

Assessing Classmate Peer Effects on Student Learning

Qualitative Evidence for Gateway Courses at Three
Liberal-Arts Colleges

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October 2008

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1. Peer-Effects Project Overview

The Peer-Effects Project was proposed to the Teagle Foundation in March 2006 by a research team of faculty and staff members from Reed College, Lewis & Clark College, and Whitman College. Upon notification of grant funding in May 2006, we initiated a three-year project to examine whether and how a student's classmate peers affect his or her learning in first-year core courses. Our project team comprised three faculty and staff members from each school: a member of the economics faculty, a member (and recent chair) of the core-course faculty, and the director of institutional research.

The project uses both qualitative and quantitative research methods. Qualitative research was conducted at all three campuses through interviews with instructors in core courses required of first-year students. Quantitative analysis was performed largely at Reed College, with participation of faculty and student research assistants from all three schools. The economists led the quantitative research effort while the core-course faculty members took the lead on the qualitative analysis. The institutional research staff members supported both parts of the project, assisting with research methodology and by providing access to quantitative data.

This report summarizes the qualitative study; the quantitative analysis is described in a parallel document. In the sections below, we examine the details of our interview methodology, the conclusions that we drew from the interviews, and the further insights that emerged from the peer-effects conference held in May 2008.

Project goals

The question of whether or to what extent a student's success in higher education is dependent on his or her fellow-students is of great significance to the modern university or college. For students, it obviously has a profound effect on an applicant's decision about which college to attend, while for universities, if certain students are likely to be better peers, it may be a significant determinant (and justification) of merit aid as suggested by Rothschild and White (1995).

While few doubt the importance of peer effects, there is little statistical or other evidence about how classmates affect college students' success. There are many studies of classroom peer effects in primary and secondary schools, but few in higher education.¹ Our project seeks to add to knowledge about college classroom peer effects by learning more about the answers to questions like the following:

- Do students with certain kinds of classmates end up as more successful students themselves? That is, does the quality of the class as a whole affect students learning and/or increase a student's subsequent academic success?
- Is there a certain kind of student that makes the best classmate?
- Or does successful peer interaction depend instead on the overall makeup of the class?
- Do students learn better when their classmates have abilities comparable to their own or when there is a diverse mix of abilities?
- Do classmates of high ability have a positive influence on their peers' learning? If so, is this effect stronger for other high-ability students or for lower-ability classmates?
- Conversely, do students of low ability have a negative influence on their peers?
- Does the male-female mix of the class systematically affect learning of male and female students?
- Are there consistent effects associated with having classmates from ethnic minorities or who are non-traditional students in one way or another?

Learning is a highly individual activity. We hold no illusions that there is a magic formula for combining students into class sections to produce effective learning. Moreover, we do not intend the focus on peer effects to obscure the crucial importance of the instructor, the curriculum, and other factors that have long-established

¹ A bibliography of educational peer-effects literature can be found on the project Web site at http://web.reed.edu/teagle_grant/Bibliography.html

effects on student learning. Rather, we are examining what importance peers have when we have controlled for some of these obviously major factors.

This study tends toward a big-picture approach to peer effects. We place less emphasis on unpacking the details of how individual events affect individual peers' learning of specific subjects. Rather, we focus broadly on classmate actions, attitudes, and aptitudes that over the course of a full semester or year tend to be associated with high levels of student achievement. Detailed, day-by-day studies of individual classes would produce additional useful information, but could only be conducted on a small number of classes. While sacrificing detail, our approach allows us to extract data from a large number of classes, thus reducing small-sample biases.

Project methodology

Multi-method approach

This study of classroom peer effects involves two related methods of analysis: a qualitative study consisting of conversations with experienced core-course instructors and a quantitative study of the statistical relationship between measurable characteristics of classmates and measurable student outcomes. We view these two components as strong complements.

The quantitative analysis allows us to look for formal, statistical evidence of classmate peer effects. However, the data that can be collected limit the student characteristics and outcomes that can be examined statistically.

The qualitative study, though it does not allow the same degree of formality, enables us to move beyond the limitations of the data. The qualitative examination allows us to peek inside the peer-effects box to explore a range of peer-interaction phenomena, albeit through the lenses of particular professors.² Thus, one aim of the qualitative study is to provide a richer context through which to interpret the statis-

² The quantitative study builds on Hoel, Parker, and Rivenburg (2006), which finds evidence of peer effects in the core course at Reed College, but does not explore the mechanisms through which they arise.

tical results. Another is to identify promising aspects of peer effects that might be approached statistically through collection of additional quantitative data.

Focus on first-year core courses

We examine the effects of classmates in required, first-year, core classes at Lewis & Clark, Reed, and Whitman Colleges. Several reasons motivate the choice of core classes:

- These courses are required of all entering first-year students, so we need not worry about students with particular characteristics choosing to take (or not to take) the courses. We can therefore claim to be studying the entire (non-transfer) student populations of the three schools rather than an idiosyncratic subset.
- Student self-selection of classmates, whether explicit or implicit, may introduce bias into quantitative and qualitative assessment of peer effects. When students and their peers are similar in dimensions such as interests, motivation, and ability that cannot be perfectly measured (and thus for which we can't perfectly control), it is impossible to distinguish statistically between the effects of a student's own characteristics and the effects of the peers. Because of this problem, most statistical analyses of peer effects in higher education have looked at roommate rather than classmate peers. In the core courses that we study, students are assigned into sections of roughly homogeneous size by a process that is largely or wholly random. This allows us to avoid one of the most difficult problems in examining peer effects.
- Core classes involve teaching students the *process of learning* in a central way alongside the teaching of course content; students learn the reading, writing, and discussion skills it takes to be a college student as well as learning the core material. This claims for these courses a central position in the curriculum, which in turn suggests such core courses have an outsized influence on a student's academic career.
- Classmate peer influence seems likely to be a significant factor in class discussions, which are the norm in these core courses. While there are certainly other

contexts in which such students learn (study groups, dorm discussions, etc), class discussion figures more prominently in such classes than in homework- and/or lecture-oriented classes. Classmate interaction should thus be more observable in these classes, both qualitatively (by the professor) and quantitatively (because the data can be gathered specifically on the class).

Looking at core courses naturally leads us to emphasize the kind of peer effects that arise in classroom discussions. This is not to deny that there are other forms of significant peer interaction, and we did gather some incidental evidence about non-core courses from some of our interview subjects. However, extending the analysis beyond the core-course environment lies beyond the scope of the present study.

Instructor interviews and peer-effects conference

We gathered information for the qualitative study through interviews with core-course instructors at all three schools. Our aim was to conduct ten interviews at each campus. We succeeded in conducting ten personal interviews at Reed and Whitman, plus one additional instructor at Whitman who was unable to keep the interview appointment but answered questions in writing. At Lewis & Clark, we were able to complete only eight of the ten scheduled interviews due to illness and scheduling conflicts. Thus, we have in-depth responses from 29 core-course instructors at the three schools, in addition to the insights of the three team members who have regularly taught and chaired these courses.

After performing and analyzing the interviews, we invited the interview participants and faculty representatives from other colleges and universities with common-syllabus core courses to discuss our tentative findings at a conference, held at Reed College in May 2008. The conference featured enthusiastic discussions among about forty participants, leading us to refine our understanding of peer effects.

Context: Colleges and courses

The study looks at three selective liberal-arts colleges located in the Pacific Northwest: Lewis & Clark College and Reed College, both in Portland, Oregon, and Whit-

man College in Walla Walla, Washington. Although there are important differences among the schools, all three are small, selective, and strongly residential, all three offer curricula dominated by traditional liberal-arts disciplines, and most importantly for our purposes all three require first-year students to take a discussion-based core course with a common syllabus. Also crucial for our analysis was access to adequate historical records of individual student characteristics and achievement, which was facilitated by the institutional research staff at all three colleges.

The core courses we study vary in topical content and to some degree in format (although all emphasize student discussion), but they share common goals. Central aims of each school's core course include:

- Teaching students to read carefully and think critically,
- Teaching students to write clearly, and
- Teaching students to learn from and contribute to an intellectual conversation.

In each case, the syllabus for the course was either identical across sections or had extensive shared content. In some cases, exams or paper topics were common across sections. Table 1 summarizes some characteristics of the three core courses, which are described in more detail below.

Lewis & Clark College: Inventing America

Lewis & Clark required first-year students to take a year-long core course entitled "Inventing America" (IA) from 1994 through 2005. (In 2005, it was replaced by a new core course "Exploration and Discovery" with different content but similar goals and format.) The first semester of IA was taught from a common syllabus; in the second semester instructors were allowed to vary their content considerably and students could sign up for sections reflecting their individual interests. We considered only the fall semester of IA to be the core course for this project.

The content of IA's fall-semester typically consisted of three main sections. The first consisted of readings in political philosophy including Plato, Sophocles, Hobbes, Locke, and Rousseau. The second related directly to the founding of the United

States, including readings from the Declaration of Independence and the Federalist Papers. The final section examined (largely recent) literature related to those left out of the founding, including women, Native Americans, and slaves.

IA consisted of three hours of discussion per week with no required plenary lectures. Most sections were taught at a common afternoon time. However, several sections were taught at a morning time each year to accommodate in-season athletes with afternoon practices and students whose long afternoon labs conflicted unavoidably with the usual time.

Prior to 1997, assignment to sections was random with sections being balanced for gender, number of athletes, and number of international students. Beginning in 1997, students listed four preferred sections based on their preference for an instructor. Since these were first-year students, the preference was usually based on the instructor's department and/or on word-of-mouth recommendations received during orientation. About 90 percent of the students were placed in one of their four requested sections.

Reed College: Classical Humanities

Reed's Classical Humanities (Hum 110) course has been taught in largely its present form for more than half a century. It is a full-year course with a single grade for the entire year and is required of all first-year students, though an occasional student postpones it until the second year due to time conflicts between the required lectures and another class. Hum 110 serves as an introduction to the Reed "conference method" of learning through discussion-oriented seminars.

The Hum 110 syllabus is largely confined to Ancient Greece and Rome. It focuses on Greek literature, history, art, philosophy, and religion in the fall semester and on the culture of the Roman Empire (broadly construed) in the spring.

Table 1. Core courses

	Lewis & Clark	Reed	Whitman
Title of course	Inventing America	Classical Humanities	Antiquity and Modernity
Duration and syllabus	Two semester courses: Fall is common syllabus; students choose different topic-based sections in spring	Year-long course; few students change sections	Year-long course; very few students change sections
Student credit	4 semester hours each semester	6 semester hours (1.5 Reed units) for each semester	4 semester hours each semester
Contact hours per week	3 hours of discussion; occasional optional lectures	3 hours of discussion; 3 hours of required lecture	3 hours of discussion; occasional optional lectures
Content	Fall: Classical to modern, emphasizing political philosophy relating to founding of U. S. and to groups left out of founding process	Classical philosophy, history, and literature; Greece in fall and Rome in spring	Philosophy, history, and literature, focusing on classical in the fall and early modern/modern in the spring
Section size	Discussion sections of 18–19 (slightly larger in early years).	Discussion sections of 14–17.	Discussion sections of 16–18.
Scheduling of sections	Most at common afternoon time. A few at morning time for in-season athletes and students with afternoon labs.	Sections are offered at many times and days.	All sections meet at common morning time.
Section choice	Students rank-order four preferred sections/instructors.	Students register for section/time without knowing instructor.	Students are randomly assigned to sections by registrar.
Criteria for evaluation	Writing, class participation, and exams.	Writing, class participation, and exams. Single grade for full year.	Writing, oral reports, discussion participation, exams. Semesters graded separately.

Students in all conference sections attend three hour-long plenary lectures per week and study a common syllabus. Conference sections are spread across all class-time blocks, so a few students each year have to change sections from fall to spring when the time of their fall section conflicts with a spring class.

Fall conference sections are listed in the class schedule without instructors, so students sign up for conference sections in time slots to match their schedules without knowing the instructor. There is, however, a possible relationship between a student's choice of Hum 110 section and his or her other classes. For example, a student planning to major in biology will likely be taking introductory courses in biology and che-

mistry, which between them occupy three particular class blocks during the week (with no choice of alternative times. Thus, biology majors are likely to enroll in a more limited subset of Hum 110 sections. Sections are adjusted to balance the number of male and female students by the registrar's office.

Whitman College: Antiquity and Modernity

General Studies 145 and 146 ("Core") at Whitman College is a sequence of two one-semester courses that is required of all first-year students. Although there are no required lectures, all sections share a common syllabus according to a common schedule. A few sections are offered with reversed semester sequence (beginning in the spring and ending in the fall). These are populated by students starting their college careers in the spring and those who fail the first semester of Core in the fall.

The first semester of Core emphasizes antiquity (classical works from Greece and the Roman Empire); the second semester samples modernity (works from the Renaissance to the present).

All sections meet at the same time and no course open to first-year students conflicts with Core. Students are randomly assigned to sections by the registrar, balancing males and females across sections. With very few exceptions students remain in the same section with the same instructor for both semesters, although separate grades are given in the fall and spring. (Students requesting a change of sections are re-assigned randomly to another section with an opening, which eliminates "section shopping" and discourages changes.)

2. Interviews with Instructors: Goals and Design

The first phase of our qualitative research was to design and conduct a series of interviews with core-course instructors at the three schools. Instructors are a key locus for knowledge about peer effects for several reasons. First, they are present in the class every day and observe the classroom interactions among students. Second, in their role as evaluators of student progress, they pay close attention to the growth of students' reading, writing, and discussion skills during the class. Finally, instructors who have taught the core course frequently have observed multiple cohorts of student

peers, allowing them to compare classes that seemed more effective against those that were less successful.

We recognize that there are important limitations of using instructors as observers of peer effects. Instructors do not always know exactly how students influence one another's learning, particularly when considering this issue retrospectively rather than actively during the actual teaching process. Moreover, instructors often do not know about interactions between classmates that occur outside of the classroom. Finally, the instructors' measures of success may be only imperfectly correlated with peer influences on student learning. For example, a student may learn to view the world in a different way through the comments of a peer, but this experience may not improve the writing and critical reading skills on which the instructor evaluates the student.

Moreover, one of the interviewees pointed out that instructors' and students' perceptions of which peers were beneficial may differ. For example, instructors tend to think of students who talk a lot in class as good peers, whereas other students may resent those students, or they may come to rely on them too much to carry the load in discussion.

Goals of the Instructor Interviews

We wanted instructors to reflect on their experiences in the core-course classroom, telling us about individual students who influenced their peers positively or negatively and about class sections that had been successful and unsuccessful. Most of the instructors we interviewed had taught the core class numerous times, allowing them to reflect across the years about noteworthy classes and individuals.

Every instructor's experience is unique in many ways:

- Each instructor has taught a different set of classmate cohorts.
- The peer interaction in each instructor's classroom is influenced by his or her own personality and teaching style.
- Each instructor may perceive peer interactions among the students in a different way.

- Each instructor has a unique view of how student learning should be evaluated and what, if any, aspects of peer interaction should be included in evaluation.

We sought a sufficiently broad and diverse pool of interviewees to allow us to begin to distinguish common themes—i.e., a pool that would be large and diverse enough to span a wide range of variation in instructor characteristics.

While there were specific questions that we believed to be important as we entered the interview process, we also wanted to allow the interviewees to lead us toward important peer interactions lying outside of our preconceived boundaries. We knew some of the questions to which we wanted to learn the answers, but also wanted to invite our interviewees to introduce new aspects of peer effects that we had not considered.

Selecting the Interviewees

Each school offers 20+ sections of the core course each year with considerable overlap of instructors from year to year (and often decade to decade). The pool of prospective interviewees included all current faculty who had taught the course at least three times. Within that pool, ten interviews at each school seemed both feasible and sufficient to provide a broad and diverse set of experiences and instructor perceptions.

In selecting the interview subjects from the pool, we sought breadth at each school in age, sex, and home department. Although most of our interviewees had taught the course many times, we also wanted a few younger faculty members who were relatively new to the course to see if their “freshness” led to any useful insights. While most interviewed faculty members were tenured, a few were untenured assistant professors and some were non-tenure-track instructors who have specialized for many years in teaching the core course. To achieve field breadth, we interviewed instructors from a wide variety of academic departments. Table 2 shows the names and titles of the faculty members who were interviewed for the project.

Table 2. Names and departmental affiliations of interviewees

Lewis & Clark College
Clifford Bekar, Economics
Kimberly Brodtkin, Core Curriculum
Chana Cox, Core Curriculum
Jane Hunter, History
Curtis Johnson, Government
Susan Kirschner, Core Curriculum
Stepan Simek, Theater
Stephen Weeks, Theater
Reed College
Michael Breen, History
Jay Dickson, English
William Diebold, Art History
Ralph Drayton, History
Walter Englert, Classics
Nathalia King, English
Laura Leibman, English
Jan Mieszkowski, German
Pancho Savery, English
Ellen Stauder, English
Whitman College
Paul Apostolidis, Politics
Sally Bormann, General Studies
Dana Burgess, Classics
David Carey, Philosophy
Mitchell Clearfield, Philosophy
Roberta Davidson, English
Rogers Miles, Religion and General Studies
Margo Scribner, English and General Studies
V. Elyse Semerdjian, History
Robert Withycombe, Rhetoric and Film Studies
Zahi Zalloua, Foreign Languages and Literature

Design of Interview Format and Questions

Interview team

In choosing the size and composition of the interview team, we considered several important criteria. First, it seemed essential to have at least one person from the interviewee's own college present to provide a local context for the questions and a familiar

face to the project. Second, we wanted to have at least one person take part in *all* of the interviews to assure that a similar interview protocol was followed for all sessions and so that responses across individuals and across colleges could easily be compared. Finally, we wanted the interview team to be small enough to allow the interviews to take place in faculty offices.

These criteria seemed best served by an interview team of two, consisting of the principal investigator (for consistency and comparison) and the project team member from the local core-course faculty (for local expertise and familiarity).

Pilot and final interviews

To allow a mid-course refinement of the procedure and questions, we conducted the interviews in two batches. Three faculty members at each school were interviewed during March and early April 2007 in a set of “pilot” interviews.

Our goal was to complete ten interviews at each college. We had a pool of ten or eleven candidates at each school. The interview procedure used in the pilot interviews worked well and only slight changes to the questions were deemed desirable. We then proceeded with the remaining final batch of interviews in May 2007.

Advance questions

We wanted the interview subjects to have the opportunity to reflect in advance of the interview on their experience with peer interactions and to consult any records that might aid their recollection. To facilitate their preparation, we sent a set of advance questions to each interviewee; the questions are shown below:

- What do you think are the most important collective characteristics of the students in a class section that help students learn from each other?
- Can you think of particular class sections that worked well to promote the understanding of class members? What were their characteristics? Were these class sections equally effective for all members of the class or did the effectiveness vary across student characteristics (strong/weak, male/female)?
- Can you think of 2 to 3 students over your teaching career who seemed to promote the understanding of other students? What were their characteristics?
- Were any of these students effective in promoting a positive class atmosphere but were not themselves outstanding scholars?

- What specific student behaviors have most enhanced the learning of peers? What behaviors have detracted the most from peer learning?
- If you had to name a single “model” student from the class, whom would you name? Why?

Interview format and questions

Interviews were conducted either in the interviewee’s office (at Reed and Lewis & Clark) or in the core-course team member’s office (at Whitman). We began the interview by telling the subject that we would ask permission before quoting their remarks and asking for permission to record the interview, which was granted by all.

We then described our interests with the following text: “We are interested in how the characteristics of a student’s peers affect success in learning. We wish to define success *relative to each student’s own ability or potential*, so successful peer interaction allows a student to learn more than they might be expected to otherwise. We are particularly interested in how peers’ personalities or abilities work to promote or hinder learning success relative to their own potential. These effects could be the result of individual actions on the part of a peer or could occur through larger group or full-class interactions.” We concluded the introductory phase of the interview by asking the instructor to avoid identifying individual students by name, using pseudonyms or other mechanisms to preserve anonymity.

The body of the interview consisted of a conversation prompted by our prepared questions. Most questions were posed by the local core-course team member with the principal investigator recording detailed notes and following up or filling in with occasional questions.

The questions that guided our interviews are shown below with a rough topical organization:

- *Introductory Questions*
 - *What criteria do you think are most important in assessing student learning in the core course? In other words, what outcomes will a successful student have achieved through the course? Are these success criteria reflected in students’ course grades?*
 - *Do you think that the quality of his or her peers affects a student’s learning?*

- *Successful and Unsuccessful Class Sections*
 - *What collective characteristics of the students in a class section do you think are the most important in helping students learn from each other?*
 - *Can you think of particular class sections that worked well to promote the learning of class members? How would you characterize the mix of students in these classes? Why were they effective?*
 - *Were there particular class sections that worked particularly poorly in promoting learning? How would you characterize their mix of students? Why were they ineffective?*
 - *Were these class sections equally effective or ineffective for all members of the class or did the effectiveness vary across student characteristics?*
- *Beneficial and Detrimental Peers*
 - *Can you think of two or three students over your teaching career whose presence in the class seemed to promote the understanding of other students? What were their characteristics?*
 - *Were the students who were effective in promoting a positive class atmosphere also themselves outstanding scholars?*
 - *Can you think of two or three students over your teaching career who benefited from peers more than others? What were their characteristics?*
 - *What specific student behaviors have most enhanced the learning of peers?*
 - *What behaviors have detracted the most from peer learning?*
- *Goals of Students in Core Course*
 - *What do you think are the main goals students hope to achieve in the core course? Do they vary across students? To what extent do you think classmate peer interaction is promoted by having similar educational goals?*
- *Peer Effects and Specific Groups of Students*
 - *Have you observed differences between male and female students in how they learn from each other?*
 - *Does the presence of members of minorities groups, international students, transfer students, or older students affect how the class learns?*
- *External Effects on the Core Classroom*
 - *Do the nature of the classroom and/or the time of day have significant effects on student learning and peer interaction?*
- *Mix of Abilities*
 - *In thinking about how the mix of student intellectual abilities affects learning, do you think that a diverse mix of abilities is better for weak students or that they learn best when most of their peers are close to their ability? How about for stronger students?*

- *Peer Interaction Outside of Class*
 - *Because the core course is taught from a common syllabus, there are opportunities for peer interactions among students from different sections. Have you observed such interactions? How beneficial were they for the students?*
- *Final question*
 - *What other things might we have asked or that you think are important in better understanding classmate effects on student learning?*

These questions were used by the interviewers to prompt the instructors to explore the broad question of peer effects, not as a strict rubric for scoring responses or bounding the conversation. During the interviews, instructors often went outside the boundaries of the specific question that was asked, either anticipating later questions or raising issues that were not covered in our set of questions. We encouraged this and adjusted our subsequent questioning to avoid repeating topics that had been covered earlier.

Performing and Analyzing the Interviews

Several of the final interviews did not take place as scheduled because of illness, last minute conflicts, or broken appointments. Most were rescheduled, but we were able to speak with only eight of the desired ten instructors at Lewis & Clark College. One interviewee at Whitman College was unable to keep the appointment, but responded to our interview questions in writing and is included in our study. Because we had scheduled an “extra” interview, this gives us eleven Whitman instructors and a total of 29 interviews.

Nearly all interviews went the full, scheduled 60 minutes and some extended a few minutes beyond. We encountered considerable support and enthusiasm for our research project and none of the instructors we interviewed was reluctant to discuss any of the topics we explored.

All interviews were recorded and transcribed either verbatim or in detailed summaries. The summaries were then distributed to the entire research team, each of whom provided detailed analysis. The next section of this report discusses the consensus that emerged from a group meeting to analyze the results in August 2007.

3. Interviews with Instructors: Results and Analysis

Are Peers Important?

Yes. The vast majority of interviewees felt that peers can have a strong positive or negative influence on their classmates' learning. One stated, "I think the chemistry of an individual section has *everything* to do with whether or not some students go far." A remarkable number of the interviewed instructors admitted, however, that they had not thought much about peer effects prior to our study.

Most of the instructors were able to come up with clear examples of individual students who had influenced their classmates and examples of individual sections that were more and less successful. One example was from an instructor who had taught multiple sections in the same semester. A student from the weaker section who happened to attend the stronger class would perform at a higher level than he or she normally did in the regular section.

One channel for peer effects is motivation. An excellent peer is often one who tends to motivate others to read more carefully, participate in class discussions, and try to understand the material at a deeper level. This often occurs through modeling good academic performance with insightful comments reflecting careful reading and thought. However, it can equally often happen through a classroom attitude that catalyzes the participation of others and encourages them to devote more energy to the course.

These courses serve a dual role in their colleges' curricula: providing academic content and introducing students to the process of learning in college. The content of the core courses introduces first-year students to classic texts that apply to many disciplines they are likely to study. The process of the courses introduces them to being a college student and to particular skills that will apply to nearly all courses: careful reading, academic discourse in the classroom, and writing. Interviewees noted some peer effects on the learning of content, but a large portion of their comments were directed at the learning of process: particularly how to engage in classroom discussion.

Most of the peer effects our interviewees discussed related to enhancing the quality of class discussions. Nearly all interviewees discussed examples of student behaviors that promoted productive discussion and others that deterred it. Most recalled “good classes” as ones in which class sessions had been lively and enlightened, and “bad classes” as ones where the discussion had never gotten off the ground.

The focus on classroom conversation as a locus for peer influence is natural given the discussion-oriented character of the core courses. It is a behavior in which the influences of students on each other are easily observed by instructors, whereas other kinds of peer interaction are often less visible. All instructors recognized that student actions can aid or hinder the instructor’s own attempts to shape the tone of classroom discussions.

Instructors were less convinced about (or at least less able to observe) peer influences on such academic skills as analytical reading and writing. Some instructors use peer editing of papers to facilitate such interactions. Most of those who assign peer editing were able to identify more and less beneficial peers and peer behaviors in this context. These effects tended to occur on an individual level, so a “good class” for these kinds of effects tended to consist simply of “good individuals” without any obvious synergies.

Because the core courses at all three colleges use a common syllabus with students in all sections studying the same texts at the same time, peers may interact across section boundaries. Most instructors had some anecdotal evidence about inter-section influences. Some of these were simple boasts and gripes such as “my section is better than yours” or “why does my section have to do more work than yours.” However, some instructors reported that students mentioned having discussed texts or exchanging paper drafts with students from other sections.

Descriptions of Beneficial and Detrimental Peer Behavior

Given that most of the peer effects that the instructors described were directly related to class discussions, it is not surprising that the peer behaviors that were mentioned most often related to the roles that students played in advancing or hindering class discussion. The students who were recalled as the most effective peers were ones

whose contributions and attitude encouraged response from others. Those whom the instructors characterized as destructive tended to shut down the conversation.

However, as one instructor pointed out directly, high-quality thinking underlies both good class participation and good writing, so they often go hand-in-hand. To the extent that peer influences arising in discussion improve the quality of a student's thinking, this may be reflected in improved writing as well.

Attitude vs. aptitude

The statistical study that our team undertook as a companion to the qualitative interviews relied, by necessity, on measurable characteristics of incoming students and their peers. The data available on incoming students in college databases relates almost entirely to measures of academic ability—scores on standardized admission tests and high-school grades—and basic demographic information. The only variable in our dataset that might be influenced by the characteristics of an applicant's personality apart from raw academic ability is an admissibility rating assigned by the admission office. The contribution of personality to this rating is assumed to be fairly minor compared to the admission dean's perception of the applicant's academic ability.

Given the prominence of aptitude measures in our statistical work, we were naturally very interested in how a student's actual or potential academic ability, as measured by the student's grades or admission credentials, connected with his or her influence as a peer. Do students gain from having more able peers who achieve higher grades and enter with more impressive credentials? Do they gain from peers who are close to their own level of academic standing? Is there some other complementarity between peers?

However, a strong consensus emerged from our interviews that characteristics of the student's personality and attitude had more effects on peers than did the student's raw academic ability as measured by grades or admission numbers. While most agreed that the most beneficial peers had been average-or-better students, it was notable that in only a few cases were the stellar peers also the strongest when measured on the usual grading scale. For example, the most outstanding peers were often not excellent writers.

The importance that the instructors attached to students' personalities may reflect the emphasis that they placed on classroom discussions in assessing peer effects. A central premise of class discussion is that all students can learn from the group: that the interaction of individuals with varying backgrounds and opinions provides a richness of understanding that is not possible to achieve individually. Thus, instructors consistently lauded peer behavior that advanced the *collective* expression of ideas and denigrated behavior that impeded it.

Academic ability surely affects the content of a student's classroom contributions: smarter and better prepared students would be expected to have greater insight on the readings and to thus make comments that have greater academic merit. While the contributions of these students to the discussion may advance the class toward academically profound answers, they do not necessarily advance the active participation of their peers in the conversation and so may not contribute to achieving the richest and deepest *collective* responses to questions. Indeed, they may have quite the opposite effect if their contributions are voiced in a superior, dismissive, belittling, or intimidating tone.

The instructors we interviewed consistently ranked as the most effective peers the students whose contributions to class discussions seemed to open up space for the contributions of others. While these students were often academically very strong, we heard about many students who were not academically outstanding but who seemed to have a strongly positive effect on their peers. A central conclusion from our analysis of the interviews is that instructors think attitude affects the quality of peer effects more than aptitude.

Good peer behavior

There were many peer characteristics that were mentioned by many or most of the core-course instructors we interviewed. The most obvious (and probably universal) beneficial behavior was simply attending and being prepared for class. In small discussion sections, absences are easily noticed by both instructors and peers. Students who fail to participate because of inadequate preparation also drag the class down, as do those who attempt to dominate despite being unprepared.

As noted above, most of the positive peer characteristics related to students' personalities and their attitudes toward the course and toward academic study in general. Many of these characteristics overlap and one would often expect to find students exhibiting one characteristic to have others as well.

- **Attendance and careful preparation for class** were at or near the top of most lists. Indeed, this positive characteristic was obvious enough that few instructors felt the need to dwell on it.
- **Maturity, leadership, and concern for the progress of the class** were mentioned in various forms by many instructors. Students who are genuinely concerned with how the class is going and who have the personal tools to take the lead in facilitating peer interaction seem to be priceless assets in a discussion-based classroom. Self-confident, humble, energetic, empathetic, and cheerful were mentioned as desirable traits often seen in these students.
- **General intellectual curiosity** was almost universally listed as a desirable peer characteristic. Students who like to think about abstract questions and learn for learning's sake tend to bring a positive influence to class discussions. They are good role models for others who are less convinced of the merits of the intellectual enterprise. Several interviewees used the term "playfulness" with ideas to describe beneficial peer behavior.
- **Respect for the opinions of other students** was another near-universally mentioned characteristic. Students who believe that their peers' insights are valuable usually listen to them carefully and respond thoughtfully and in a way that invites further comment. This kind of participation leads to improved class dynamics. One instructor noted that students feel like they are taken seriously when one of their peers (or the instructor) subsequently refers to or builds on their comments, even if they end up disagreeing. Such behavior validates the student's contribution to the discussion and encourages further participation.

- **Demonstrated enthusiasm for the core course and its subject matter** was often described as important. Even students with general intellectual curiosity are not necessarily excited about the subjects that dominate the reading lists of core courses. Science majors, in particular, were sometimes identified as (at least initially) uninterested in the humanistic core fields. Excitement about the subject makes good peers in at least two ways: (1) such students are very likely to come to class well prepared and (2) they may convey their enthusiasm to others. Some instructors perceived the pervasive local attitude toward the core course to be quite negative; these instructors were likely to view enthusiasm for core as a positive characteristic. (The degree to which instructors were concerned about the prevalent student attitude toward the core course varied considerably across schools.)
- **Openness to new ideas and approaches** was mentioned by many instructors. Those with a willingness to revise their opinions—to see through the comments of others that their initial ideas were mistaken—stand to gain more from peer interaction and may contribute more to it. By contrast, closed-minded or dogmatic students often find little basis for productive discussion with their peers.
- **A cooperative rather than an overly competitive attitude** toward academics was highlighted by some interviewees. Cooperative students were more interested in advancing the class conversation toward an improved shared understanding; overly competitive students often attempted to “score points” through their comments or to convince the class to adopt their opinions, which can shut down further discussion. One instructor characterized cooperative peers simply as “civil people.”
- **Willingness to speak in class** was important, though most instructors felt that shy students could contribute positively without making frequent contributions. “Extroverts that are not narcissists” was how one characterized the ideal peer personality. Several instructors noted that students with backgrounds in acting were often classroom catalysts because they were uninhibited

participants. Our interviewees' opinions about the quiet peer are discussed in more detail below.

- **Taking chances** was viewed as important by many instructors. When recalling excellent peers, many described situations in which a student “exposed himself” by “being puzzled out loud” or “talking through an idea in front of the other students.” By putting such an idea or question in front of the class, the student provided a focus for productive conversation among his or her peers. One instructor pointed out that by being uncertain or even wrong, these students could relieve the pressure that other students may have felt to be brilliant all the time.

The instructors cited students who exhibited these behaviors regularly as outstanding peers. As one might expect, the emphasis among them varied across instructors and some noted that it was class-situation specific. For example, if the rest of the class is very quiet, then willingness to speak might be crucial whereas in a class with many strong opinions, a peer who is a cooperative facilitator might provide an important buffer to the more forceful personalities.

It is worth noting that most instructors spoke more about generating and encouraging discussion than about “training” it. A couple mentioned the value of students who “disciplined” their peers by asking them for evidence to support their assertions, but these were the exception to the more common refrains of elicitation and facilitation.

Detrimental peer behavior

To a large extent, the behaviors described as destructive were the opposite of those presented above as good peer behaviors. However, it is important to distinguish between students who merely fail to engage in beneficial behaviors and students who engage in behaviors that instructors reported as having actively negative influences on peers.

- **Dismissive or judgmental behavior** was a common characteristic of a destructive peer. Highly perceptive comments by high-ability students can be positive or negative depending on the tone with which they were delivered. Students who perceive themselves to be better than their peers sometimes discourage discussion in a number of ways: by talking down to the rest of the class, by attempting to “score points” by demonstrating their intelligence, by making comments with a “tone of authority,” or by attempting to engage in a dialog with the instructor to the exclusion of peers.
- **Rigidity of views** may present difficulties. Good discussion involves being willing to admit that you might be wrong, which is difficult for some students, especially on sensitive topics. For example, some instructors reported that students with strong religious views had particular difficulties discussing religious texts dispassionately.
- **Rejection of peer learning** was reported by some instructors, with the prevalence varying widely across colleges. Such students wanted professors to tell them the “right” answers rather than engaging in a group conversation. Several instructors described a student attitude that might be represented as “I’m not paying all this money to listen to a bunch of 18-year-olds.”
- **Excessively loquacious** peers (sometimes unintentionally) could stifle participation by other students. Some such students always have to be the first to speak, others keep talking endlessly (often about issues only tangentially related to the text under discussion), and some repeat the same point over and over. One instructor referred to such a person as “annoying boy.” (This behavior was more commonly reported among male students than females.) Most instructors reported that they attempted to manage such situations with a private conversation with the student. One mentioned a correlation of such disruptive behavior with specific learning disabilities.
- **Active or ostentatious disengagement** that “exudes boredom” was reported by some instructors. Examples included ignoring the class discussion, looking out the window, hostile body language, checking text messages or email (or

surfing the Web), and in one case performing conspicuous acts of personal grooming during class. These actions were distracting to other students and could foster or contribute to a more widespread negativity toward the class.

While most instructors were able to relate examples of detrimental behavior, few reported situations where this behavior had “destroyed” the class’s effectiveness. In some cases, the instructor reported that he or she had succeeded in managing the behavior; in others the other students in the class had marginalized the offending student. When, however, the detrimental behavior was attributed to severe social awkwardness, students often shrugged it off fairly readily.

All instructors were responsive to the question about destructive peers, but some pointed out that students’ classroom behavior often improves over the year. Students who initially exhibit the negative characteristics above sometimes learn more appropriate behavior as they participate in discussions through the year. All use individual, out-of-class meetings to try to encourage better behavior.

The quiet peer

A special category of peer is the student who consistently avoids contributing to class discussions but who does not display active disengagement. Nearly every instructor had taught many quiet peers and talked about them at some length. Some students are shy by nature and find it very difficult to speak in front of others. Others have been taught to be passive in the classroom setting. One common example was international students whose educational and cultural backgrounds have conditioned them not to speak in class.

All instructors agreed that there were always a few quiet students in a class section. Most believed that this was not usually a problem. However, there seemed to be a tipping point at which too many quiet peers made it difficult or impossible to sustain a productive discussion. Many veteran instructors had experienced at least one such section in their years of teaching.

Most instructors hesitated to find fault with quiet peers and seemed generally sympathetic. Many described positive behavior by quiet peers: active listening, taking

Careful notes, and showing clear, if silent, signs of engagement. Some noted that the quiet student's occasional contributions were often given disproportionate attention and impact by his or her peers: "when the wallflower finally speaks up, it is more appreciated." One instructor felt that the quiet but engaged students often learned the most from their peers, carefully writing down everything that was said in class and using it in their subsequent papers.

As with the loquacious peer, instructors often tried to manage the situation individually with the student, encouraging them privately to participate more in discussions. Some found other ways for these students to engage the material, such as written interactions with peers, small group discussions or presentations, or assigning the student (in rotation with others) to lead discussions. One instructor reported that the student-led discussions were often livelier than instructor-led classes because each student participated more as a *quid pro quo* for other students' participation when he or she was leading the discussion. Other strategies for encouraging quiet peers include using out-of-class electronic forums to encourage shy students to contribute or encouraging shy students to prepare questions ahead of time to be asked at the beginning of class. One instructor sometimes delayed all student response to a question by 30 seconds to allow the students who think more deliberately time to respond.

The nice peer

Another special category of peer that was described by some instructors is the student who is "too nice" to disagree with a statement made by another student. The prevalence of this behavior seems to vary dramatically across the three colleges. Although most instructors agreed that civility was a positive and important norm of classroom demeanor, some students seemed to carry this too far. "They don't want to disturb the waters of the friendly community (so) they ... let points of intellectual disagreement pass or even avoid critically thinking about what someone is saying."

Instructors worked actively with these overly polite students to teach them that it was appropriate to express disagreement as long as they were "careful, kind, and considerate."

Do students change?

We did not ask directly how stable a student's characteristics as a peer are or whether students' peer behavior often changes through the course. The design of our project, complemented by quantitative analysis focused on the characteristics of students at the time of admission, may have predisposed us to view peer characteristics as relatively stable and to pose questions in a way that encouraged interviewees to adopt that view. Given this potential bias in our approach and the lack of direct questioning, any conclusions that we might draw about this question must be highly tentative.

Most instructors, whether independently or cued by the tone of our questions, seemed comfortable with the idea that the students have stable, previously formed academic and personality traits and that these are a significant determinant of class behavior. One interviewee seemed to support the pre-determined nature of peer behavior when she said "students are the way they are."

However, all instructors described attempts to work with problem students to improve their peer interaction, which clearly implies a hope that peer behavior can be changed. Some also described ways in which they changed their own classroom behavior in response to the students, either with the intent of changing students' behavior or in order to fill roles that were absent in the mix of students.

Of course, the whole notion of classroom peer effects rests on the idea that student behaviors influence other students. It would be naïve to suppose that X's actions affect Y's learning environment leading to peer effects without at all influencing Y's own behavior. If X's actions drive Y's response, which in turn causes Z to behave in a particular way that affects X's learning and causes him to act in another way, we enter a loop of complex endogeneity. Taken to an extreme, such pervasive interactive co-determination of classroom behavior could imply a chaotic (in the sense of mathematical chaos theory) determination of the classroom environment that would be independent of any exogenous or predetermined student traits.

While our interviewees clearly believed that student learning and behavior were sensitive to peer actions, none seemed inclined to treat the classroom atmosphere as

the outcome of chance interactions independent of the traits that the students brought to the class. To this extent, we continue to believe that exogenous characteristics of the students in a class have strong effects on the success of a core-course section. However, given the indirect and potentially biased nature of our information, we must leave unresolved the details of how peer characteristics evolve during the course of the class.

Descriptions of Successful and Unsuccessful Class Sections

A discussion class is more than a simple aggregation of its individual students. While a class filled with students exhibiting good peer behavior (by the criteria above) would likely be a very effective one and a class of destructive peers would almost surely be disastrous, all instructors agreed that the impact of any individual peer or behavior depends crucially on the peer group within which it occurs. A generally enthusiastic and active group can probably ignore or ostracize an actively disengaged classmate who might disrupt a quieter or more marginally engaged class.

Moreover, there may be various “roles” played in a classroom discussion: initiator, lightning rod, advocate, skeptic, joker, curmudgeon, peace-maker, etc. Just as 80 brilliant oboe players do not make an orchestra, a class full of lightning rods, skeptics, or jokers is sure to fail. A successful core-class section may require not just “good” individual peers, but also a mix of students who can fill the necessary roles. One instructor pointed out that “We can’t have all questioners; we need to have some answerers as well.” Another noted that students seem to settle into the roles of “first to speak,” “first to respond,” “get involved later,” and “not speak at all unless called on” roles.

A mix of student interests (or prospective majors) seems desirable in a core class as well. With a diversity of backgrounds and interests, each student may get a chance to be excited by the material and shine in class on a different day. “X might be great at the philosophical text and less good with the poetry, and that might be Y’s forte.” A diverse set of background experiences was also thought desirable. One instructor said that in an ideal section “you have some kids from small towns, some kids from cities. You have some kids who went to religious schools or are themselves very religious and you have some who like to think of themselves on the cutting edge of atheism.”

The instructor also contributes heavily to the classroom mix of personalities. One role of the instructor in a discussion is to step into an unfilled role: initiating conversation if others do not, making a joke when levity is needed, doubting the consensus if skeptical viewpoints have gone unspoken, or calming conflicts between forceful students.

Instructors, like their students, adopt some roles more naturally than others, so a naturally skeptical instructor would complement a class lacking students to fill this role. Instructors differ in their ability to manage various potential disfunctionalities in the classroom as well. Some instructors thrive on lively, even heated, exchange while others might lose control of a class where discussion became too spirited. Some instructors are more able to draw quiet students into the discussion than others, for whom a quiet group of students might never get started.

Because of the complexities of classroom interaction, we tried to probe beyond individual actions to learn about the group characteristics of successful and unsuccessful class sections. Instructors were generally able to recall specific class sections that they viewed as more (and less) successful than others. When asked what made sections successful, they often described the contributions of individuals in the class, referring to some of the positive individual behaviors described above. Many discussed the negative impacts of individuals' dysfunctional behaviors as leading to unsuccessful sections.

Analyzing the interviews, the most common definition of a good section seems to be one that can sustain academically productive class discussion involving the majority of students. Toward this end, the most important "role" that instructors commonly invoked for making sections work was the student whose own contributions were of a kind that encouraged others to get excited about the class and join the conversation. A few such positive peers could make a class successful. Those whose class contributions (either through participation or active non-participation) trivialized the class or discouraged peers from speaking were at the center of most unsuccessful sections.

In addition, some instructors commented on the importance of class bonding. It was not necessary for students to be close personal friends, but feelings of familiarity and acceptance led to "academic friendship" among members of successful classes.

Students were also more satisfied, comfortable, and confident if they felt that theirs was a “good class.” This class self-image can be formed early in the year and may be difficult to reverse if it becomes negative.

Concentric-ring model of peer distribution

An image evolved during the course of our conversations that describes the initial composition of a class section in terms of three concentric rings. In the center is an active and engaged group—those naturally “good peers” who demonstrably take the enterprise seriously, model good academic performance, and encourage their peers to join in the classroom intellectual discourse. In the outer ring are any students who are predisposed to be actively disengaged or hostile on the periphery. Lying between them in the middle ring is a potentially large group of initially “uncommitted” students who are not disposed to strongly positive or strongly negative peer behavior.

We discussed above many different characteristics of good and detrimental peers. These underlying student characteristics vary on a multivariate continuum that resists facile reduction to a single measure of “good-peer-ness.” Thus our attempt to depict this complex web of factors in a single dimension must be viewed as a simple abstraction. Moreover, while there was consensus that students vary considerably in their predisposition to be good peers, drawing any kind of borders between good and neutral or neutral and detrimental is clearly arbitrary.

Nonetheless, the concentric-ring model provides a useful framework for describing two closely related phenomena that we heard described by many instructors. The first is the “critical-mass hypothesis” that a class is successful if the central group is large enough to sustain good class discussion with occasional contributions from the middle group and despite potential distractions from the periphery. This hypothesis is consistent with a static view of student behavior that is determined mostly by personality and background and that does not change much within the core class. If enough of the students exhibit good peer behavior, then the class will be successful for most students even if those outside the center never become strong participants themselves.

The second is the “gravitational-attraction hypothesis” that students in the middle ring tend to be drawn over time either into the center or toward the periphery. Suc-

cessful classes are those in which the center is large enough (and the periphery small enough) to attract a large share of the class into positive peer engagement. This hypothesis emphasizes the dynamic evolution of student behavior over the duration of the core class in response to the behavior of peers. Whereas the central group sustains the class by itself under the critical-mass model, it does so in the gravitational model by inducing additional students to become active participants.

Critical-mass hypothesis

All interviewees agreed that class discussions require a minimum critical mass of active participants to be successful. The number of active contributors that instructors felt was necessary in a class of 15–20 ranged from a low of three to a high of six or more. Those who viewed student participation as being largely determined exogenously by their innate personalities tended to view the success of a class in terms of having enough outgoing students to sustain lively interaction.

Having a critical mass of participants of varying levels of sophistication can serve to anchor the conversation at a level that is accessible to all students (and so may encourage all to participate). The mass may, for example, often “translate” for the benefit of weaker members of the class the input of very strong students, whose contributions might otherwise not elicit responses (and who might therefore cease to contribute). Equally, they may translate the input of weaker students by adding evidence or refining terms, so that the whole class can benefit.

In terms of the concentric-ring model, students in the center group are consistent contributors who can be counted on to be active in class. The peripheral group does not participate positively. We characterized as the middle group those who contributed sporadically, either offering an occasional comment regularly or varying between active and inactive participation depending on the topic, their daily degree of preparation, or other factors.

According to the critical-mass hypothesis, a successful class is one with a sufficient number of students whose engagement and personalities make them active, central participants. Detrimental peer behavior was not frequently discussed by interviewees

promulgating the idea of critical mass, so the distinction between the districting peripheral group and the middle was less important.

Gravitational-attraction hypothesis

For many instructors, the success of the class seemed to depend on *relative* size of the center and the outer ring and on the direction toward which this middle ring of students is pulled. Many interviewees reminded us that the students entering these courses are 18 years old and are experiencing college for the first time; they are “like unopened blossoms” in the phrase of one instructor. They do not know the norms of behavior that are expected in a college classroom and have not yet formed their academic identities. This means that their behavior is likely to evolve considerably over their first year as these academic identities develop.

Peer pressure and instructor influences within the core classroom will play an important role in teaching new college students behavioral norms and in helping them to define their identities as students. This is one reason that we might expect strong peer effects to emerge from these classes. As one instructor put it, by the end of the first month the students will have decided “whether it’s going to be cool to play” the academic game.

In terms of the concentric-ring model, if most of the middle ring “buys in” and is attracted toward the center then the majority of the class participates in discussions and the class is likely to be successful. If the middle ring “opts out” toward the periphery then classroom interaction will be strained because the number of active participants is small.

Many factors influence the middle ring of students. Having a sufficient number of actively engaged participants can instill a norm of intellectually active behavior in these wavering, middle-ring students, pulling them into the active group and making a highly successful class. When there are too few students who are initially predisposed toward active engagement, it is harder to demonstrate intellectually productive peer-with-peer interaction, and thus more difficult to establish active discussion as a valuable norm. Moreover, if active peers are too sparse, they may be seen by the majority of

students as exemplary in a way that does not encourage imitation—they may be viewed as simply smarter or better readers—and instead shuts down conversation.

With a solid and sizable center establishing a centripetal norm of academic engagement, it may be possible for a class to shrug off the centrifugal influence of actively disinterested or even hostile members. However, if a large proportion of the class is disengaged and non-participatory then silence, indifference, or rejection of the class can become accepted as the norm, leaving the small central group as the lone active participants in a less-than-successful class. Some instructors reported that one sufficiently disruptive student had sometimes been enough to derail an entire class.

External affinities of middle-ring students with center or periphery students may also affect whether they become active participants. One instructor noted a class with several athletes in which excellent peers drew their teammates into positive roles.

Instructor effects on peer interaction

While our instructor interviewees felt that peers were important, we should be careful not to neglect the instructor's own crucial role. By encouraging positive peer interaction, a successful instructor may be able to help pull the middle ring students into the active, participating center or discourage disruptive behavior from the potentially destructive periphery.

Some instructors described explicit strategies that they used to encourage peer interaction. One physically moves around the classroom to stand behind the student who is speaking, drawing the attention of all the students toward the speaker and forcing the speaker to address the other students rather than the instructor.

Many instructors ask students to discuss issues in small groups then report the results of their group discussions to the class as a whole. They argue that students who are uncomfortable speaking to a class of 16 may participate more actively in groups of three or four. Insecure students are often more confident in front of the larger group when reporting the results of their small groups to the whole class than speaking on their own because they are presenting ideas that have been validated by the other group members. Even “nice peers” are often willing to speak up in disagreement with others if they perceive it as supporting the views of their own “team.”

Some instructors had students serve as discussion leaders in the second half of the course. They observed high participation by peers when students were leading the discussion, surmising that this might be a quid-pro-quo for expected participation when they served as leaders.

Effects of the physical classroom environment

Instructors had widely varying views on the effect of the physical classroom setup on peer interaction. The one near-universal preference was for a classroom in which students were seated around a table, as opposed to chair-desks arranged in a circle or, worst of all for most instructors, stadium-style classrooms where all seats face the front. Nearly all instructors felt that each student being able to see all the others when talking or listening to them was crucial for promoting peer-with-peer interaction.

Beyond preferring a table setup, instructors varied (sometimes with surprising passion) on issues such as whether the table should be solid or have an open middle. One interviewee argued that a solid table removed the distraction of “twitching feet” across the table, but others felt that being able to see the whole person was beneficial. Instructors also varied in their opinions about whether a room with windows is better than one without and whether there should be space behind students sitting at the table or whether room space should be tight.

Which Students Are Most Affected by Peers?

We posed this question to each of the interviewees and rarely got a clear answer. While most instructors could identify students and actions that had made for a better class discussion, few were able to speak confidently about which students gained the most from such discussions. One instructor noted that her post-course evaluations suggested that the students in a class usually largely agreed about whether the class had been successful. If all recognized that the class had been a good one, perhaps all believed that they had gained from it.

Although there was nothing approaching a consensus on this issue, we heard a number of isolated opinions that were suggestive. One argued that less intellectually

mature students may move from a highly structured view of learning to more open-minded learning by observing intellectually inquisitive peers.

Openness to new ideas was another characteristic that seemed important to benefiting from peers, as well as one that made students themselves better peers. Some students are just “waiting for a fire to be lit” or “allow college to transform them,” while others may be so inflexible in their views (for example, about religious topics) that they gain little.

We heard some opinions that middle-level and weaker students gained from having bright and positive peers. There was some sense that the best students will learn the material regardless of any reinforcement they get from peers.

One instructor was convinced that the quiet students benefited from having an active center sustaining the discussion. He characterized these students as participating in an “engaged spectator sport.”

Among the characteristics that instructors associated with weak sensitivity to peer effects were “solo learners” and those who do not process conversation as well. One instructor argued that some international students tend to be “on a mission” and that academic success can be a “life or death issue” for them. Such students “would still work hard in a class of duds.”

Are good students pulled down by weaker ones?

One situation that was mentioned was a class in which a strong, engaged, participating student was discouraged and held back by peers who had not done the reading but were clever enough to free-ride on that student’s comments. The instructor was convinced that this student learned less than she would have in a class where others contributed commensurately.

However, others argued that the opportunity to explain their advanced arguments to less-able peers could promote the learning of the best students. They try to put students in situations such as small groups where stronger students can learn from the process of helping weaker ones.

Are weak students pulled up by stronger ones?

There was quite strong consensus that weaker students can learn by hearing the arguments of stronger students. Many instructors seemed to take this effect for granted and did not make it a central focus of their comments.

One instructor pointed out that it is hard to learn from peers if there are no good role models in the class, suggesting that weak students depend on a few strong ones to enhance learning. Others attempt to promote this kind of peer effect through peer editing of papers.

Is it Better to Have a Class with Matched Abilities or a Mix?

Most, but not all, instructors subscribed to the notion that a mix of students promotes learning better than classes in which all students are at a homogeneous level of ability. In such a class, the “weaker students can aspire to be excellent like the top students,” but they have company in their struggling to achieve this.

With a mix of students, “it challenges the good students to explain themselves to the weaker ones. Weaker students are encouraged to think more deeply about the subject.” Another interviewee argued that “the more capable students receive a salubrious check upon their tendency to self-congratulation” by the presence of students that are slower at figuring out what is going on. However, several instructors felt that a wide mix of abilities only worked if the students in the middle (ability-wise) are able to act as a bridge between the top and bottom students, learning to translate the input of more and less academically sophisticated peers for the benefit of the entire class.

Among those who believed that relatively homogeneous classes were better, one had come to this opinion after talking with students. He found that weaker students had often been intimidated by good ones, and had participated and learned less as a result. This concern was echoed by another who pointed out that most students attending these schools were accustomed to being among the smartest in their high school class, which makes them susceptible to becoming demoralized by really smart comments from peers.

One instructor expressed a feeling that students learn best when there is “a sense of equality in the class.” Although this doesn’t mean everyone must be identical, large and obvious differences in ability can undermine this feeling.

Issues Related to Gender, Ethnicity, and Other Student Characteristics

Gender issues

Female students may, in general, tend to have different effects on their fellow students than males, and they may also be affected by their peers in different ways. Our interviews elicited considerable response consistent with traditional sex stereotypes.

Males were routinely characterized as, on average, more self-confident, combative, and competitive; females as more concerned with cooperation, community-building, and earning peer validation. One instructor characterized female students as more focused on “process and order” whereas the males are more interested in outcomes: “getting the problem right.” They tend to be complementary in their approaches to the classroom: “Too much communitarianism, there is a lack of friction and nothing gets going. Too much competition just freezes everybody out of the discussion and creates hostility.”

A large share of the “problem children” reported as destructive peers were male. One instructor characterized males as more likely to see themselves as “unrecognized geniuses.” Many fit the mold of the “testosterone male,” who tries to dominate the class and insists on being right. Both females and males were common among the stellar peers. Females were more commonly in the categories of “quiet peer” and “nice peer.”

Ethnicity issues

Each of the three schools has a very limited enrollment of minority students. No instructors felt that they had enough experience with minorities in the core classroom to generalize at all.

There were a couple of situations that were reported often enough to suggest general application. One was the isolation of lone ethnic minority students in a section. At times, they seem to feel like they are being called upon to represent their supposed ethnic group, rather than just their own opinion. As the only black student in a section, peers may view the minority student “as a spokesperson rather than as a person.” While an occasional student adopts this role readily, others are reluctant to speak in that situation. One instructor reported a situation where a second black student had joined a section at mid-year, which made the first student much more comfortable expressing his individual opinions.

When studying racially charged materials such as Toni Morrison’s *Beloved* (which has appeared on the reading lists at two of the schools), both minority and majority students can be uncomfortable. Some faculty viewed this discomfort as a positive factor that forced both groups out of their comfort zone, though all acknowledged that it was difficult to break through a near-universal reluctance to open up about racial issues.

Issues for international students

International students for whom English is not the native language face particular difficulty in these reading- and writing-intensive core courses. They may process spoken English more slowly than native students, making it difficult to follow the classroom conversation let alone contribute to it. Even if they have a useful point to contribute, they may lack confidence in their ability to express it in English.

Many instructors had taught classes with multiple international students, which sometimes made them more comfortable. However, a large share of international students with a tendency to be silent can be stifling.

We heard numerous comments about moments of great enlightenment in which the comments of an international peer caused American students to realize that not everyone sees the world in the same way that they do. These often seemed to occur either around a text that is cherished in Western culture (such as the Bible) or around texts that emanate from other cultures.

As noted above, many international students were characterized as highly motivated, focused students. These students take the academic enterprise very seriously and are not easily derailed by detrimental peer behavior.

Conclusions from Faculty Interviews

Despite the diversity of responses that we heard from our interviewees, we were able to draw tentative conclusions about some aspects of peer effects in the core courses at our three institutions.

- **Peers matter.** Although many had not explicitly considered peer effects prior to our study, all the instructors we interviewed believed that peers affect students' learning. They were particularly aware of peer effects through participation in classroom discussions, which affects fellow students' learning both of content and of the process of academic discourse.
- **There are specific characteristics that make good peers.** There was near-universal consensus about the individual characteristics and behaviors through which good peers enhance students learning.
 - **Personality and attitude are crucial.** The most important peer characteristics seemed to be one associated with students' personalities and their attitudes toward learning and toward the class. The most stellar peers were often A- or B+ students, but they always behaved in ways that stimulated others' interest in the class and invited their active participation in discussions.
 - **Good academic quality is also important.** The best peers were never C students and often had A or A+ ability.
- **A critical mass of strong peers is important.** Many instructors highlighted the importance of having a critical mass of positive peers who were capable of elevating the quality of discourse to a high level. That is, the composition of the class as a whole matters as much as the individual characteristics of members.

- **Classmate role models are very important.** Many students do not come into core class with established academic identity. They establish it partially in the core class, and partially on the basis of role models in that class. A central group of good peers can convince others that it's "cool to play" the academic game, drawing them into the center and promoting a successful class.
- **There are diverse roles to be played in a successful classroom,** so a diversity of personalities and backgrounds is good. Even though most instructors could describe an "ideal peer," it was not always clear that one needed, or even wanted, a whole class full of them. A class was more than a simple sum of the individuals in it. While in an "ideal class," all students would be careful readers, excited about the course, and civil in demeanor, such an ideal class would also need diversity: both questioners and answerers, both skeptics and consensus-seekers, both quick responders and careful, deliberate thinkers.
- **Males and females tend to play different roles in the classroom.** We heard many instructors characterize distinct academic personalities that they associated with male and female students. Males were more aggressive and tended to focus on content; females were more cooperative and tended to be more concerned with process. Excellent peers who were identified by instructors were about equally divided between males and females. Those identified as destructive peers were more often male.

These were, by and large, the conclusions that we drew from our thirty hours of interviews with faculty members. The next step of the research was to bring the interviewees together with some instructors from other colleges with similar core courses to ask whether these conclusions seemed valid and whether there were areas of peer effects that we had not adequately considered.

4. Peer-Effects Conference: Goals and Design

To follow up, we convened a conference at Reed College about one year after the interviews. Approximately half of the interviewees attended as well as representatives from other colleges and universities with comparable core courses. The conference lasted one-and-one-half days and included four plenary sessions and two sets of smaller group discussions.

Purpose of the Conference

The goals of the conference were several, involving both the advancement of the research and its dissemination.

- **Validating our understanding of the interviews** by reconnecting with the interviewees. Our hope was to present our interpretation of the interviews (roughly as documented in the previous section) for the review of the instructors who were interviewed, asking them to assess whether or not we had understood their views on peer effects correctly.
- **Assessing the extensibility of our results** by hearing from instructors in core courses at other schools. Do the observations on peer effects that we gathered at Lewis & Clark, Reed, and Whitman Colleges resonate with their experiences on their own campuses?
- **Disseminating our results to a broader audience.** Inviting core instructors from outside our group of schools made them aware of our study and opened up broader potential lines of communication and perhaps collaboration for future work.

Conference Invitees and Attendees

Project college faculty and staff

In addition to the project staff members and the 29 faculty members who were interviewed, we invited one additional core-course instructor from each of the three

project colleges. This was done partially to increase representation from the schools in light of numerous interviewees who were unable to attend. It also allowed us to include key faculty members (such as current course chairs) who were unavailable at the time that the interviews were performed. Deans and presidents of the three schools were also invited, though none attended.

The following instructors and project staff attended. Non-interviewees who were added to the conference are marked with asterisks.

- **Lewis & Clark College**
 - Core-course instructors: Cliff Bekar, Kim Brodtkin, Kurt Fosso*, Susan Kirschner
 - Project staff: Jay Beaman, Jim Grant, Ben Westervelt
- **Reed College**
 - Core-course instructors: Michael Breen, Jay Dickson, Nathalia King, Jan Mieszkowski, Ellen Millender*
 - Project staff: Nigel Nicholson, Jeff Parker, Jon Rivenburg
- **Whitman College**
 - Core-course instructors: Dana Burgess, David Carey, Mitch Clearfield, Kurt Hoffman*, Rogers Miles, Zahi Zalloua
 - Project staff: Jan Crouter, Ruth Russo

In addition to the project staff and core-course instructors, we invited three members of the psychology faculties with related interests and expertise. Of these, only Kathy Oleson of Reed College was able to participate.

External participants and recruiting

To identify institutions that would be strong candidates to send external participants, we searched for schools having comparable core courses and sharing important geographical and/or institutional characteristics with our project schools. We identified colleges and universities with suitable core courses by examining the membership roster of the Association for Core Texts and Courses (ACTC). To augment that list,

we explored the catalogs of all selective liberal-arts colleges in the West and those of all small colleges and universities in the Pacific Northwest, looking for other schools with appropriate core courses.

From this search, we issued invitations (through academic deans and/or core-course chairs) to the schools and institutions listed in Table 3. Those attending are listed in the right-hand column: 11 attendees from 20 institutions invited.

While we had hoped to have representatives from all of the schools and organizations invited, finding available and interested participants proved difficult at some schools. Similarly, while all of our interviewees expressed interest in attending, only about half were actually able to participate on the days the conference was scheduled. The conference ultimately brought together 33 faculty members and two professional staff members from a total of twelve colleges and universities. In addition, eight students from Reed and Lewis & Clark Colleges attended and served several roles: performing administrative tasks, acting as rapporteurs, and occasionally contributing to discussions when a student perspective was useful.

Agenda of Presentations and Discussions

The conference schedule is shown in Box 1. The breakout sessions divided the attendees into three discussion groups, each led by one of the project-staff core-course instructors. Another project faculty member summarized main points on the white board in the meeting room while project student assistants took detailed notes.

The opening plenary session began with a brief overview of the overall peer-effects project. This session focused on the central research questions, the multi-method approach, the connection between the qualitative and quantitative sides of the project, and the role of the conference in our study. Following this introduction, each of the three project-staff core-course instructors presented a brief description of the core course at his or her home institution. After a short break, Jeff Parker concluded the

opening plenary by summarizing our interpretations (as discussed above) of what we heard from interviewees at the three campuses about peer effects in the core courses.³

Table 3. Conference invitees and attendees

School	Location	Attendee(s)
Carthage College	Kenosha, Wisc.	None
University of Chicago	Chicago, Ill.	None
Claremont-McKenna College	Claremont, Calif.	None
Colgate University	Hamilton, N.Y.	None
Columbia University	New York, N.Y.	Patricia Grieve
Emory & Henry College	Emory, Va.	None
Gonzaga University	Spokane, Wash.	Patricia Terry
Hampden-Sydney College	Hampden-Sydney, Va.	John Eastby
Luther College	Decorah, Ia.	Jacqueline Wilkie
Notre Dame University	Notre Dame, Ind.	None
Pacific Lutheran University	Tacoma, Wash.	Matthew Levy
Pomona College	Claremont, Calif.	Eric Hurley
Rhodes College	Memphis, Tenn.	None
Scripps Colleges	Claremont, Calif.	None
St. John's College	Santa Fe, N.M.	Kenneth Wolfe
St. Mary's College	Moraga, Calif.	José Feito, Rebecca Engle
Thomas Aquinas College	Santa Paula, Calif.	None
Whitworth College	Spokane, Wash.	None
Willamette University	Salem, Ore.	Richard Ellis
Ass'n for Core Texts & Courses	Moraga, Calif.	J. Scott Lee

³ Slides from this presentation are available at http://web.reed.edu/teagle_grant/Interviewpresentation.pdf.

Friday, May 30

12:00 – 1:00 **Arrival and registration**

1:00 – 3:00 **Opening session**

Welcoming remarks. Overview of Teagle Peer Effects Project. Brief overview of the core courses at Lewis & Clark, Reed, and Whitman Colleges. Presentation of the results of faculty interviews.

3:30 – 5:00 **Breakout sessions**

Discussion of interview results. What are the individual student and collective class characteristics that lead to effective peer interaction and learning?

6:00 **Social Time and Dinner**

Saturday, May 31

8:30 – 9:00 **Arrival (coffee, tea, juice, and pastries)**

9:00 – 10:30 **Plenary session**

Presentation of ideas coming out of Friday afternoon breakout discussions. Further discussion of peer effects in core classroom.

10:45 – 11:45 **Presentation of results of quantitative analysis project**

Brief, non-technical summary of the statistical analysis on peer effects in the core courses at the three host colleges.

12:00 **Lunch**

1:15 – 2:45 **Breakout sessions**

Discussion of statistical results. How can we quantify the relevant aspects of student and class peer interaction?

3:00 – 4:30 **Final plenary discussion**

Presentation and discussion of ideas coming out of the Saturday breakout sessions.

Box 1. Conference agenda

The second session on Friday afternoon asked small subgroups to discuss the interview analysis as presented in the opening plenary. This breakout session was organized around the following six central questions, though the conversations ranged widely:

- **Have we understood the interviewees correctly?** Are the tentative conclusions that we have drawn from analyzing the interviews consistent with what these instructors intended to tell us? Did we seriously misinterpret major points?
- **Do good peers get rewarded with good grades?** Do instructors explicitly or implicitly consider actions that create positive (or negative) peer effects when assigning grades.
- **Did instructors tell us about classes they enjoyed vs. classes that were pedagogically effective?** Is there an important difference? Stimulating discussion seemed to be a common theme of good classes, but is this just because the instructor felt good about the class or do students also learn more and better?
- **Are our results specific to core courses and other discussion-based courses?** Are peer effects important in other courses? Are there similar or different kinds of peer effects in courses that emphasize lectures, problem sets, projects, etc.?
- **Are our results specific to these three Northwest schools?** Are there regional biases or biases associated with the student pools at these schools? Do faculty members from other institutions have similar experiences?
- **What are we missing?** Are there important issues about peer effects that have not been adequately explored? What are they?

After a dinner and an evening to think and talk informally about the issues raised the first day, we reconvened on Saturday morning for a plenary session at which each of the breakout group leaders summarized the responses to the questions that emerged in his or her session. Following these short presentations, the full group con-

sidered what we know and don't know about the answers to these questions and how we might learn more.

Following that discussion, Jeff Parker presented a brief summary of some results of the statistical analysis that complements the interviews.⁴ This presentation was aimed at a non-quantitative audience and emphasized interpretation of broad results rather than detailed discussion of methodology. The basic theme of this presentation was that common hypotheses about peer effects—for example, that having academically strong core-course peers improves students' subsequent grades—were supported very weakly if at all by the statistical analysis.

After lunch, another breakout session (with a different mix of group assignments) allowed participants to discuss questions about the statistical analysis and its relationship to the interviews. This session was organized around the following set of questions:

- **Do core-course peers have effects that extend beyond the core course itself?** Our statistical analysis looks for effects of peers on performance outside of the core course. Is this reasonable? Do core courses and the associated peer effects actually influence performance in other classes?
- **How can we measure the classmate attributes that matter for peer effects?** We find weak results for standard academic-quality measures from the admission file. Are there other variables we could measure that would relate more closely to peer effects?
- **What are the best outcome measures to examine in looking for peer effects?** We use grades in non-core courses and graduation from the institution. Are there other measurable outcomes that would be better?
- **Are there other useful approaches to examining peer effects?** What other ways could we try to evaluate peer effects beyond the interviews and statistics?

⁴ See http://web.reed.edu/teagle_grant/Statisticalresults.pdf.

The final session brought the groups back together for a plenary discussion of these questions. Once again, the session leaders began by summarizing the main ideas discussed in each breakout group.

Summary of Conference Outcomes

Each conference session featured spirited discussion among project staff, interview subjects, and external participants. Sessions remained focused largely on the questions we posed, though responses ranged widely.

The external participants included several scholars who not only have extensive experience in core courses but who have also done research on student interaction and learning. While the kinds of research that they do take a very different approach than ours, many of the central research questions overlap considerably. Hearing a little about their research and getting their comments on ours was an unexpected benefit of the conference.

Participants in general agreed more often than not about the nature of peer effects and the difficulties of modeling or measuring them accurately. There was a strong consensus that peer effects can be important in core courses, though questions were raised about what aspects of the student experience were affected by peers and how. Some pointed out the importance of distinguishing different kinds of learning, for example learning course content vs. learning the process of class participation, or learning that is reflected immediately in core-course performance vs. learning that emerged years later.

While there was broad agreement on the importance of peer effects in core courses and the importance of core courses in a liberal-arts education, more specific aspects of our analysis were greeted skeptically. The simple version of the concentric-ring model absorbed withering criticism—much of it justified but some arising from confusion about the simplistic metaphor.

The participants led us in many ways to clarify our thinking about many issues. Among the most important was the extent to which student characteristics are static and predetermined vs. dynamically influenced by their peers and the instructor. After this discussion we realized that at different points in the interviews, instructors had

implicitly taken student characteristics as given while at other times they had talked about how student behavior evolves in response to their experience in the course. This has led us to see how the concentric-ring model can be useful as a vehicle for visualizing class dynamics under either assumption, though the two applications are quite different.

Another ambiguous point that was emphasized by some conference participants was the nature of the learning that peers are supposed to enhance or hinder. We also heard a lot about the desirability of “unpacking the black box” through which peer effects might occur, whereas our approach has been more focused on identifying (and, in the statistical study, measuring) inputs to learning and outputs.

In sum, the peer-effects conference was useful in confirming the broad outlines of our understanding of instructor comments on peer effects, but also in challenging some aspects of our presentation and focusing us on additional aspects of peer interaction that had escaped our notice.

5. What We Have Learned about Peer Effects in Core Courses

The most important and universally supported conclusion from the interviews and conference is that professors believe that students contribute to their peers’ learning. Along with the influence of the instructor and external factors such as time of day and location, the actions and interaction of the students in a class contribute (positively or negatively) to the “core-course experience.”

This core-course experience, occurring at a critical, foundational stage of students’ college careers, is likely to leave a lasting imprint on their attitudes toward academic work, their proficiency in the formal skills of scholarly thinking, discussing, and writing, and their familiarity with a core body of thought that underlies modern scholarship in humanistic disciplines. It is during the first year, of which the core course is a central component, that a student sets the trajectory for his or her academic career and begins to define his or her academic personality. The environment of the core-course classroom often has a formative influence on this process.

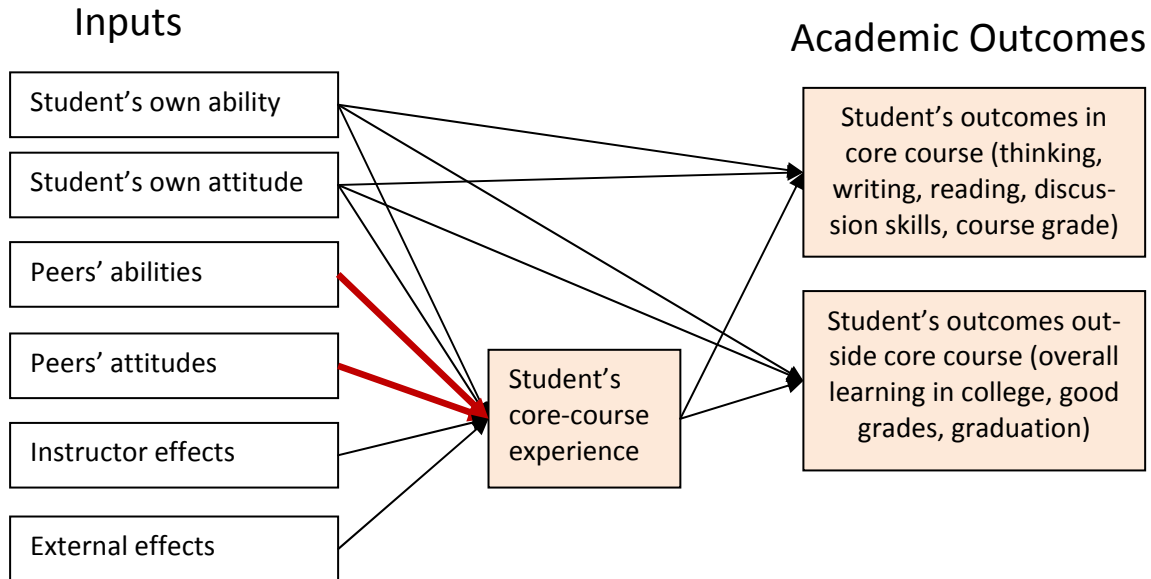


Figure 1. Core-course peer effects

Figure 1 shows a simple schematic representation of core-course peer effects. In the center is a student's overall core-course experience, the quality of which depends on the instructor, external influences on the class, the student's own attitude and abilities, and the contribution of peers' attitudes and abilities. The student's ultimate academic success—how much she learns, how well she reads, analyzes, discusses, and writes, whether or not she graduates, what kind of grades she gets, and how she goes on to use her education—depend both on her own abilities and attitudes and on the experience she has in the core course (and, though not the focus here, other courses).

Although we discussed all the arrows in Figure 1 at various points in our conversations, the interviews and conference discussions focused most heavily on the two bold red lines describing how peers influence the core-course experience. In particular, the most prominent channel for core-course peer effects was through interaction in class discussion.

This emphasis on peer effects in class discussion contrasted sharply with the general consensus that grading in the core course (an academic student outcome) is determined largely by the quality of the papers a student writes. Instructors were less confident of the link from quality of the class discussion (the central box in Figure 1)

to the student's academic outcome—even outcomes such as writing quality that occur in the core course itself. Both “academic citizenship” and academic performance are skills that are taught in the core course and can be modeled by peers. The open question is the degree to which these skills overlap. In particular: How much does a good peer discussion environment improve students' writing ability?

Models of Successful and Detrimental Peer Interaction

Is there a single model of “successful peer behavior” that applies universally in core courses or does the effect of one student's behavior depend fundamentally on the context of instructor and classmates?

Many of those assembled at the peer-effects conference were quick to point out the difficulty of generalizing about successful peer behavior. They provided several important examples of how a given classroom behavior could be beneficial or detrimental depending on context. For example, the engaged but quiet peer is not a problem if there are plenty of classmates to carry the discussion. But in a class where everyone else is also quiet, it may be critical for these engaged students to participate vocally.

Some instructors favor a somewhat confrontational, “in your face” approach in class that challenges students to state and defend their positions. Others (the majority) prefer a more polite or consensual style of discourse. An aggressive student who might thrive in the former environment could destroy the classroom atmosphere that the latter instructor attempts to create.

Students who tend to bring the conversation “back to reality” can be invaluable, but are only really essential if classmates' discussions frequently tend to float off onto irrelevant tangents. The skeptical student is most valuable when he or she has an overly consensual group of classmates who might otherwise let faulty logic go unchallenged. The consensus-builder is needed in classes where conflicting opinions are strongly expressed.

Some felt that a useful analogy could be drawn between a core-course class and a basketball team. Just as the basketball team needs players who can fulfill different

roles—scorer, rebounder, and playmaker—a successful classroom needs students who can fill various roles in discussion.

Moreover, the role that a particular student fills may depend on the other students in the class. Students may adapt to fill missing roles in the classroom. Just as a basketball player who is a natural power forward may play center on a team without a taller player, the absence of a “natural skeptic” in the group may encourage other students to fill that role.

Should we then conclude that there are no general models of positive or negative peer behavior and that all peer effects are driven by context? We do not believe so. Certain peer behaviors that we might call “fundamental classroom behaviors”—civility, engagement with the course, respectfulness, intellectual curiosity, and others listed in an earlier section—were cited by nearly all instructors as *generally* positive behaviors, regardless of the context and class.

However, the importance of context emphasizes the distinction we drew above between good peer behavior at an individual level and successful collective performance as a class. Fundamental classroom behaviors, such as intellectual curiosity and respectfulness, seem to be universally desirable: *every* student in an ideal class would behave in these ways. Other “role-specific behaviors,” such as being an ice-breaker, a skeptic, a consensus-builder, or a gadfly who raises off-the-path points, are valuable as complements to one another. If every student in the class was a consensus-builder or if all were skeptics, the class would be unbalanced and would not function effectively.

An excellent core class, then, needs to excel in both dimensions of peer behavior: (1) most or all students must exhibit good fundamental classroom behaviors and (2) the mix of role-specific behaviors must be complementary. The fundamental behaviors aggregate in an obvious way; other factors being equal, a class with more good-behaving students will be better than one with fewer. The role-specific behaviors are much more difficult to aggregate. There is no fixed formula for how such characteristics as skepticism and consensus-building behavior should be combined to produce classroom success. This limits the prospects for constructing a successful mathematical model of peer classroom behavior even if all of the relevant variables could be adequately measured.

Are Peer Characteristics Stable or Dynamic?

Another focus of intense discussion at the peer-effects conference was the following question: Are the important peer characteristics personality traits that are largely determined prior to entry into college and that do not change much or are they learned behaviors that are influenced by instructors and peers and that evolve through the core course? Both views received considerable support from our interviewees. We believe that both those characteristics developed before college and those learned in college are important.

Students who enter college at age 18 surely have growth and maturation ahead of them, thus it would be naïve to pretend that students do not change. Indeed, attending college is *supposed* to change students' lives and would be an expensive waste if it did not. Moreover, we study core courses in part because they play a central academic role in guiding that maturation at a critical moment in the student's career, so we should expect that students' behavior would be influenced by their core-course peers.

But while students surely evolve during their college years, few change beyond recognition. A student who begins his or her college career as a quiet wallflower is unlikely to metamorphose into a gregarious ice-breaker in a semester or two. While an abrasive student's rough edges may mellow some in the core course, the underlying personality is unlikely to change very much.

Thus, while the process of teaching students to behave well in class is a central part of the core-course instructor's (and peers') mission, our research suggests that the mix of basic personalities that walk in the door on the first day has a large influence on the success of the class. To the extent that we can successfully measure these personalities, it may be possible to develop a model to predict which groups of peers will interact more successfully and which will be less successful.

Limitations of Our Work

Our research has led us to a much deeper understanding of core-course peer effects. However, we recognize that it is only a first step and, as a first step, is subject to limitations that restrict the generality of its conclusions.

We examine only faculty perceptions

Professors are eyewitnesses to the learning of their students. More than that, their professional duties demand that they both encourage and measure that learning. Thus, core-course instructors are well positioned to know about student peer effects in their courses. Furthermore, the professors we interviewed have taught the core course repeatedly, allowing them to make comparisons across different peer groups of students and assess what made one group work better than another.

However, each comment made in a class of 16 students provokes 15 unique reactions in the speaker's classmates. These reactions are observable to the instructor only to the extent that the classmates verbalize them. Since few of the 15 are likely to respond verbally to any specific comment, the instructor actually sees a very limited sample of the peer interaction occurring in class. If peers interact in important ways outside of class, the professor probably misses that interaction entirely.

Thus, while we believe that we have learned a lot about core-course peer interaction from the instructors we interviewed, there is surely value in hearing from students about peers and peer behaviors that advanced or inhibited their learning. Each student may have a unique perception of how he or she has been affected by peers and comparing classmates' responses to their peers may enrich our understanding of the generality or specificity of peer reactions.

We examine only core courses

Core courses are a fundamental part of the curricula of our three colleges. But they are idiosyncratic in being centered in humanistic content and a discussion format. Although we did not invite instructors to comment on their experiences with peer effects in other courses, many did. Some said explicitly that peer effects were different in an advanced class where students all selected the class based on shared interests and common prerequisites.

At the conference we explicitly asked attendees to assess whether the kinds of peer effects that we observed in core courses were similar to those in other classes. There was some agreement that other discussion courses had similar kinds of peer effects but that student interactions were quite different in courses that featured lectures, prob-

lem sets, and labs as important components. In these classes, it is likely that instructors would be less aware of peer interactions because they would not occur in the highly visible setting of class discussion. Moreover, there was some sense that the peer effects on problem sets and lab assignments might be more ability-based than those in the discussion setting. Although attitude and personality are relevant for students working together on a difficult problem set, the academic ability to contribute to solving the problems is probably most important.

We do not unpack the “black box” of peer interaction

The comments at the conference of two educational psychologists who do research on learning made clear that our methodology looks only at the inputs and outputs of the educational process, not at what is going on inside the central box of Figure 1. By video-taping class interactions and having them evaluated either by the students themselves or by research assistants trained to look for specific behaviors, it is possible to get inside the box and learn more about the process of learning from peers.

While this is a fascinating line of research that may lead to useful insights about how students learn from each other, it is not a methodology that matches the expertise of our team. Moreover, the resource cost of such studies would limit the analysis to a very small number of class sections. We believe that our approach to peer effects is a complement to this kind of detailed learning analysis.

6. Directions for Future Research

The completion of the peer-effects interview project leaves us with both unanswered questions and ideas about specific research directions that might help answer them. There is strong consensus on the research team that we have learned as much as we can from talking to instructors. Further research should focus in two directions: trying to learn about students’ perceptions of peer effects and trying to find ways to validate statistically what we have been told in the instructor interviews.

Learning from Students about Peer Effects

We believe that there is much to learn from students about peer effects. Interviews are a very time-intensive process and given that each student's experience is limited to one core-course section, it would be very costly to extend the interview analysis to students. Surveys would provide a more efficient methodology by allowing us to solicit the responses of many students from many sections. By comparing student experiences within and across class sections, we may learn more about what kind of peer behavior they felt was beneficial and what kind was detrimental.

We could also enhance our ability to model peer effects statistically by attempting to measure the quality of the "core-course experience" directly. Using the model of Figure 1, this would allow us to separate the left-side analysis of how peer characteristics affect the core-course experience from the right-side analysis of how the core-course experience affects our measurable outcomes. We could attempt to answer questions like "Do students in class sections that they rate as good experiences tend to overachieve in terms of grades (both in the core course and beyond)?" and "What mixes of student pre-course personalities lead to good (and bad) student class experiences?"

Moreover, it might be possible to design repeated surveys that would directly or indirectly assess how peer behavior (and their reaction to it) evolves through the core course. This would help us resolve the question of how much student classroom behavior changes in response to peer and instructor influences.

Measuring the Student Characteristics that Matter

As noted above, our parallel statistical analysis looks for peer effects of the ability distribution of core-course classmates. Finding weak or non-existent peer effects in the statistical model (as we do) should not surprise us given that all of our peer measures are based on potential academic ability (as measured, for example, by SAT scores) whereas instructors were adamant that peer personality and attitude matter more.

A promising line of future research would survey the attitudes and personalities of first-year students as they enter the core course, allowing us to measure such class attributes as the number of outgoing students vs. the number of quiet ones. Paired with surveys at the end of the course asking about their perceptions of beneficial and detrimental peer interactions, this could allow us to zero in on the linkages between incoming personality attributes and influential peer behaviors. We believe that this is a most promising direction and, with the aid of new psychologist team members with expertise in measurement of personality and attitudes, we hope to move in this direction in the future.

7. References

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