

Preparation for Following Year

- Based on feedback from faculty participants, the Associate Dean/QEP Coordinator selects readings for the workshop in May 2018.
- The Associate Dean/QEP Coordinator identifies and invites a leader in the field of inclusive pedagogy to participate in the May 2018 workshop.

Spring 2019

Pedagogy and Learning Community

- The Chemistry and Mathematics/Computer Science QEP faculty incorporate inclusive pedagogy in Spring gateway courses.
- The Chemistry and Mathematics/Computer Science QEP faculty continue their Inclusive Pedagogy Learning Community with the Associate Dean/QEP Coordinator and the Information Literacy Librarian. The group will meet four times during the spring. During these Learning Community sessions, participating faculty will:
 - share the successes and challenges they faced as they implemented the pedagogical interventions they had planned,
 - discuss one or two selected readings and assess their relevance for future pedagogical interventions.
- The Associate Dean/QEP Coordinator convenes two meetings of the QEP Advisory Committee to update them on Learning Community activities.

Assessment

- The Chemistry and Mathematics/Computer Science QEP faculty collect assessment data and work with the Office of Planning and Institutional Research for analysis.
- The Office of Planning and Institutional Research conducts and summarizes assessments across participating departments.
- Trained student facilitators conduct focus groups with students.
- Diverse Learning Environments survey deployed.

YEAR 4

(May 1, 2019 – May 31, 2020)

Summer 2019

Assessment

- Biology, Economics, Physics, Psychology, Chemistry, and Mathematics/Computer Science faculty use assessment of learning outcomes from previous academic year and determine new interventions to incorporate for upcoming year.

Fall 2019

Assessment

- Assessment of learning outcomes and program goals are analyzed both across years and in the aggregate.
- The Associate Vice President for Planning and Institutional Research works with QEP faculty to develop an assessment report to be shared with campus constituencies.

Spring 2020

Communication and Extending Results

- QEP faculty share best practices with department faculty.
- Results and recommendations shared with educational organizations (e.g., AAC&U, Association for Institutional Research) and publications as appropriate.

YEAR 5

(May 1, 2020 – May 31, 2021)

Summer 2020

Assessment

- Biology, Economics, Physics, Psychology, Chemistry, and Mathematics/Computer Science faculty use assessment of learning outcomes from previous academic year and determine new interventions to incorporate for upcoming year.

Fall 2020

Inclusive Pedagogy Across the Campus

- The Center for Teaching and Learning convenes a working group consisting of representative faculty and academic staff to develop programming around ongoing inclusive pedagogy for interested faculty across all academic departments.

Spring 2020

Inclusive Pedagogy Across the Campus

- The Center for Teaching and Learning implements programming around ongoing inclusive pedagogy for all academic departments.

Resources

Most of the resources required for the successful implementation of Davidson's Quality Enhancement Plan are already in place. We have an institutional commitment to inclusive academic environments reflected in the College's highest aspirational goals. We have dedicated faculty who wish not only to bring new pedagogical techniques to their classrooms but to learn from each other, and especially from their students, how to be most effective. We have a Center for Teaching and Learning whose mission ensures that budget, staff, and programming dollars are allocated to student support and faculty development. We have a President and Chief Academic Officer who have long been advocates of inclusivity as evidenced not only by what they have said but by what they have prioritized.

Davidson is fortunate that so many of the structures that will support its QEP are already in place and require no further allocation of budget dollars. Nor are additional staff required. We believe this also positions us to continue the work beyond the formal time period of the plan.

Below we provide details about the resources that will be directed toward the successful implementation of Davidson's QEP.

Budget

The budget is primarily focused on the first three years of the plan. At the end of the third year, participating faculty from all six of the departments falling under the plan will have been through the workshops and learning community programming, and all protocols for program evaluation will have been tested and finalized. Beginning in the fourth year and continuing into the fifth, faculty will be working with others in their departments, and the Center for Teaching and Learning will continue its work related to inclusive pedagogy but any associated costs (expected to be minimal) would fall under regular departmental and CTL expenses.

Expenses during the period of the QEP include stipends paid to faculty beginning participation in the coming academic year and the Inclusive Pedagogy workshop attended by them the preceding May. An external facilitator receives a stipend for leading the workshop; that amount is set in the budget. Other expenses associated with bringing an external facilitator to campus (primarily travel and lodging) and incidental associated costs are estimated based on the May 2016 workshop.

Additional but minimal expenses include hospitality costs for the mid-year meeting associated with the learning community and a small budget for library or similar materials that may be requested in conjunction with it.

The Center for Teaching and Learning

The Center for Teaching and Learning has staff and facilities already focused on supporting students in their academic pursuits and faculty as they explore and implement pedagogical change. Although the QEP represents new programming, the effect on the CTL more generally has been carefully reviewed by the Associate Dean of Faculty, who directs the CTL, and the Vice President for Academic Affairs. The QEP does not impose an undue burden on the CTL's resources nor will it diminish the ability of CTL staff—most of whom will not be involved in QEP programming—to meet ongoing tasks.

Associate Dean of Faculty. The Associate Dean, who will have direct responsibility for the learning communities, has actively assessed the ways the QEP supports and enhances her role in the CTL and has carefully considered any potential complications it

presents. She and her staff are confident that no additional staff are required specific to the QEP.

Academic Assessment Analyst. This position had been approved prior to finalization of Davidson's QEP and is not created by it. However, one function of this position directly benefits the assessment component of the QEP.

As such, the Academic Assessment Analyst will consult with faculty in the participating departments regarding data collection, analysis, and interpretation.

Associate Vice President for Planning and Institutional Research. Although not part of the CTL, the Associate Vice President has worked with academic departments developing assessment protocols and assisting in the interpretation of results. This will continue, specifically with departments participating in the QEP, both as a bridge to the Academic Assessment Analyst once that position is filled and through the Associate Vice President's membership on the QEP Advisory Committee.

The formal budget submitted in support of Davidson's Quality Enhancement Plan follows.

Quality Enhancement Plan Budget						
Plan Year		Year 1	Year 2	Year 3	Year 4	Year 5
		2016-17	2017-18	2018-19	2019-20	2020-21
Inclusive Pedagogy Workshop/Learning Community						
	Faculty expenses*					
	Faculty stipend	\$24,000	\$28,000	\$28,000	—	—
	Workshop lunch/hospitality	\$435	\$465	\$465		
	Dinner with facilitator	\$550	\$550	\$550	—	—
	Midyear meetings of QEP faculty	\$400	\$400	\$400	\$400	\$200
	Facilitator expenses					
	Stipend	\$1,500	\$1,500	\$1,500	—	—
	Air travel	\$600	\$600	\$600	—	—
	Ground transportation	\$150	\$150	\$150	—	—
	3 nights lodging	\$360	\$360	\$360	—	—
	Meals	\$205	\$205	\$205		
	Miscellaneous materials	\$500	\$500	\$500	—	—
	Library Resources	\$500	\$500	\$500	\$500	\$500
Total		\$29,200	\$33,230	\$33,230	\$900	\$700
<p>* For the project's first three years, participating faculty include 3 from each of the 6 quantitative departments (for a total of 18). Amounts for stipends in Years 2 and 3 reflect the participation of seven rather than six faculty. This is to provide for a replacement in case a participating faculty member has to leave the program in Years 1 or 2. If no one leaves during this time period, the total cost of the project will be \$8,000 less.</p>						

Organizational Structure

The organizational structure of Davidson's QEP has been established with two goals in mind.

- To ensure its successful execution
- To provide a foundation on which future pedagogical transformation, beyond the QEP itself, can build

Overall Responsibility

With a focus on student learning and placement within the academic program, primary responsibility for the QEP rests with the Vice President for Academic Affairs and the faculty.

Plan Coordination

Coordination of the components of the QEP's implementation will be assumed by the Associate Dean of Faculty. She will organize the May inclusive pedagogy workshops, convene the learning community, and be a liaison to offices or staff that will be involved in assessment, presentation, or other functions as warranted.

We have created a QEP Advisory Committee. The role of the committee will include the following:

- Advise the VPAA and Associate Dean of Faculty should any changes to the plan as envisioned present themselves
- Review assessments of learning outcomes and programmatic goals provided by the Office of Planning and Institutional Research
- Engage with the learning communities at their invitation or when insights from programmatic assessments might productively be shared
- Provide an institutional perspective in preparation for the period beyond the QEP regarding inclusive pedagogy across the curriculum

Membership on the QEP Advisory Committee includes:

- Associate Dean of Faculty
- Assistant Dean for Educational Policy
- Two faculty members, one of whom will be a QEP participant
- Two students selected in conjunction with the Student Government Association
- Associate Vice President for Planning and Institutional Research
- Director of Multicultural Affairs
- Associate Dean of Students
- Academic Assessment Analyst

Leadership and institutional support will also be provided by the chairs of the participating departments (Biology, Chemistry, Economics, Mathematics and Computer Science, Physics, and Psychology), Information Technology Services, and the Information Literacy Librarian.

Assessment

Assessment, as detailed in the following chapter, will take place at both the departmental and institutional level. Primary responsibility will be located in the Office of Planning and Institutional Research.

Assessment of the Quality Enhancement Plan

Davidson will employ a multi-method, multi-year assessment protocol. The primary focus will be learning outcomes across the gateway courses of participating departments. There will also be an overall program evaluation.

Assessment of Learning Outcomes

We began by analyzing the learning outcomes for the gateway courses in the QEP's quantitatively oriented departments. We were able to categorize them along four dimensions independent of discipline.

- Recognition (foundational concepts and techniques)
- Application (demonstration or amplification of concepts)
- Extrapolation (application to new questions or ideas)
- Discipline-adjacent (communication, judgment, connections)

(See Appendix E for the full list of gateway learning outcomes and their categorization.)

The most common category was Application, defined as the demonstration or amplification of concepts. At the first inclusive pedagogy workshop in May 2016, faculty also shared experiences that supported the potential in this category for the measureable effect of inclusive pedagogical innovations.

During the first workshop for faculty representing departments that are part of the QEP, participants determined that learning outcomes from the Application category provided the best focus for measuring the effect of the pedagogical innovations. Faculty experience has shown that this was the point in students' learning trajectory where obstacles were more likely to appear and students were more likely to struggle.

Outcome data, of course, by their very nature, are limited to what the students eventually achieved. Exams and rubrics do not capture the stops and starts along the way. Faculty, however, see what is happening in the classroom or laboratory and are continually asking themselves such questions as, "Am I hearing more questions from students on a particular topic?," "Have I needed to assign additional problems sets/exercises/reading in order to help students better understand implications?" "Were more examples necessary before students grasped a concept?" Faculty are aware, in their classrooms and laboratories, of the process by which students learn. Their experience here made the decision about focus upon Application clear for participants.

Assessment of these learning outcomes as part of the QEP will have both formative and summative components. Assessment will also comprise multiple methods. The following detailed examples for the biology and economics gateway courses illustrate these components and methods.

Biology

Participating faculty teaching in the gateway Biology courses each selected two Application learning outcomes fundamental to their disciplines. The resulting six learning outcomes state that students will be able to:

- Reconstruct phylogenies using character matrices and apply phylogenetic principles to understand animal diversity and systematics

- Analyze the roles of biotic and abiotic factors in population structure and dynamics, supported by the mathematics of exponential and logistic growth
- Analyze data with basic descriptive statistical methods
- Interpret scientific figures and other forms of data
- Evaluate biological data to address predications and hypotheses and answer scientific questions
- Apply skills of scientific exploration including critical thought, data collection and analysis, quantitative analysis, and communication of complex information

Progress toward these learning outcomes and achievement of them will be measured using the following formative and summative assessments:

Formative

- Clicker quizzes
- Group discussion
- Review questions that map to specific learning outcomes
- Mastery assignments based on laboratory projects focused on research presentation
- Mastery quizzes based on a bank of questions from which students complete subsets until they have mastered the skill
- Performance in group work activities and “minute” papers

Summative

- Exam questions that map to specific learning outcomes
- Laboratory simulation exercises

Economics

Participating faculty teaching in the gateway Economics course selected two Application learning outcomes. fundamental to the discipline. These learning outcomes state that students will be able to:

- Interpret critical microeconomic and macroeconomic concepts—demand and supply in the competitive output market; and aggregate demand and aggregate supply in the macro economy, and to apply basic economic policy tools in these contexts.
- Distinguish between positive and normative economic concepts and arguments.

Progress toward these learning outcomes and achievement of them will be measured using the following assessments:

Formative

- Mastery tests that can be retaken to address content deficiencies
- Group problem sets

Summative

- Exam questions that map to specific learning outcomes

Across Departments Participating in the QEP

There are two overall goals toward which the departments aspire and that will be evaluated through exam questions and, where relevant, laboratory assignment rubrics, mapped to learning outcomes.

- Improvement in learning outcome achievement in the Application category for all students
- Absence of differential performance on these learning outcomes by race/ethnicity

The statistical assessment of these two goals will be performed by the Office of Planning and Institutional Research at the end of each year, both for that year and in the aggregate for all years as subsequent years become available.

The statistical assessment of a broad Application learning outcome across the disciplines will also be performed by the Office of Planning and Institutional Research at the end of each year and in the aggregate for subsequent years. That outcome is:

All students will be able to recognize under what conditions theories, models, or quantitative evidence should be applied and to use them appropriately to explain phenomena or solve problems.

Faculty in participating departments will map their discipline-specific learning outcomes to a rubric based on the broad Application learning outcome. The two goals assessed, based on the proportion of students in the quantitatively-oriented gateway courses achieving the overarching learning outcome, parallel the goals for the discipline-specific learning outcomes:

- Improvement in the achievement of the broad Application learning outcome for all students:
- Absence of differential performance on this learning outcome by race/ethnicity

Effect of the Classroom Environment

In addition to the assessment of student learning outcomes, evaluation of the classroom environment will be performed using multiple tools.

Statistical Analysis. The Diverse Learning Environments Survey (DLE) will be given to a sample of students in participating courses annually. Individual student responses to the DLE will be linked to performance on learning outcomes as above. The analysis, performed by the Office of Planning and Institutional Research, will focus on the relationship between learning outcomes and classroom experience as measured by the following DLE themes.

- Interpersonal validation. Measures students' view of faculty and staff attention to their development. Particular attention to two items related to faculty ("Faculty believe in my potential to succeed academically", "Faculty empower me to learn here").
- Academic validation in the classroom. Measures the extent to which students' view of faculty actions in class reflect concern for their academic success. ("Felt that faculty provided me with feedback that helped me assess my progress in class", "Felt that my contributions were valued in class", "Faculty were able to determine my level of understanding of course material", "Felt that faculty encouraged me to ask questions and participate in discussions").

- Academic self-concept. Measures students' beliefs about their abilities and confidence in academic environments. Particular attention to three items on which students compare themselves relative to peers ("Academic ability", "Intellectual self-confidence", "Mathematical ability").

Qualitative Analysis. Each year, focus groups will be conducted with students in participating departments where inclusive pedagogy innovations have been instituted in introductory courses.

Facilitators will be recruited from the junior and senior class. Several recent projects at Davidson using student facilitators have shown there to be an advantage in having student-led discussion around issues of both social and academic environments. These student facilitators will be trained by the Associate Vice President for Planning and Institutional Research. Protocols for the focus groups will be developed in consultation with the Associate Dean of Faculty and faculty in the discipline.

Focus group transcripts will be analyzed using a grounded theory technique with particular attention to linguistic evidence of inclusivity in the classroom. Successes, challenges, and opportunities to better promote inclusivity will be shared with faculty participating in the QEP as part of the learning community activities. The desired outcome for this particular assessment is not only the language of inclusivity but evidence of the leveraging effect of high expectations applied to students beyond the course.

Program Evaluation

At the program level, the effect of inclusive pedagogical innovations should be evident in three ways.

- Closing the gap in introductory course performance by race/ethnicity as measured by average course grades
- Leveraging the effect of inclusivity fostered in the gateway courses to students' as measured by the DLE's theme related to a sense of belonging. This theme measures the extent to which students feel a sense of academic and social integration on campus and should provide evidence that the effect of inclusivity reverberates beyond a particular course. The aspiration here is a finding of no differences by race/ethnicity. The particular focus will be on two items ("I feel a sense of belonging to my campus" and "I see myself as a part of the campus community").

Summary

Assessment will focus on learning outcomes categorized as Application and appropriate to each of the participating departments. A broad Application learning outcome will also be assessed across these departments. A program evaluation will also look at the learning environment fostered by the inclusive pedagogical innovations.

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Appendix A:

Inclusivity Focus Groups Transcript Analysis

Peer-Facilitated Focus Groups on Inclusivity at Davidson

Spring 2015

Four student focus groups were held on the topic of inclusivity at Davidson. Each group was led by a trained peer facilitator. Although participants were told the topic was inclusivity on campus, inclusivity was intentionally left undefined so that students were able to articulate their experiences in the ways that most resonated with them.

Although the topic is highly personal, and individual opinion can vary, the goal of focus group research is to look for common themes across circumstances or, as appropriate, the common denominators within differing circumstances. The following summary is organized around several themes that emerged in the current research.

The Campus Environment

To get a general sense of how students perceived the general campus environment, participants were asked to share words or phrases that described Davidson. They responded quickly with adjectives, virtually all positive, many of which related to a sense of student community such as “friendly,” and “accepting.” One participant noted that students hear alumni refer to Davidson as a “special place” but that there is rarely any indication of what makes it special. “It’s almost as though it’s just understood,” as another participant said.

The students understood the topic of the focus groups to be inclusivity, but words referring to diversity came up spontaneously in only one group, and much later in the conversation. One participant offered the observation that Davidson was “not very diverse,” quickly followed by tempering statements from other participants such as “but there is greater diversity of opinion than some peer schools.”

The Classroom Environment

Asked to describe the classroom environment at Davidson, participants used words such as “small,” “involved,” “challenging,” and “collaborative.” When noting the competitive nature of academics here, participants were quick to clarify that it was not “cut-throat” and that students didn’t rise or fall by others’ success or failure. In terms of the student population, and prompted to think about diversity, participants tended to categorize by geographical and political representation. There was some disagreement with respect to the latter; some participants felt there was a good mix of political opinion but others felt students skewed conservative, especially among the men.

When asked about the classroom atmosphere—as distinct from environment—participants described the dynamics of the class, particularly an acknowledgment that some students were more willing to contribute to class discussion than others. Asked what might be behind that difference, most participants offered reasons that reflected students’ previous experiences and, especially, the dynamic set by the professor.

For some participants, the feeling that they matter in the classroom was driven less by what the student brings to the classroom than by the nature of the classroom itself. For example, exposure to new ideas or being challenged by a professor who is a recognized expert in a field can make students feel they are engaged in something important, a sense that reflects positively on them.

Student Interaction

The participants spent considerable time describing what it can feel like in a classroom where one or two students seem to have a significantly higher level of knowledge or understanding. Whereas upper-class students described the higher ability of some students as unique to those students (that is, an area of expertise or interest, or verbal facility on any topic), first-year students were more likely to attribute differences to the preparation with which students entered Davidson (that is, some students had participated in a more rigorous high school curriculum or had unique extracurricular opportunities).

However created, the result was a feeling of intimidation that led to a reluctance to contribute to class discussion. The participants did not believe the issue was unusual or unexpected; rather they believed it probably happened whenever a school attracts “smart students.” Under those conditions, they noted, students who had been at the top of their high school classes now found themselves surrounded by others also accustomed to being at the top.

There was a suggestion that Davidson students might be more concerned than students at similar colleges about “ever being wrong” in class and, as such, more likely to hesitate to offer an answer or idea in class. The reaction of other participants suggested this was commonly understood to be true. (Here, faculty reaction is critical, as discussed in the section *The Role of the Professor*.)

As part of the focus groups, participants were asked to respond to two different scenarios. In the first:

It’s the first week of the semester and a friend is telling you about the class she just had. “I feel like it matters that I’m in that classroom, that what I think matters. I think it’s because...” and she’s suddenly called away by a phone call. Finish her thought. What was she going to say next?

Responses tended to cluster around the unique contributions the hypothetical student could make to a classroom discussion. For example, “I have a perspective that others might not have,” whether that perspective is based on the student’s personal characteristics, opinions, or experience. However, participants emphasized that this situation applied to nearly everyone under different circumstances or in different classrooms. In the words of one, “Everyone is different in some way, and that means everyone can bring something to the table.”

In the second scenario:

It’s the same week. Another friend tells you, “I might as well have been invisible. Or wrong no matter what I said. I think it’s because...” Finish her thought. What might create that mindset?

Here, participants returned to the idea of a student in that class who is extremely intelligent or knows the subject especially well, resulting both in a shift of attention to that student and reluctance to participate among the other students. A variation on this particular theme was the fear that, even if one knew the answer or the issue, others in the class were more articulate. In particular, they worried that the inability to speak well on a topic would cause others to conclude they knew less than they actually did.

It is worth noting that these perceptions applied across all focus groups, including one composed of student government leaders presumed to have higher levels of confidence and greater experience speaking in public. Although the degree might have been less, no immunity to intimidation by other students, or worry about how one was perceived, was conferred by those roles.

When prompted to consider whether some students might feel more invisible than others, participants were quick to suggest that students who were quiet or shy about participating in class were at greater risk. Conversation about the effect of being less comfortable in group settings was animated, and many participants offered examples of their own experiences or those of friends or classmates.

Only when prompted to consider whether issues of representation might come into play did participants suggest that possibly students of color might feel hesitant. However, they attributed that hesitation to the low number of faculty of color and the possibility that “people who look like me aren’t expected to know” about a field. Similarly, female students in departments where faculty are all or mostly men might experience something similar. In both cases, there was a sense that the participants were searching for a response to the question but not otherwise engaged in thinking about the effect.

The Role of the Professor

Participants indicated that students whose high school experience included class discussion, and who had positive recollections of that, would be more willing to participate in class discussion at Davidson. But they were clear that a lack of previous experience could be overcome by the professor, just as the effects of previous positive experience could be jettisoned. Students’ comfort in offering opinions or answering questions was described as very dependent on the professor’s energy and personality, and whether a professor is open to hearing what students have to say. Participants shared examples of faculty members ranging from dismissive to hostile. Rarely did they provide names, acknowledging nothing to be gained by speaking negatively of individuals, but they indicated there is common understanding among students as to which professors are to be avoided if possible. On the other hand, they also noted that students will gravitate toward courses when they’ve heard accolades about the professor’s classroom atmosphere.

As they delved into the classroom dynamic, participants discussed ways in which some aspects of a professor’s personality or interests could be in contrast. For example, a professor may be wonderful when speaking to a student one-on-one but struggle with running a class conversation; an expert on a topic may understandably have the final word on facts related to it but carry that perspective into areas where differing opinions reasonably exist.

Participants indicated that it is often clear to students when a professor is less than passionate about a topic, or just “marking time” in an introductory class. Both have a dampening effect on students’ comfort and willingness to engage in the classroom.

Further, given students’ concern about being wrong, or the effort required to speak up when it does not come naturally, how professors handle conversation in the classroom matters. As the participants indicated, it is rare that a professor will be rude, but feeling dismissed can be equally devastating. One participant described a class where she seldom spoke. Others in the class assumed that she wasn’t interested in the subject but, in fact, she “was fascinated” but intimidated by the professor. When she finally did give her opinion on an issue, “he just said, ‘anyone else?’” The student didn’t know whether

to interpret that response as encouragement for others to share their opinions or as a prompt for someone else to give a “correct response.” Another participant described it as “the worst outcome, when you finally get up the nerve to talk and the professor moves on, barely acknowledging what you said.” One participant recalled approaching a professor about his struggle participating in the class. He was told to “just study more.” The professor assumed the only factor driving conversation was knowledge of the class material.

The issue of personal comfort in a group setting resonated with the participants in every group. When there are few opportunities for students who are quiet or less confident to break into the conversation, they have observed instances where the professor concludes the student is not interested in the class and acts accordingly.

Participants noted that the rare professor will go beyond dismissive, and that one harsh criticism can shut down a student’s inclination to engage with a course. One participant recalled a professor telling her, “if you write the way you speak, you’ll never be successful.” This student said that she had loved the material in the course and would have welcomed constructive criticism. But all she felt she’d heard was “stop talking.”

Another student recalled being told directly “not to talk so much in class.” This student did, however, ask the professor for clarification, concerned that she was perceived as dominating the conversation. She was told that was not the case, but gained no further understanding. Other participants recognized the situation she was describing. As one put it, “it’s not a case of a couple students dominating the class conversation but those students saying something again because no one else is talking.” They described professors who struggle to get the whole class involved but still “try to shut down the students who are talking.”

Participants were quick to note, however, that many of their professors have a contagious enthusiasm for their courses, a genuine interest in each student, and a talent for creating energy in the classroom. When the professor has set a positive tone, they said, everyone feels included and valued.

Perceived Preferences

The participants perceived a preference among the faculty for students with clear plans for their lives after graduation, especially if those plans include graduate or professional school. Within that group, they suggested, were also professors who showed what is perceived as favoritism toward students who express interest in graduate school in the professor’s field.

One participant offered an opinion with which others in his group readily agreed: That Davidson’s focus on what students do after graduation may be read by students as anxiety about the liberal arts. That is, the way the college handles public questions about its value is by—in the words of one student—“constantly discussing” how the liberal arts lead to specific careers. The message students received is that the liberal arts are a viable choice to the extent there is a demonstrated relationship with their post-Davidson life. Participants believed that the focus should instead be interdisciplinary, particularly the ways students connect “what they’re learning to what else they’re learning,” not how what they’re learning connects to a career on which they often remain undecided.

One participant suggested that there is a “model Davidson student” and that those students are consistently put front and center even though there are many students doing great things. “Aren’t we all game changers?” as one said. There was a great deal of agreement with this sentiment. As another participant put it, “Davidson tells students they can do anything and be anything the first two years. Then, junior year, they lift up the veil and tell you that you have to be a professional something so they can put you in a publication or on a poster.” The sentiment reappeared when the groups discussed how students perceive the degree to which they matter at Davidson. Specifically, there was consensus among the participants that everyone matters for the very reason that everyone has some interest on which they are uniquely focused but that not all interests are equally valued by the college.

A discussion of values in one group led to a participant’s observation that that a culture of stress has become a Davidson value. Other participants agreed that alumni and some faculty want students to connect on “deeply engrained sense of stress” and to bond over how difficult their academic life is. The question of whether such a culture creates a shared experience or is counterproductive remained open.

Components of Inclusivity

It required some prompting to get participants to consider whether some students might experience the Davidson classroom in different ways. Even then, as above, much of what they described revolved around individual differences among students. For example, they suggested that students who tend to be quiet or prefer one-on-one conversations could understandably feel uncomfortable in a Davidson classroom where there is a good amount of discussion. They also reported that when there are majors and non-majors in a classroom, majors sometimes are dismissive of non-majors’ opinions or ideas. Even first-year students taking classes that do not include majors agreed that how peers react to what they say in class determines the likelihood that they will continue to actively engage in classroom discussions.

Asked directly what would make classes feel more inclusive, participants offered ideas that tended to fall into three categories.

The professor

- Professors should consciously set guidelines about how to be respectful to others with different viewpoints. (One participant recalled a science class that included a student who didn’t believe in evolution and that the message given to other students was that both she and her view were to be respected.)
- Professors should also be aware that they are “role models” for ways to challenge an idea without calling the idea bad, and valuing student opinion without shutting down conversation.
- A faculty that is more representative of the student body and the country would be positive. Participants believed that the college is trying to address this issue and that it takes a long time to change faculty demographics. At the same time, however, they believed that increasing diversity through temporary faculty does not work because students are unable to establish a relation with someone who is leaving nor are temporary faculty able to advise students.

Academic content

- When a professor sets a tone that the goal is discussion, not right or wrong answers, students can get caught up in the class's energy. This is particularly true when students feel they are helping to set the direction of the class.
- In many cases, it's appropriate for a professor to have a conclusion he or she wants the class to reach. But if the professor is overly directive, the students can feel less engaged, both individually and as a group.
- Students want to feel prepared for class, and that feeling of preparation is often of function of the degree to which out-of-class assignments relate to in-class discussion. Relevance of assignments to class discussion has the additional benefit of creating a level playing field, where students can draw on common knowledge and apply it to issues or questions.

Class format

- Large classes can be difficult because students have to work harder to establish contact with faculty. Even speaking to a professor during office hours can be uncomfortable if the student feels the need to introduce him- or herself.
- Classes that are strictly lecture format can make students feel superfluous. One participant described a class where there seemed to be no difference whether three or 30 students attended.

Responding to a general question regarding what would make students feel part of a campus community, participants tended to first describe why they had difficulty coming up with answers. As one participant noted, it was uncomfortable for her, as a "white, female, middle class, heteronormative student" to talk about what would make anyone else feel more included because she didn't want to imply that students unlike her were "somehow other." Particularly in classes where there might be a subjective viewpoint, participants expressed concern that they could be perceived as insensitive. One participant indicated he found himself hesitating even when referring to students of his own race, since he personally used "Black" and others used "African American."

In one of the focus groups, an example occurred spontaneously while discussing how easy it is to misconstrue the intent of language. A participant was talking about taking great care not to use insensitive language. "What are the right ways to refer to race or to lower class...sorry, working class..." He stopped talking, seemingly feeling he'd made a misstep. Other participants immediately responded: "See?" Like that?"

There was consensus among participants that there may be students who question whether they belong at Davidson because they are not well-represented among the college's demographics, but that it was easy for students to feel they matter as individuals, and that the latter carried greater weight. Said one participant, "Even students who might say they don't belong here still would say they matter here because they're doing important things or are connected with things they believe in." Other participants in that

group were in enthusiastic agreement. “The invisible people,” one said, “are the ones that are only here for academics and don’t get involved in other things.”

Summary

When participants in these focus groups talked about inclusivity, they tended to engage primarily around the tone set by the professor, individual differences among students with respect to confidence or comfort speaking in a group setting, and perceptions of what is valued at Davidson. It should be noted that the tone set by the professor had significant effects on both individual students and students as a group in the classroom. Even students who indicated they were comfortable in front of their peers were often uncomfortable if they felt unsure about the professor.

Even though the way participants defined differences among students at Davidson emphasized individual personality, much of what they said might be applicable for creating a sense of inclusivity and comfort within any set of student characteristics. That everyone is subject to a feeling that he or she may not “belong” may be magnified if the student is part of an underrepresented population, certainly, but a number of basic principles may apply across multiple configurations of demographics, personalities, and interests.

Professors should understand that students have widely differing levels of comfort speaking in a group, and that the level of comfort can vary in the same individual under different circumstances. Tempting as it may be to believe otherwise, classroom participation or meeting with the professor outside of class is not necessarily correlated with students’ interest in the class material or ability to master it. Any tactic that increases the likelihood of an individual student speaking in class increases the likelihood of all students participating more fully.

One way to engage students is by letting them speak to their own experiences. Yet that has less effect for students who are naturally reticent, or students who feel intimidated by other students with greater experience or verbal ease. An effective alternative may be letting them share in the professor’s passion, challenging them as a group, and by creating an environment where they apply what they learn in class to issues and questions that matter to them.

Previous research on Davidson students in the classroom suggest that students can experience a professor’s remarks or demeanor in very different ways, often as a function their sense that they belong at Davidson. One avenue for further research may be investigating the ways student experience in, and faculty assumptions about, the classroom environment intersect and where they are at odds with each other.

Appendix B:

Focus Groups of First-Generation Students

Peer-Facilitated Focus Group of First Generation Students at Davidson

Our Teagle project on academic support of first generation college students at Davidson includes a series of peer-facilitated focus groups. These groups serve a dual purpose: 1) we are learning about the needs, perceptions, and experiences of the students and 2) we will be able to assess the effect of new programs or changes to existing programs. We chose to use peer facilitators on the assumption that the students would be more forthcoming and we have found that to be true; one clear theme of the discussion was that they appreciated talking to someone who “got it,” who shared their experiences and was able to understand the issues. The first group was comprised of students from all four classes and facilitated by a senior. As a control, we also conducted a peer-facilitated focus group of students who were not first generation in order to isolate experiences and perceptions unique to first generation students at Davidson.

Several major themes emerged from the discussion.

Self-definition. The primary distinction the students in the group made between themselves and other students was not race, income, or geography but high school background. Specifically, their perception was that a disproportionate number of Davidson students attended private high school. As a result, they felt those students were better prepared to manage both the academic workload and other aspects of life at Davidson, particularly participation in sports, working out, and social activities.

As with the first generation focus group, the primary distinction the students in the non-first generation group made between themselves and other students was high school background. The students in this focus group talked less about the number of students who had attended private high schools than had the first generation focus group, or their ability to manage classes and other activities but, like that group, did believe that students from private high schools were better prepared for the workload they encountered at Davidson.

Legacies. In addition to being the first in their families to attend college, the students in the group felt that elite colleges like Davidson attract disproportionate numbers of students whose parents, grandparents, and extended family members also attended the college. That experience gave them additional advance knowledge of the campus and a more effective support system at home.

Parental expectations. The students in the group described their parents as supportive of higher education and proud that they were attending Davidson, but not as understanding of the difference between success at the high school level and success in college. Specifically, they found that their parents perceived grades below an A as evidence that the students weren’t working hard enough whereas parents of students who had themselves attended college better understood what a B represented. When asked if there was anything Davidson could communicate to parents that would help them understand, the students were universal in their agreement that their parents simply passed all communications from the college directly to them.

Tutoring. The students were quick to acknowledge that they felt they were not as good as other students if they needed to ask for academic assistance; this feeling was further exacerbated by the fact that in high school, they were the ones tutoring other students. Further, if they were able to push past that feeling and ask for assistance, a single bad experience with a tutor was generally sufficient to keep them from coming back to the Center for Teaching Learning. Bad experiences were defined as either impatience or other attitude issues, or a lack of practical advice. The latter was especially an issue for the writing center because so much seemed to

depend on what a particular professor wanted and, unless the tutor was in the same class—which was unlikely to happen—there was no way for the tutor to know.

Participants in the focus group with non-first generation students did not view using the writing center or tutors as a reflection on their ability to grasp course content. However, they did tend to use them more strategically. For example, one student said she would go to the writing center once she had specific criticisms or suggestions on a paper from her professor, and she focused on those in her meeting with a writing center tutor. Another student would have a specific question about a class when meeting with a tutor and bring additional material he had already been through trying to answer that question to his meeting, resulting in more of a conversation than a “lesson.”

The non-first generation students also relied more on affiliations—sports teams, eating houses, other student memberships—to navigate both academics and social life on campus. The more specific the affiliation, the more useful they found them. That is, being on the same hall or choosing a particular lifestyle didn’t create the same sense of shared experience. Affiliations also provided protection against a sense of “otherness.” As with the first generation students, these students perceived that many other students had greater advantages coming into Davidson in the form of family income or private high schools or travel opportunities. However, finding what one student called a “common thread,” such as having to schedule school work against practice times and team travel tended to put them all on a level playing field.

Discouraging professors. Several students in the group shared stories of professors who told a class on the first day that they didn’t believe in As or that few students received them. The students found this attitude very discouraging but also confusing because it seemed to reflect a bias the professors brought to the class versus experience with students. This attitude further complicated the students’ willingness to seek out academic assistance, particularly from the professors but also from the Center for Teaching and Learning, since to do so would validate the professors low expectations.

Among the participants in the group of non-first generation students, again, a more strategic approach to their professors was discussed. They would use information such as that described by the first generation students not as a reflection of themselves, or even the class as a whole, but as insight into how the professor approached his or her classroom. They were better able to parse expectations and use classroom dynamics to succeed.

In general, then, students who were not the first of their family to attend college were less likely to view difficulties as a reflection on their academic ability or right to be at Davidson. They were more strategic and more likely to commonality within student campus affiliations than the first generation students, and made faster adjustments as a result. At the same time, the issues faced by the first generation students regarding family understanding and expectations were very real and genuinely complicating, making it all the more important to help them find a road map for navigating the myriad changes Davidson demanded of them.

Appendix C:

Nilanjana Dasgupta CV (partial)

(For the complete version of Prof. Dasgupta's CV, visit
<https://people.umass.edu/nd/dasgupta.webcv.pdf>)

*Curriculum Vitae***Nilanjana Dasgupta***Office address*

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Education

Ph.D. **Yale University, New Haven, CT**
 1998 Social Psychology
M.Phil. **Yale University, New Haven, CT**
 1996 Social Psychology
M.S. **Yale University, New Haven, CT**
 1994 Social Psychology
A.B. **Smith College, Northampton, MA**
 1992 Major: Psychology, Minor: Neuroscience
 Summa cum laude, Phi Beta Kappa, Sigma Xi, Psi Chi, Highest honors for Honors Thesis

Employment

2014-present **Director of Faculty Equity & Inclusion**, College of Natural Sciences, UMass-Amherst
 9/2012-pres **Professor**, Department of Psychological & Brain Sciences, University of Massachusetts
 2006-2012 **Associate Professor**, Department of Psychology, University of Massachusetts, Amherst
 2003-2006 **Assistant Professor**, Department of Psychology, University of Massachusetts, Amherst
 1999-2002 **Assistant Professor**, Department of Psychology, New School for Social Research
 1997-1999 **Postdoctoral Fellow**, Department of Psychology, University of Washington, Seattle

Grants, Awards, and Honors

2014 Distinguished Academic Outreach Award in Research, University of Massachusetts, Amherst
 9/14/15-5/31/19 National Science Foundation (HRD 1348789) Supplement. PI: N. Dasgupta. \$539,826
 6/1/14-5/31/19 National Science Foundation (HRD 1348789). PI: N. Dasgupta, Co-PI: C. Riegle-Crumb. Title: "Peer influences on adolescents' self-concept, achievement, and future aspirations in science and mathematics: Does student gender and race matter?" \$1,499,993
 9/1/11-8/31/14 National Science Foundation (GSE 1132651). PI: N. Dasgupta. Title: "Peer Matters: When and how do peers influence young women's participation in science, technology, engineering, and mathematics (STEM)?" \$524,580

9/1/13-8/31/17	National Science Foundation (DUE 1323084). PIs: L. Dierker & D. Beveridge (Weslyan University). Advisory Board Member: Dasgupta. Title: "Passion-Driven Statistics: A multidisciplinary project-based supportive model for statistical reasoning and application." \$599,995
10/1/13-9/30/15	National Science Foundation (DRL1252350). PIs: F. Sullivan & R. Adrion (University of Massachusetts). Advisory Board Member: N. Dasgupta. Title: "Microgenetic Learning Analytics." \$300,916
8/15/13-7/31/16	National Science Foundation (DUE 1231286). PI: Mathieu (U Wisconsin); Advisory Board Member: N. Dasgupta. Title: "The Center for the Integration of Research, Teaching, and Learning (CIRTL) Network: 25 Research Universities Preparing a National Faculty to Advance STEM Undergraduate Learning." \$5,000,000; UMass subaward \$166,944
2012-13	Family Research Scholar, Center for Research on the Family, UMass
May 2012	Mellon Mutual Mentoring Team Grant. Co-PI with Jennifer McDermott. \$10,000
March 2011	Hidden Bias Research Prize (\$10,000) awarded by Level Playing Field Institute for "outstanding research article on gender equity in the classroom" published by Stout, Dasgupta, Hunsinger, & McManus (2011), <i>Journal of Personality & Social Psych</i>
9/1/09-8/31/13	National Science Foundation (BCS 0921096). PI: N. Dasgupta (D. DeSteno as co-PI) "Collaborative research: Investigating underlying mechanisms and behavioral consequences of emotion-induced implicit prejudice." \$411,104
3/1/06-8/31/11	National Science Foundation CAREER Award (BCS 0547967). PI: N. Dasgupta. Title: "STEMing the tide: Changing educational environments to enhance girls' and young women's participation in science and mathematics." \$400,537
2009	Fellow of the Association for Psychological Science (APS)
2009	Fellow of the Society for Experimental Social Psychology (SESP)
2006-07	Family Research Scholar, Center for Research on the Family, UMass
2005-06	Lilly Teaching Fellowship, University of Massachusetts
2005	Morton Deutsch Award for best article published in <i>Social Justice Research</i> in 2004
6/1/04-5/31/05	Healey Endowment Grant. PI: N. Dasgupta. Title: "Seeing is believing: Exposure to counterstereotypic women leaders and its effect on conscious and nonconscious beliefs about the self." \$10,162
9/06/02-7/31/05	National Institute of Mental Health (R03 MH66036-01). PI: N. Dasgupta. Title: "On the malleability of automatic stereotyping." \$131,326
1/26/03-1/25/04	American Psychological Foundation, Wayne F. Placek Award. PI: N. Dasgupta. Title: "Implicit and explicit sexual prejudice: Examining behavioral correlates and testing a prejudice reduction intervention." \$30,000
8/24/01-12/31/02	National Science Foundation (BCS-0109105). PI: N. Dasgupta (co-PI: D. DeSteno) Title: "Collaborative research: The effect of emotions on automatic evaluations, goals, and behavior." \$34,768
8/1/00-7/31/03	National Institutes of Health (P01 MH56826). PI: M. Merson; Consultant: N. Dasgupta. Title: "Understanding HIV relevant stigma in India."
9/7/00-9/6/02	American Psychological Foundation, Wayne F. Placek Award. PI: N. Dasgupta. Title: "Implicit and explicit sexual prejudice: Examining behavioral correlates." \$6000
1996	Society for the Psychological Study of Social Issues. PI: N. Dasgupta. Title: "Pigments of the imagination: The role of perceived skin color in stereotype maintenance and exacerbation." \$2,000
1996-97	Yale University Dissertation Fellowship

1992-96 Yale University Graduate Fellowship
 1992 Summa cum laude, Phi Beta Kappa, Sigma Xi, Psi Chi, Smith College, Highest honors for Senior Thesis, Smith College; Smith College Alumna Scholarship.

Publications

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- Dasgupta, N., Scircio*, M., & Hunsinger*, M. (2015). Female peers in work teams enhance women's motivation, verbal participation, and career aspirations in engineering. *Proceedings of the National Academy of Sciences*, 112(16), 4988-4993.
- Ajzen, I., & Dasgupta, N. (2015). Explicit and Implicit Beliefs, Attitudes, and Intentions. In B. Eitam & P. Haggard (Eds.), *Human Agency: Functions and Mechanisms*. UK: Oxford University Press.
- Dasgupta, N. & Stout, J.G. (2014). Girls and women in science, technology, engineering, and mathematics: STEMing the tide. *Policy Insights from Behavioral and Brain Sciences*, 1, 21-29.
- Yogeeswaran*, K., & Dasgupta, N. (2014). The devil is in the details: Abstract versus concrete construals of multiculturalism differentially impact intergroup relations. *Journal of Personality and Social Psychology*, 106, 772-789.
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* All co-authors with asterisks were graduate students at the time of the research.

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- Dierker, L., Alexander, J., Cooper, J., Selya, A., Rose, J., & Dasgupta, N. (under review) Engaging Diverse Students in Statistical Inquiry: A comparison of learning experiences and outcomes of

Appendix D:

A Sample Workshop Agenda

May 16, 2016**Monday**

All day event	May Workshop on Inclusive Pedagogy
09:00 - 09:15	Welcome and Coffee
09:15 - 09:30	Introductions
09:30 - 10:45	Prof. Buju Dasgupta presentation: What is Inclusive Pedagogy? Best Inclusive Practices -- Chambers 1046
10:45 - 11:00	Break
11:00 - 12:15	Discussion: Efforts at Inclusion We've Already Tried, How They Worked
12:15 - 13:15	Lunch Break
13:15 - 13:45	Using Zotero (James Sponsel)/Buju meets with Wendy -- Chambers 1046
13:45 - 15:30	Reading and Research Time: read intro articles
15:30 - 15:45	Break
15:45 - 17:00	Large Group Discussion with Buju: Initial Thoughts about Innovations to Try in your Gateway Course

May 17, 2016**Tuesday**

All day event	May Workshop on Inclusive Pedagogy
09:00 - 09:15	Welcome and Coffee
09:15 - 10:05	Biology's Consultation with Buju; Reading Time for other participants -- Chambers 1096
10:15 - 11:05	Economics' Consultation with Buju; Reading Time for other participants -- Chambers 1045
11:15 - 12:05	English's Consultation with Buju; Reading Time for other participants -- Chambers 1015
12:15 - 13:30	Lunch at Kindred; farewell to Buju
13:30 - 14:00	Kevin Smith on 5-Year Departmental Grade Data on the Achievement Gap
14:00 - 14:30	Discussion on Kevin Smith's data
14:30 - 17:00	Reading and Research on your own

May 18, 2016**Wednesday**

All day event	May Workshop on Inclusive Pedagogy
09:00 - 09:15	Welcome and Coffee
09:15 - 09:45	Assessment: Mapping Learning Outcomes to Assessment Instruments (Shireen Campbell)
09:45 - 10:15	Discussion of Mapping Learning Outcomes
10:15 - 10:30	Break
10:30 - 12:00	Discussion: Stereotype Threat, Culturally Relevant Pedagogy, Anti-Colorblindness

12:15 - 13:30	Lunch Break
13:30 - 14:30	Discussion of Less-Time Intensive Interventions: Pre-Test Exercises/Growth-Mindset Interventions/Etc.
14:30 - 14:45	Break
14:45 - 17:00	Reading/Researching on your own in Zotero Database and Elsewhere

May 19, 2016**Thursday**

All day event	May Workshop on Inclusive Pedagogy
09:00 - 09:15	Welcome and Coffee
09:15 - 10:15	Discussion of Time-Intensive Interventions: Active Learning/Flipped Classroom/Incorporating Culturally Relevant Material
10:15 - 10:30	Break
10:30 - 12:15	Reading and Research on Your Own
12:15 - 13:30	Lunch Break
13:30 - 15:30	Microaggressions (Tae-Sun Kim) -- Chambers 1046
15:30 - 15:45	Break
15:45 - 17:00	Reading/Collaboration within Departments: What Interventions Seem Most Compelling to Us, Collectively or Individually?

May 20, 2016**Friday**

All day event	May Workshop on Inclusive Pedagogy
09:00 - 09:15	Welcome and Coffee
09:15 - 10:45	Reading and Consultation with Department
10:45 - 11:00	Break
11:00 - 12:15	Last Thoughts before formulating your first action plans
12:15 - 13:30	Lunch Break
13:30 - 14:00	Linda LeFauve to answer questions about assessment -- Chambers 1046
14:00 - 15:15	Departments come up with Action Plans for Changing Gateway
15:15 - 15:30	Break
15:30 - 17:00	Departments Present Action Plans

Appendix E:

Full List of Gateway Learning Outcomes and Their Categorization

GATEWAY COURSES: STUDENT LEARNING OUTCOMES**BIOLOGY****Biology 111***(Hales)*

Category	Subcategory	Learning Outcome
Recognition	Foundation	Explain fundamental principles of cell signaling, inheritance, and metabolism at the molecular level
Extrapolation		Design and execute experiments with appropriate controls, and analyze and depict data with basic statistical methods Deliver oral presentations with effective use of visual aids
Application	Demonstration	Apply knowledge of fundamental concepts to current molecular biology stories in the news
Application	Demonstration	Dissect and explain published research articles from journals

Biology 111*(Wessner)*

Category	Subcategory	Learning Outcome
Recognition	Technique	Use a spectrophotometer
Recognition	Technique	Use a light microscope
Application	Demonstration	Analyze and graph raw data
Application	Demonstration	Interpret graphs and tables from primary scientific journal articles
Recognition	Foundation	Describe the basic principles of cell signaling
Recognition	Technique	Describe the processes of DNA replication, transcription, and translation
Recognition	Foundation	Describe the basic principles of bioenergetics
Extrapolation		Discuss the bioethical issues associated with biomedical research
Discipline-adjacent		Explain to an educated lay audience the scientific underpinnings of a popular press science article

Biology 111*(Bernd)*

Category	Subcategory	Learning Outcome
Recognition	Foundation	Explain concepts fundamental to cellular communication, genetics & bioenergetics
Extrapolation		Apply molecular concepts to novel scenarios
Extrapolation		Develop hypotheses and design controlled experiments to test the hypotheses
Application	Demonstration	Analyze data with basic descriptive statistical methods (using Excel)
Application	Demonstration	Perform common laboratory techniques (pipetting, spectrophotometry, microscopy)
Discipline-adjacent		Work in small groups

Application	Demonstration	Interpret scientific figures and other forms of data
Discipline-adjacent		Write a scientific article and speaking using scientific vocabulary

Biology 112*(Barsoum)*

Category	Subcategory	Learning Outcome
Application	Amplification	Appreciate and summarize the prevailing evidence for evolution and explain how new findings provide further evidence
Recognition	Foundation	Comprehend the various mechanisms of both micro- and macroevolution, when and how they operate, how to detect and measure their operation, and how they connect to each other
Application	Amplification	Reconstruct phylogenies using character matrices and apply phylogenetic principles to understand animal diversity and systematics
Application	Amplification	Explain animal behavior from an evolutionary and ecological standpoint, detailing the interdependence of behavior, population structure, and community structure
Application	Amplification	Analyze the roles of biotic and abiotic factors in population structure and dynamics, supported by the mathematics of exponential and logistic growth
Extrapolation		Connect thermodynamics, population dynamics, and biodiversity to community structure and dynamics
Recognition	Technique	Trace the flow of energy and matter through the biosphere
Recognition	Technique	Specify the role of abiotic factors in multiple levels of ecology
Extrapolation		Synthesize the molecular biology of cells with animal form and function in order to understand the anatomy and physiology of multiple organ systems and
Application	Demonstration	Develop analytical, experimental, critical thinking, computing, writing, and presentation skills through repeated practice of the scientific method and reading of scientific literature

Biology 112*(Stanback)*

Category	Subcategory	Learning Outcome
Application	Amplification	Summarize the prevailing evidence for evolution and explain how new findings provide further evidence
Recognition	Foundation	Comprehend the various mechanisms of both micro- and macroevolution, when and how they operate, how to detect and measure their operation, and how they connect to each other
Application	Amplification	Explain animal behavior from an evolutionary and ecological standpoint, detailing the interdependence of behavior, population structure, and community structure

Application	Amplification	Analyze the roles of biotic and abiotic factors in population structure and dynamics, supported by the mathematics of exponential and logistic growth
Recognition	Technique	Trace the flow of energy and matter through the biosphere
Recognition	Technique	Specify the role of abiotic factors in multiple levels of ecology
Extrapolation		Synthesize animal form and function in order to understand the anatomy and physiology of multiple organ systems and
Application	Demonstration	Demonstrate analytical, experimental, critical thinking, computing, writing, and presentation skills through repeated practice of the scientific method and reading of scientific literature

Biology 112*(Peroni)*

Category	Subcategory	Learning Outcome
Recognition	Foundation	Explain basic concepts and principles in the covered sub-disciplines of biology
Recognition	Foundation	Understand and correctly use biological vocabulary related to these subjects
Application	Amplification	Generate plausible hypotheses for observations or data relevant to the course's topics
Application	Demonstration	Interpret data presented in tables or graphs and make defensible conclusions
Application	Demonstration	Design simple, well-controlled and replicated experiments
Discipline-adjacent	Present the results	of their investigations in lab reports (manuscript format), posters, and oral presentations
Discipline-adjacent		Use Excel to manage data and calculate basic descriptive statistics
Application	Demonstration	Conduct and correctly interpret the results of basic statistical tests (e.g., t tests, Chi-square tests)
Application	Demonstration	Interpret simple articles from the primary literature
Extrapolation		Evaluate the reliability of sources that make claims relevant to the material covered in the course

Biology 113*(Campbell)*

Category	Subcategory	Learning Outcome
Recognition	Foundation	Develop a foundational understanding of the key concepts in biology: information, evolution, cells, emergent properties, and homeostasis
Application	Amplification	Assemble overarching themes of biology (egg structure/function, surface area to volume, signal amplification, noise, etc.) that span more than one key concept and all size scales

Extrapolation		Apply the process of science to answer questions about nature
Application	Amplification	Employ and understand quantitative analysis and mathematic reasoning with experimental data
Application	Amplification	Use mathematical modeling and simulations to enhance understanding of biology
Extrapolation		Integrate different science and math disciplines to provide a more holistic understanding of biology
Discipline-adjacent		Communicate with a wide audience and collaborate with science and math colleagues
Extrapolation		Connect biology with everyday world and society
Recognition	Foundation	Recognize that biology is not divided into two sizes as represented by common course divisions
Extrapolation		Evaluate public policy in light of scientific evidence
Extrapolation		Distinguish biology as a science based on experimental questions and data analysis rather than a discipline of vocabulary words

Biology 113*(Bejjani)*

Category	Subcategory	Learning Outcome
Extrapolation		Distinguish biology as a science based on experimental questions and data analysis rather than a discipline of vocabulary words
Recognition	Foundation	Develop a foundational understanding of the key concepts in biology: Information, evolution, cells, emergent properties, and homeostasis
Application	Amplification	Assemble overarching themes of biology (e.g. structure/function, surface area to volume, signal amplification, noise, etc.) that span more than one key concept and all size scales
Extrapolation		Apply the process of science to answer questions about nature
Application	Amplification	Employ and understand quantitative analysis and mathematic reasoning with experimental data
Application	Amplification	Use mathematical modeling and simulations to enhance understanding of biology
Extrapolation		Integrate different science and math disciplines to provide a more holistic understanding of biology
Discipline-adjacent		Communicate with a wide audience and collaborate with science and math colleagues
Extrapolation		Connect biology with everyday world and society
Extrapolation		Evaluate public policy in light of scientific evidence
Application	Amplification	Employ a scientific approach to answering biological questions and test hypotheses
Application	Amplification	Analyze experimental data and reach logical conclusions

Application	Demonstration	Describe the big ideas of Evolution, Information and Cells through experimentation
Discipline-adjacent		Organize an oral presentation for sharing scientific information with peers
Application	Amplification	Prepare a written summary of experiments designed, performed and analyzed personally
Extrapolation		Design experiments to construct and test a new promoter
Application	Demonstration	Explain how antibiotic resistant bacteria appear in a matter of days
Recognition	Technique	Review the information contained within promoters
Extrapolation		Construct a reasonable explanation of why mammals evolved bitter taste receptors
Application	Demonstration	Pipet correctly
Recognition	Technique	Use data from plate reader (absorbance and fluorescence)
Recognition	Technique	Work with bacterial cells
Application	Demonstration	Make dilutions of stocks
Discipline-adjacent		Use Excel, PPT/Keynote
Discipline-adjacent		Give oral presentation of your research
Discipline-adjacent		Edit a wiki page
Recognition	Technique	Assemble DNA oligos, ligate and transform bacteria
Application	Demonstration	Perform PCR and gel electrophoresis
Application	Demonstration	Interpret DNA sequence data
Extrapolation		Appreciate the scientific process as a means to learning
Discipline-adjacent		Enjoy doing science that is novel
Discipline-adjacent		Like the connection between lab and lecture
Discipline-adjacent		Judge the impact of a minimal lab manual vs. a very detailed lab manual

Biology 114*(Smith)*

Category	Subcategory	Learning Outcome
Recognition	Foundation	Describe the importance of the “big ideas” and recurring themes of biology (biological information, evolution, cells, homeostasis, and emergent properties) and critically analyze the scientific support for these ideas
Application	Amplification	Evaluate biological data to address predictions and hypothesis and answer scientific questions
Extrapolation		Synthesize the results of scientific studies to inform your views on ethical, legal, and social issues
Extrapolation		Design scientific studies to address questions about the nature of biological processes
Application	Demonstration	Apply skills of scientific exploration including critical thought, data collection and analysis, quantitative analysis, and communication of complex information

Biology 114*(Paradise)*

Category	Subcategory	Learning Outcome
Application	Demonstration	Demonstrate knowledge of the important biological principles and factors that operate at the levels of the individual organism, the population, the community, and the ecosystem (and describe these levels)
Recognition	Foundation	Describe fundamental concepts and big ideas in organismal biology, diversity, evolution, ecology, & physiology
Application	Amplification	Evaluate how evolutionary processes inform the study of biology and operate in biological systems
Recognition	Foundation	Describe organisms' interactions with their environment and other organisms
Application	Amplification	Explain how biological systems change in both space and time and compare/contrast changes that occur in different biological systems under different conditions
Application	Amplification	Evaluate, interpret, apply, and integrate data from the primary literature on individuals, populations, communities and ecological systems
Discipline-adjacent	Demonstration	Demonstrate an ability to ask questions in organismal biology, develop investigations to answer those questions, and present those results to others
Application	Demonstration	Develop and apply core competencies of quantitative reasoning, experimental design, critical thinking, data analysis and communication that transcend course content

CHEMISTRY**Chemistry 115***(Beeston, Blauch)*

Category	Subcategory	Learning Outcome
Recognition	Foundation	Identify early and recent developments in the acquisition of knowledge about the nature of matter
Application	Demonstration	Predict and explain the properties of atoms and molecules based upon models of atomic and molecular structure and bonding
Application	Demonstration	Predict and explain the chemical and physical properties of pure substances (gases, liquids, solids) based on fundamental laws and theories
Application	Demonstration	Identify common reaction types and make qualitative and quantitative predictions about reactions based on the application of stoichiometric, thermodynamic, kinetic, and equilibrium concepts

Application	Amplification	Employ logical thinking and problem-solving skills, including reading and interpreting questions connecting problems to core concepts strategizing and solving problems and critically examining answers
Recognition	Technique	Demonstrate the skills necessary for scientific research and discovery, including safe handling of chemicals and equipment planning and carrying out experimental procedures making qualitative and quantitative observations and measurements graphically representing and interpreting data drawing conclusions and recognizing the limitations of experimental methods

Chemistry 115*(Myers)*

Category	Subcategory	Learning Outcome
Recognition	Technique	Represent chemical reactions symbolically
Recognition	Foundation	Describe the basic structure of ground state atoms
Recognition	Foundation	Describe the fundamental modes of chemical bonding
Recognition	Foundation	Identify key types of chemical reactions
Recognition	Foundation	Describe the atomic level structure of gasses, liquids, solids and solutions
Application	Demonstration	Apply the concepts of the mole and stoichiometry to chemical problems
Application	Demonstration	Apply basic knowledge of thermodynamics and kinetics to chemical problems
Application	Demonstration	Apply the concept of equilibrium to chemical problems

ECONOMICS**Economics 101***(Kumar, Nungsari, Ross, Finkle, Fitz)*

Category	Subcategory	Learning Outcome
Application	Demonstration	Apply the “economic way of thinking” in decision making and in evaluating trade-offs
Application	Demonstration	Construct and manipulate basic economic models
Application	Amplification	Interpret critical microeconomic and macroeconomic concepts – demand and supply in the competitive output market and aggregate demand and aggregate supply in the macro economy, and to apply basic economic policy tools in these contexts
Application	Amplification	Distinguish between positive and normative economic concepts and arguments
Application	Amplification	Explain the connections between the domestic and international economies, with particular application to international trade and international finance or exchange rates

MATHEMATICS**Mathematics 113***(Davis, Keough)*

Category	Subcategory	Learning Outcome
Application	Demonstration	Identify and employ appropriate techniques to evaluate indefinite and definite integrals
Application	Demonstration	Use the foundation of Riemann sums to develop definite integral expressions corresponding to areas of regions in the plane, lengths of curves, volumes of regions in 3-space, or the work performed by a variable force
Application	Demonstration	Develop appropriate bounds on the error of a numeric approximation to the value of a definite integral or the sum of a series
Application	Demonstration	Identify and employ an appropriate series test to determine convergence or divergence of a series
Application	Amplification	Determine a Maclaurin or Taylor series for a function, and connect aspects of a Taylor series to properties of a function it represents
Application	Amplification	Apply vector operations to resolve questions about lines and planes in 3-space

Mathematics 113*(Thompson)*

Category	Subcategory	Learning Outcome
Application	Demonstration	Identify and employ an appropriate integration technique to find antiderivatives and compute definite integrals
Application	Demonstration	Apply knowledge of integration to find areas, lengths, and volumes
Application	Demonstration	Identify and employ an appropriate series test to determine if a series converges or diverges, and, if it converges, find its value
Application	Amplification	Use knowledge of series to compute Taylor and Maclaurin Series
Application	Amplification	Apply major theorems to solve concrete problems
Application	Demonstration	Perform operations on vectors and apply knowledge of three-dimensional space and vectors in Calculus 3 and Linear Algebra

PSYCHOLOGY**Psychology 101***(Boyd)*

Category	Subcategory	Learning Outcome
Recognition	Foundation	Explain the current psychological perspectives
Recognition	Foundation	Describe the methods used in psychological research, the advantages and disadvantages of each methodology, and the ethical issues involved in psychological research

Recognition	Foundation	Identify the major structures of the brain and their functions
Recognition	Foundation	Demonstrate knowledge and understanding of theory and research in the areas of learning, memory, cognition, motivation and emotion, development, psychopathology and psychotherapy

Psychology 101*(Smith)*

Category	Subcategory	Learning Outcome
Recognition	Foundation	Recognize and explain the contributions psychology has made to the understanding of behavior
Recognition	Technique	Identify and evaluate the methods and techniques psychologists use to study behavior
Recognition	Technique	Describe and critique the current research trends in psychology
Discipline-adjacent		Use and apply psychological principles to better your life and the lives of others
Discipline-adjacent		Prepare you for further study and investigation in psychology related disciplines

Psychology 101*(Kello)*

Category	Subcategory	Learning Outcome
Application	Demonstration	Evaluate psychological “data” as presented in the popular media as well as in professional books and journals
Recognition	Foundation	Understand the development and current structure of psychology as a distinctive behavioral science
Recognition	Technique	Understand the research techniques that are used to study behavior and mental life
Recognition	Foundation	Understand the primary conceptual frameworks that have inspired research and practice in the field
Recognition	Foundation	Know the primary areas of research and practice in the field, the major theoretical and practical issues in each, and the current status of research and practice in each

Psychology 101*(Leyva)*

Category	Subcategory	Learning Outcome
Application	Amplification	Recognize the contributions that psychology has made to the study of behavior in exams, learning curve activities and in-class assignments
Recognition	Technique	Identify the methods and techniques used by psychology to study behavior in exams, learning curve activities and in-class assignments
Extrapolation		Apply the methods and principles of psychology to real life situations including a film (inside out), an experiment and/or a research talk

PHYSICS**Physics 120/130***(Belloni, Cain)*

Category	Subcategory	Learning Outcome
Recognition	Foundation	Obtain a basic understanding of the fundamental concepts in physics
Extrapolation		Develop critical thinking and analytical problem-solving skills
Application	Amplification	Learn to apply these concepts qualitatively as well as quantitatively
Extrapolation		Gain an appreciation of how large a role physics plays in your daily life
Recognition	Technique	Develop analytical, graphical, and reasoning skills
Application	Demonstration	Gain experiences with experimental processes, including some experience designing investigations
Recognition	Technique	Develop an array of basic skills and tools of experimental physics and data analysis
Recognition	Foundation	Demonstrate knowledge of fundamental principles of physics
Application	Demonstration	Solve qualitatively problems or situations involving the fundamental principles of physics
Application	Demonstration	Solve a physical problem by determining the relevant concepts, parameters, and mathematics
Application	Amplification	Set up experiments to measure physical quantities, record data, analyze results, and fit the data with appropriate mathematical formulas
Discipline-adjacent		Demonstrate effective oral and written communication skills in the discussion and interpretation of data
Discipline-adjacent		Develop collaborative skills by working in groups on laboratory experiments