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for the Woodrow Wilson National Fellowship Foundation

College Readiness: *The View from Early College High Schools*



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FOREWORD

Education reform conversations across the nation are swirling around the issues of college readiness and college completion. With the widespread adoption of the Common Core State Standards (in 35 states and the District of Columbia, at the time this report was published), states are working to close the gap between standards—expectations for K-12 learning—and the preparation students need for a successful college and workplace experience. Despite these efforts, college readiness for underserved students has still proved elusive.

For almost a decade, the Early College High School Initiative, funded by the Bill & Melinda Gates Foundation, has focused on eliminating the standards/readiness gap. The Woodrow Wilson National Fellowship Foundation has, since 2003, been one of 13 intermediary organizations nationwide to participate in that initiative.

This report by Roberta Matthews, provost emerita of Brooklyn College, bares the complexities of implementing a college-ready curriculum within the current landscape of state standards. It also looks at concrete strategies used successfully by secondary and postsecondary faculty in early colleges—small schools that blend college and high school in ways that challenge traditional notions—to improve the college readiness of students underserved in higher education.

The Woodrow Wilson Foundation's approach to early college and other college readiness initiatives centers on the active participation of college and university faculty. As this report demonstrates, without the involvement of postsecondary faculty, high schools receive little guidance about what students need to know and be able to do in college. Woodrow Wilson's six-plus decades of working with baccalaureate institutions nationwide positioned the Foundation to create early colleges that engage college and university faculty intimately in the day-to-day work of the school, bringing high school teachers into direct, ongoing conversation with their counterparts in higher education. The end goal, as with Early College High Schools throughout the national initiative, is to make college real for students who, because of the failures of traditional high schools in high-need areas, would otherwise face the longest of odds in getting to and through college.

In the pages that follow, Dr. Matthews conveys the collective experience of early college partnerships supported by Woodrow Wilson, as well as by our colleagues at the Middle College National Consortium, another of the 13 original intermediaries. The intent is to give readers a broader set of innovative classroom practices and faculty approaches to learning that can help to bridge the secondary and postsecondary divide. We are grateful to the Consortium and its faculty for their willing participation in this endeavor.

This work would never have taken place without the support of the Bill & Melinda Gates Foundation, whose commitment to American education has paved the way for a national movement toward college success for all of our nation's young people. The Woodrow Wilson Foundation is deeply grateful for this support. We also owe a debt of thanks to Dr. Matthews for her continued commitment to the issues and initiatives she describes in these pages. What we have learned from her work has value for new efforts—like enhanced dual enrollment—to reach more students in any high school setting, large or small, urban or rural. We aspire to make the Foundation's efforts in educational practice useful to leaders and institutions nationwide, and trust that Dr. Matthews' insights will help make the early college model more accessible to schools and colleges across the country.

Robert J. Baird
Vice President, School-University Partnerships
The Woodrow Wilson National Fellowship Foundation

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Although I had a prior relationship with many of the faculty and teachers I interviewed, for some I was the disembodied voice of a stranger at the end of a phone line. To all who took the time to speak with such candor and in such detail, I express my appreciation. In addition, many followed up our conversations with clarifying emails and shared a variety of materials with me. Space limitations made it impossible to include their work, uniformly of high quality, and reflective of the good thinking of committed professionals. Their pride of achievement linked with their understanding that all teaching is a work in progress reflects their deep understanding of the profession. Their students are fortunate to work with such dedicated mentors.

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I especially wish to acknowledge the good work of Kristen Vogt who gave a thoughtful and sensitive reading to the final draft and whose editorial suggestions, deletions and additions strengthened the piece immeasurably. It was a real pleasure to work with such a talented, focused, and generous person who multi-tasks with such grace and good humor.

Roberta S. Matthews

ABOUT THE AUTHOR

Roberta S. Matthews holds a doctoral degree in modern British and Irish Literature. She served as Provost and Vice President for Academic Affairs at Brooklyn College from 2001 through 2007. During her time there, she played a key role in devising a new strategic plan, envisioning the new core curriculum and creating new undergraduate and graduate programs. She launched the Center for the Study of Brooklyn and the Magner Center for Career Services. The Center for Teaching grew in prominence and effectiveness. As Provost, Matthews oversaw the hiring of over 150 new faculty and developed a rich orientation program for them. In 2003, in partnership with the NYC Department of Education and the Gateway Institute, and as part of the Bill & Melinda Gates Foundation initiative, she established the Science, Technology and Research (STAR) Early College High School. STAR graduated its first class in June 2007, with 72 of its original 76 students receiving their degrees.

Before coming to Brooklyn College, Dr. Matthews served as the founding Director of the CUNY Honors College: University Scholars Program. During 1999-2000 she served as Interim President at LaGuardia Community College / CUNY. Prior to that, she was Vice President for Academic Affairs and Dean of the Faculty at Marymount College in Tarrytown, New York. Matthews spent many years in high-level administrative positions and as a Professor of English at LaGuardia Community College. Her experience spans public and private, senior and community, small and large colleges.

Dr. Matthews has published widely and offered workshops on learning communities and active learning at colleges and universities across the country. Throughout her career, she focused on curriculum and program development, school-college collaboration, and international education, always dedicated to achieving educational excellence through intentional and proven reform efforts. She retired in June 2007 and continues to serve on education policy and advisory groups.

**COLLEGE READINESS:
THE VIEW FROM EARLY COLLEGE HIGH SCHOOLS**
Roberta S. Matthews

INTRODUCTION

Early college high schools for underserved urban and rural youth, funded by the Bill & Melinda Gates Foundation, first opened their doors in 2003-04. These small schools provide the opportunity for students to graduate from high school with one to two years of transferable college credit. Through active partnerships between college faculty and local school leaders, early colleges offer rigorous college and pre-college courses, as well as practical skills students need to succeed in college. The success of early college schools depends on these school-college partnerships that are outside the norm of secondary-postsecondary relationships in the United States today.

Although not enough time has passed to collect robust longitudinal data and analyze trends, enough time has passed for these schools to generate impressive rates of graduation, college credit accumulation and college-going (Lewin, February 2010). Early college students—74 percent of whom are students of color and 56 percent of whom are low-income—are meeting or exceeding national averages for achievement (Nodine 2009):

- In 2008, across 37 early colleges open for at least four years, 2,360 students graduated with high school diplomas. The four-year graduation rate of 92 percent is stronger than the national average (estimates range from 69-83 percent).
- Also in 2008, 83 percent of 4,198 graduates from across the initiative reported earning at least some college credits (compared to 17 percent nationally), and 40 percent earned more than one year of college credits while in early college.

**SELECTED INDICATORS OF COLLEGE READINESS,
EARLY COLLEGES VS. NATIONAL AVERAGE**

	Early College High School Initiative	National Average
% of students who graduate high school in four years	92%	69-83%
% of students who take a college class in HS	83%	17%
% of students who plan to go to college	88%	72%

(From Nodine 2009 and AIR/SRI 2009)

This brief is primarily based on interviews conducted with postsecondary and secondary partners from the early college networks supported by the Woodrow Wilson National Fellowship Foundation (WW) and the Middle College National Consortium (MCNC). The lessons learned by faculty involved in early colleges are important to examine and understand. For leaders,

policymakers, observers, and others committed to broader goals of increasing high school graduation rates and preparing college-ready students, these lessons from WW and MCNC faculty offer a roadmap to success, with all the bumps and crevices clearly delineated along the way.

In voices from the field, we learn of the challenges and solutions that will perforce drive larger efforts such as the National Governors Association's Common Core Standards initiative (Lederman 2009). Their goal—to align elementary, secondary and postsecondary learning standards with college readiness—stands at the center of early college work (www.corestandards.org). The experiences of faculty and administrators involved in creating and running schools with college partners should help shape state policies meant to support the common core and help educators at all levels modify practice in order to prepare college-ready students (Lewin, July 2010).

EARLY COLLEGES: THE TRACK RECORD FOR WW AND MCNC NETWORKS

- Combined, the two organizations support more than 50 early colleges across the nation
- An overwhelming 92 percent of MCNC early college students enroll in a college class during high school, compared to 83 percent across the early college initiative and 17 percent nationally
- In WW early colleges, 63 percent of graduates plan to attend a four-year college after high school graduation, compared to 41 percent across the early college initiative and 44 percent nationally

STANDARDS AND COLLEGE READINESS

On a daily basis, faculty and administrators in colleges, universities and early college schools confront the unintended consequences of how the standards movement attempted to reach the goal of improving the quality and success rates of secondary education. These emerging issues need to be addressed if the United States is to regain its strong position as a leader in education throughout the world.

Laudable as the standards movement is, state standards by their very nature tend to address the disciplinary content and basic skills students need to acquire in order to be certified as high school graduates. Focused on students' acquisition of enough factual knowledge so that a high school degree may be legitimately awarded, standards do not sufficiently focus on whether students have acquired college readiness skills or developed the social/emotional maturity necessary for success in college. Discipline-based state standards tend, logically enough, to be content-oriented. Often these standards are embodied in exit exams, administered at various points during a student's high school career, which necessarily drive the focus of classroom teaching.

Too often, the assumption seems to be that "covering" the standards will *ipso facto* prepare college-ready students. At their worst (as standards vary state by state), there is a notable disconnect between the standards and college readiness. As played out in the high school classroom, standards trump college readiness—if indeed an individual teacher is even aware of or

embraces college readiness goals as needing attention apart from the day-to-day “coverage” of materials (see, for example, the spring 2008 volume of *Harvard Education Review*, which explores adolescent literacy, and Lee and Spratley 2010).

Although much good work has been accomplished defining the characteristics of a comprehensive approach to college readiness (Conley, March 2007), too often individual faculty fall into three categories that demonstrate weak attention to college readiness:

- sometimes they are not aware of the specific characteristics of college readiness, in general and as related to their discipline, or
- they express their sense of the tension between addressing college readiness skills and abilities as opposed to the standards content that drives their teaching and by which their students will be evaluated, or
- they assume that they are naturally preparing their students for college by virtue of their covering the curriculum when, in reality, they are not. (For an overview of the gap between secondary and postsecondary expectations see Boser and Byrd 2009.)

In the early college environment, however, where attention to college readiness must be front and center, the tension between standards and college readiness is played out alongside and as a result of co-planning and conversation between college and high school faculty. These tensions have, as we shall see, implications for secondary education that reach well beyond the early college high school setting.



Not only does the gap between standards and college readiness criteria need to be resolved, the standards themselves—probably in an effort to be inclusive and allow for choice—often lack clarity about which topics are essential to be learned as opposed to which topics may be optional.

Without guidance, many secondary faculty vainly try to cover everything to the detriment of all, unless interventions above and beyond the standards, examples of which will be presented in this brief, further clarify the task of the teacher.

In the early college context, however, faculty are able to work together to align standards and college readiness:

- through more intentional curriculum development that serves several purposes simultaneously;
- through a focus on those contents that fall within the standards but need to be emphasized over others because they are more essential for success in particular gateway college classes; and
- through activities outside the formal classroom at both the college and the early college site that develop essential college-going qualities.

Since college readiness is front and center in the early college experience, consciousness of those qualities that ensure college readiness permeates the entire fabric of these institutions. As secondary and postsecondary faculty interact on matters involving the students whom they share and are preparing to succeed in college courses, their work underscores the difference between generic statements of college readiness skills—all of which have the ring of validity and were certainly developed conscientiously, with wide outreach and consultation—and the various on-the-ground challenges that arise and must be confronted in order to address college readiness robustly.

Over and over again, we see that when postsecondary and secondary faculty are given time to work together on practices that address common goals, the initial investment pays for itself in the development of a coherent, integrated disciplinary curriculum that serves the college readiness purpose for which it was intended. Partnerships create a core of faculty who develop the materials and vision to reach out to their peers and spread their good work with no additional expenditure.

WHAT IS COLLEGE READINESS?

College-ready students exhibit the following characteristics:

- Intellectual openness
- Inquisitiveness
- Ability to interpret texts and data
- Precise and accurate thinking
- Problem solving abilities

College-ready students are able to:

- Engage texts intentionally and critically
- Create well written, organized, and supported products of their research and own thinking (oral and written) that, as appropriate, incorporates relevant resources with correct citations to support a cogent argument
- Analyze, critique, and make connections among different works of literature and documents in various disciplines
- Use the essential concepts, principles, and techniques of algebra
- Apply conceptual mathematical understandings to extract a problem from a context; solve that problem; and interpret solutions back into a problem's context
- Determine the reasonableness of mathematical answers
- Use the scientific method and empirical evidence to draw conclusions
- Appreciate that scientific knowledge is both constant and dynamic
- Think in terms of models and systems to comprehend complex phenomena
- Master core concepts, principles, laws, and vocabulary of the discipline being studied
- Evaluate evidence and competing claims
- Understand themes and overall flow of events within larger frameworks and the theories and concepts that shape various disciplines

(adapted from Conley 2007)

The initial outlay requires deeper pockets and a leap of faith, but creates a context and an environment of deeply rooted values and approaches that help ensure a rich and continuous dialogue. The early college high school is the only model that facilitates sustained conversation and action between postsecondary faculty and secondary school teachers across all disciplines.

The body of this paper will focus on college readiness in the core subjects of English and mathematics with a brief look at some model work in other key disciplines. It will also look at how early college schools address, in Conley's words (2007), essential "academic behaviors and contextual skills and awareness."

COLLEGE READINESS IN ENGLISH

It is relatively easy to align English standards and even English state exit exams with college readiness practices; in addition, the nature of the discipline means that state standards intrude in less negative ways on classroom practice than in mathematics. This section therefore focuses on the various ways that interactions between school and college/university faculty enrich the practice of each, enhancing college readiness while adhering to state standards.

First, consider the observations of a community college professor, who coordinates a Basic Skills program at his college, about how his work as a co-teacher of a pre-college English class in the local early college school affected his thinking and work at his home college:

The point...has to do with the unspoken element of our community college pre-collegiate reading and writing courses. While all of the instructors ...who have taught these classes more than four semesters will agree that "extra-academic" skills are just as important if not more so in students' success than "content" skills, there is nothing in our course outline that supports our focusing more on this. But being in a room filled with high school students, I couldn't deny that very essential element of the class....

After teaching [the pre-college English course at the early college school], I have been more mindful of scaffolding my assignments according to the development of the students rather than simply my own understanding of the steps and processes of an assignment. I've attached more lectures and assignments to metaphors and stories. I've also gotten more involved in students' lives. Not...their personal business, and not calling home, but I let them know I want to know about them and I give them assignments so that they can tell me about the people who give them the support they need to succeed; then I remind [each student] of that person [if that] student seems to be falling off track. It's the college version of calling home.

A senior college English professor is very clear about how her interactions and partnership with the literacy coach at the partner early college school have had an impact both on the teaching of English at the early college level and on her own teaching. She is also certain that without the support of the coach she never would have gained the trust of the early college faculty nor access to their classes, which she tends to visit multiple times over the course of the year. The literacy coach, a seasoned teacher in her own right, has, over the years, functioned as both facilitator and friend, in a longstanding, personal and professional association.

Because course releases allowed the college professor to spend quality time establishing relationships with faculty and observing classes at the early college school, she came to several conclusions about teacher and classroom practice in her discipline. Faculty told her they decided which books their students would read by going to the book room to see what was available and then choosing the two books they liked best from their own reading. Although trusting one's experience with a book is not a bad way of betting that one's students will like it as well, faculty in college never use this as the sole criterion to put together a course. Regardless of whether a college literature course is driven by history or genre (and as a given in theme-based courses), the course will always work around thematic links because an important aspect of college literature courses is that the books "talk" to each other. And, based on the number of books required, a disservice was being done to students because they were being asked to read during a semester much less than a typical college course's reading requirements—about one-third as much, in fact. This in itself had an impact on college readiness. From the partner college's point of view, students were asked to read too little, and teaching was too attached to the random choice of books and to particular texts instead of being organized around larger themes.

Similarly, when the college English professor observed classes, she found that the focus of discussion was on personal opinion, with class discussion characterized by the exchange of feelings about a book. Missing from these classes was historical background, literary theory and criticism. Invited to teach a session on a particular book (and observed by the teacher of the class), the professor demonstrated, by leading a spirited discussion based on the introduction of

The college professor no longer glibly tells her first-year composition students to "forget all you learned in high school," but instead questions them closely.

some "facts" about the book (as opposed to personal opinion), that students were not cowed by this enriched approach but rather seemed to flourish in the enhanced context. The lesson was not lost on the classroom faculty in whose classes such sessions were offered, nor on colleagues during early college school/college meetings.

The professor's experiences have had an impact on her own teaching at the college as well. She no longer glibly tells students in her first-year composition classes to "forget all you learned in high school," but instead questions them closely about their experiences and is genuinely interested in what she learns. She has also transformed how she teaches master's-level courses, in which a high percentage of her students are already, or

hope to become, middle and secondary school English faculty. In her words, she is "trying to close the loop." Rather than writing traditional papers, her students now have the option of creating lesson plans for the literature under discussion. But those lesson plans must be based in research as well as in pedagogy. Since she wants her students to become English faculty who inform their teaching with history, critical approaches, and their own research, she gives them the opportunity to create these kinds of high school lessons in her graduate course, and, in turn, to demand the demonstration of such skills from their students.

The long-time relationship between the English professor and the early college school literacy coach paid off in swift action when the arrival of a new principal (new for the early college school and new to the position itself) threatened to scuttle all they had accomplished. As is

characteristic of most new principals, he was driven by the criteria on which his performance would be judged—in this case, a boilerplate curriculum, as opposed to the on-the-ground refinements of teaching and learning that the college/early college school team had worked so hard to create. In preparation for an all-day meeting between the early college school's English faculty and the college's Composition I faculty, one goal of which was to assert how important it was for students to be socialized to college mores way before they set foot on campus, the team aligned their college-readiness-based curriculum with the state standards and argued that their work did not compete with but rather supported the standards. They prevailed by demonstrating congruence. Subsequent meetings called by both sides have had as their goal refining the relationship between standards and college readiness.

Finally, here is an example of good process at an evolving early college school. (By academic year 2010-11, the school will serve grades 7-12.) For the past year, English faculty throughout the entire early college school have been working with the partner college specialist in composition to develop an integrated 7-12 curriculum focusing on college readiness in English.



The college composition professor and the chair of the early college school English Department have been working together since the inception of the school and, in academic year 2009-10, implemented a grant to give sophomore honors English students an opportunity to research and establish a Writing Center that will serve all disciplines in the early college school. The funding allowed for student tutors at the partner university's Writing Center to help train their younger counterparts at the early college. A key hope is embedded in the grant activities, partly in the elements that will contribute to the development of confidence and leadership skills and partly in the level of the honors English class: that is, the hope that at least some of the students in this class will also be the first secondary school students admitted into a university course—in this case, a first-year composition course—before their senior year. The college composition specialist and the department chair hope to build on their track record of trust and shared endeavor.

The curriculum overhaul to infuse college readiness in English throughout all grades is another grant-funded endeavor at this early college. It currently involves five professionals, both new and experienced faculty, who teach English from the 7th grade through college, including one who is also certified as and has worked as a librarian. The group hopes as well to include the special education teacher and the ELL teacher.

Curriculum development for college-readiness is fueled by two structural supports: a small grant that acknowledges the time the group has spent and will spend meeting with each other both on and off-campus; and a re-formed schedule at the early college that resulted in two significant changes—periods were 90 minutes instead of 45 minutes long, and all faculty in the same discipline had common planning time.

Once again, a relatively small infusion of funds and the availability of time to work together will enable the development of a unified and focused curriculum by professionals who appreciate the opportunity to work together to achieve shared goals. Indeed, as the 7th grade English teacher (who has her credentials in secondary English) pointed out, the 7th grade can seem awfully far away from 12th grade. Participating in this group will give her a concrete sense of purpose about her work, as well as an understanding she can share with her students of how the foundation she is laying will contribute to the future success of the students whom she teaches now and whom her colleagues will teach later.

Transformative curriculum development for college readiness depends on sustained and focused interactions between college and high school faculty around classroom practice, not on official or unofficial exhortations from above or the occasional workshop. By their very nature, English standards, approached rationally, may be used to support college readiness activities and encourage creative, professional approaches in the classroom.

COLLEGE READINESS IN MATHEMATICS

In the field of mathematics, state standards are ubiquitous and their impact on the level of attention to college readiness is most far-reaching. Standardized exit exams derived from standards shape the content of courses, often in inadvertent and pejorative ways. Perforce, a discussion of college readiness becomes a discussion of the intrusiveness of mathematics standards when developing courses or curriculum and the ways in which faculty work with or around them to address college readiness issues.

Although it is hard to generalize about state standards and the exams attached to them because they vary from state to state, it is possible to generalize about the people who create these exams, most of whom are mathematicians and educators respected by their peers, serious about their task, and cognizant of its import. States have made a real effort to gather the best people in the field to create the standards. But, ultimately, many state standards in various fields of mathematics appear as a list of undifferentiated items. For any given area or course, the items on this list might begin with the most important and work their way down to the least, but overall, such lists seem not to offer guidance to faculty about what to emphasize, what might be taught superficially or even omitted, and in what sequence the topics might most effectively be taught.

One can argue that this lack of structure reflects an attempt to be less intrusive and to offer mathematics faculty some latitude in what they teach. If the United States were filled with well-prepared mathematics faculty, confident in their ability to prepare their students well for more advanced mathematical tasks, able to pick and choose among the standards from a strong knowledge base to focus on preparing college-ready students, such a comprehensive approach might work. But with large teacher turnover resulting in the arrival of inexperienced, new faculty annually, and with so many mathematics classes being taught out-of-field by faculty whose knowledge of mathematics might be superficial, the results are often less than desirable.

Even for experienced mathematics faculty, the constraints of the standards and the standardized tests shape the content of their classes, from their point of view, in undesirable ways. Too often, faculty find that standards force them to cover non-essential materials that often have no relevance to subsequent learning. One teacher described his relationship with course standards as

a balancing act: first, his curriculum development focused on how to “get it right” in terms of standardized state tests, and then he circled back to try to fit in essential topics left out by adhering to the standards.

Standards as the Beginning of a Process

Here are two examples of how state standards in mathematics were vetted for practical application—one resulting from the work of early college school partners, the other from a statewide initiative launched by a community college auxiliary. Both are models of an important “next step” for state mathematics standards, the necessary grounding in everyday reality that increases their effectiveness and import.

In the first example, a partnership around standards grew organically from the relationship developed (and funded) over time between an early college school teacher and the chair of the mathematics department of the technical college with which the early college was associated. Both had been teaching for close to twenty years; each was experienced and had a track record of commitment to student success. Brought together by administrators from both institutions concerned that early college school graduates had poor success rates in college mathematics classes, their original assumption that they would plunge right in to curriculum development proved to be overly simple. They observed each other’s classes over time, developing a firm working relationship with both immediate and long-term results.



For instance, the early college school teacher realized, because of her class visits to the technical college, that an even-handed emphasis on topics in Algebra II did not provide her early college students with the necessary skills set for the college mathematics course into which they would be placed. She therefore revised her

curriculum to spend more time on essential topics and less on the marginally important, with more attention to logarithms being at the top of the list. Interestingly enough, across the country, college/university and early college school faculty have echoed this feedback—the need to spend more time on logarithms.

The time that this school teacher and technical college professor spent getting to know each other, learning how best to work together, and observing each other’s classes has also paid off in an evolving project that derives directly from their first-hand observations of the disconnect between each other’s classes. Ultimately, what these colleagues learned from visiting each other’s classes has been transformed into a much larger project that queried early college school and college faculty at both institutions about how they rated the content of the state standards for the pre-college course.

Since the Algebra II class was driven by state standards for the course, the early college school mathematics faculty aimed for mastery in each item. When the standards list was circulated

among members of the college mathematics department, however, the college faculty were virtually unanimous in how they ranked each item on desirable levels of mastery, levels of exposure, and levels of optional coverage, based on the content of the college algebra course into which these students would be placed. These college faculty ratings are illustrated in the table below. In this case, the feedback from the college was extraordinarily helpful for the early college mathematics faculty because it provided a vetted list of standards topics that pointed them to the most important areas and showed them what topics deserved more focus and time.

The early college teacher then asked the chair of the college mathematics department to circulate the list among colleagues statewide to see if the rankings were consistent. Because their students attend many different state colleges, the early college faculty wanted assurances that the results were not idiosyncratic to the specific course as it was taught at the technical college. This part of the endeavor is about to begin. The results will help early college faculty focus on what is not being covered sufficiently because of heavy content emphasis. This is the irony of mathematics education as it currently exists: the lament about what is not being covered

EXCERPT FROM COLLEGE FACULTY RATINGS OF HIGH SCHOOL ALGEBRA II STANDARDS

QUESTION: *What do students need to have to do well in /succeed at, as far as **minimum competencies**, before they take College Algebra (Mat 109 or 110)?*

Mastery	Exposure	Optional
Data and Linear Representations: Slope between points; slope of parallel and perpendicular lines	Exponential Functions: Exponential growth and decay	Conic Sections: Parabola, ellipse, hyperbola
Numbers and Functions: Properties of exponents	Logarithmic Functions: Logarithmic functions, properties	Data and Linear Representations: Scatter plots and least squares lines
Quadratic Functions: Solve by factoring, completing the square, quadratic formula, calculator	Logarithmic Functions: Common logs, applications, solving equations	Systems of Equations/ Systems of Inequalities: Practical applications of systems using linear programming
Polynomial Functions: Classify, add, subtract, multiply, solve domain, range	Polynomial Functions: Given graph, identify local maxima and minima, intervals where increasing/decreasing	Matrices: Inverses, determinants of matrices
Rational Functions/ Radical Functions: Solve rational equations; Solve radical equations	Rational Functions: Graphs, holes, asymptotes (rational functions)	Polynomial Functions: Remainder theorem

Note: *a standard is listed under the rating category selected by the majority of college faculty. Standards are provided for illustrative purposes only; not all Algebra II standards are included in this table.*

sufficiently because of the heavy emphasis on so much apparently non-essential material that teachers feel must be covered.

The second example of inter-institutional cooperation began as a statewide effort. Cal-PASS (the California Partnership for Achieving Student Success) is “a system that collects data about student success and transition from every segment of education, K-16 [in California]. Cal-PASS partners identify problems, develop local solutions, and bring them to scale across regions and throughout California to achieve Success at Every Level” (www.cal-pass.org). Here is how a senior director at Cal-PASS describes one initiative:

Several mathematics professional learning councils (PLCs) around the state identified the need to deconstruct the Algebra I standards. The decision emerged from conversations within the PLCs amongst the participants from all segments (K-12, community colleges, and universities) regarding what was really meant by each of the standards. The Director of Regional Collaboration quickly realized that these conversations were similar and the statewide deconstruction project emerged. Faculty from K-12, the Community Colleges, California State University and the University of California worked together to review the state standards for Algebra I. This process and product met with such success that the Deconstruction Project now encompasses Algebra I, Algebra II, Geometry and Pre-Calculus. All of the deconstructed standards may be found at www.calpass.org under the Professional Learning Councils link in the left-hand legend. They are free to download.

Over the past five years, the deconstructed standards have been used to train new and continuing faculty and define the appropriate scope and rigor for the specific mathematics course (e.g., What is the appropriate level of rigor for quadratic equations in Algebra I and how much deeper does one need to go in Algebra II). Additionally, the deconstructed standards are used to create course calendars based upon the actual complexity of the standard. Some standards are not complex and take far less time for students to master, while other standards are complex (and that is articulated in the deconstruction) and take far more time for students to master than less complex standards.

The results—given the number of new and out-of-field mathematics faculty who might receive these lists as gospel and just as easily divide the number of topics by the number of hours in a semester/year to figure out how much time to spend on them—are a call to action. Experienced faculty from all levels, in their collective wisdom, have assigned anywhere from ten minutes to three weeks to teach a particular topic. The remarkable range of the allocations in itself is a giant step in the right direction of providing faculty with guidance about the relative importance and the amount of time that should be devoted to a particular topic.

These two examples suggest different ways that state standards in mathematics should be viewed as a necessary beginning, but not an end in themselves. The point is not that there is anything wrong with the standards; rather, they require nuanced analysis in order for them to be applied effectively. And faculty who actively teach students at the secondary and postsecondary levels can best do this analysis at the grassroots level. Activities such as these focus energies on successful teaching strategies that ensure learning in key content areas and build cognitive strategies to promote college readiness and success.

Designing Backwards From Calculus: Necessary Skills and General Principles

Ideally, from the point of view of college/university faculty concerned with college readiness, the secondary mathematics curriculum would be designed backwards to prepare students for calculus. If this were the case, secondary mathematics education—whatever the context of the material studied—would be rich, focused, and incremental, and would lead to a larger vision of mathematics. Practically, it would allow students to contemplate areas of study—STEM fields (science, technology, engineering and mathematics) or business, for example—for which calculus is a gatekeeper course (see, for example, Usiskin, 1999).

This approach would address a number of concerns that echoed throughout conversations with college/university partners and the early college school mathematics faculty with whom they work. Such a focus, they suggested over and over again, would go a long way towards giving all students, regardless of where they end their mathematics education, a rich, connected background in mathematics—and the experience of a process that exposes them to the value and uses of mathematics, instead of a bunch of discrete activities to plow through indiscriminately, often without a practical context, some of which will never be referred to or used again.

The expectation in early college schools associated with senior colleges is that many, if not most, of the students should be prepared to study a college-level calculus class in their senior year of the early college school or, at the latest, their first full-time year at a college. Early college mathematics partners therefore spend a good deal of time designing courses with these goals in mind, ever mindful of state standards-based mathematics exams along the way that they often view as barriers to their goals.

For school/college partners at one early college school, the goal is to create a “lean and mean” curriculum that focuses on calculus readiness as an ordinary goal, not an extraordinary one, with attendant high-stakes state examinations as “just another test.” Their goal flies in the face of two constants: the state standards and their attendant exit exams for typical courses scheduled before calculus, and typical high school mathematics textbooks that, as one professor observed, must have ten months’ worth of material, much of which is not necessary for calculus. Indeed, a mathematics professor at another college associated with an early college characterized pre-calculus as a “remedial” course. This faculty member considered pre-calculus to be filled with materials that could (and should) have been covered well in enriched and focused earlier courses in algebra, trigonometry and geometry, but instead were covered superficially or not at all, partly because of the impact of standards, their related textbooks and tests.



Emphases and Agreements

Designing backwards from calculus is often more of a goal than a reality. In all the conversations conducted for this brief, regardless of the level of college mathematics that early college school mathematics teachers and professors were working on together, there were areas of widespread general agreement—especially about topics not covered at all or covered superficially that should instead be covered in depth. Individual teams of faculty who worked together and understood how their curricula should link had common understandings and expectations about student performance.

Virtually every team, for example, regardless of the level of mathematics involved, mentioned the need to spend more time on logarithms and exponentials. All could specifically name those topics that were not covered in the depth necessary for either the next secondary or postsecondary course in the sequence. Indeed, since agreement on the need to spend more time in-depth on a smaller number of topics is so widespread, one wonders why the chorus has not been heard. Yet, given the packed mathematics curricula so common in the nation's secondary and postsecondary classrooms, the idea of "enriching" an already overloaded curriculum meets with dismay from mathematics teachers, especially since they often find themselves teaching students who arrive in high school several grades behind in mathematics.

There was consensus that mathematical concepts needed to be taught in terms of their practical, real-world applications and use, and that the introduction of new concepts should occur in hands-on laboratories or activities, to be followed by lecture, instead of the other way around. Acknowledging the difference between experts (the faculty) and novices (the students), there was agreement as well that time had to be spent defining the language used to introduce new concepts, so that very basic differences in how terms are used in everyday English and how those same words are defined in mathematical contexts could be surfaced and acknowledged. New meanings for familiar words need to be explained and illustrated.

Reflecting current best practice in the teaching of mathematics, most mathematics faculty had abandoned the expected approach of beginning each new semester with a three-week review of what students had learned in the past semester or year, choosing instead to integrate review on an as-needed basis. The mantra of in-context, real-time learning and review instead of a disembodied backward glance over the last semester or year was pervasive. Faculty believed that seeing how and why a function could be applied, then applying it immediately, was a much more effective way not only of reinforcing prior learning but of demonstrating how that prior learning was related to new areas of exploration. Perhaps this observation goes together with the consensus that fewer topics needed to be taught, and that they should be taught in context and in depth, so that students would see why learning a particular concept was important and useful and how it might lead to further understanding.

All cited the importance of a thoughtful, well-designed, integrated, incremental mathematics curriculum that addresses the knowledge and abilities assumed by college mathematics courses, instead of a curriculum that races through fragmented concepts, pockets of knowledge and skills, and long lists of seemingly disjointed topics. As one very committed college partner of an early college school pointed out, the majority of overloaded mathematics curricula are not built for student success. They focus on getting through an excessive number of discrete skills instead of

developing fundamental mathematical learning skills. Both faculty and students feel overwhelmed by the rush to get it done, rather than think about how and why material is important in itself and as a stepping stone to more advanced material.

Mathematics faculty in senior colleges (from both pure and mathematics education departments) cited two related issues that made their work more difficult: the gap between faculty in mathematics departments and mathematics educators in the school of education, who “live in different worlds,” and the general lack of interest in mathematics departments in reaching out to non-mathematics majors in college—much less secondary school students. As one pointed out, “Faculty in English departments don’t feel that way. They want all their students to understand and love Shakespeare. But mathematics faculty are only interested in their majors and actively discourage the presence of other students in their classes.” Another noted that he was the only faculty member in mathematics (pure or education) from his large university who was working closely with the partner early college school.

Faculty themselves noted that professors in mathematics departments and mathematics educators in ed schools “live in different worlds.”

This is unfortunate. Over and over again, early college school partners recounted how their working together was transformative. Just visiting each other’s classes resulted in changed methods of teaching to help students make necessary connections later on, when they used particular concepts in more advanced mathematics courses. At one early college school, the adaptation of a college course to serve as a dual enrollment course—offering students two units of high school credit (one for each semester) and three college credits (for a “stretch” version of a what was normally a one-semester course)—was part of an NSF grant-funded SENCER project. The students in the course did well on the state exam; many

went on to handily pass the college pre-calculus course; and some will go on to calculus not because it is required but rather because they discovered that they like to study mathematics. At another early college school, a 9th grade mathematics teacher working with her college partner to develop the revised early college mathematics curriculum reports that her students now say mathematics is their favorite course. Exposed to mathematics classes that are intentional and focused, students rise to the challenge and discover that they love mathematics. Finally, at the very least, the impact of secondary and postsecondary faculty working together is a dramatic shift in outlook: “We don’t blame them and they don’t blame us—we are all on the same team.” And, as one mathematics professor who is actively engaged in working with his early college colleagues observed:

... that university partners are not employees of the school district, and therefore need not report to district administration about what they observe in classrooms, allows them to create a bond of trust with mathematics teachers. Teachers know that comments, advice, and mentoring from university partners are honest and concerned only with the teaching and content of mathematics, and so those teachers respond themselves with honesty and real questions of concern that in the presence of district administration (however benign) they might be wary of raising, to protect their jobs or status, or just not appear ill-informed or silly. There is, in effect, a natural professional confidentiality bond with university partners opening a safe mental space in which real professional mathematics development can grow.

Although the speaker is a full professor of mathematics, his commitment to working with his early college colleagues focuses attention once again on the question of how engagement and teaching are valued in the work of university faculty—issues raised by Ernest Boyer in *Scholarship Reconsidered* (1990) and recently revisited by Gordon Gee, president of The Ohio State University, in his remarks about action research, social engagement, and related activities as alternative paths to the full professorship (Welsh-Huggins 2010, Jaschik 2010).

Training and Background of Mathematics Faculty

The common thread throughout conversations with mathematics faculty at both secondary and postsecondary levels was the necessity of having a rich background in mathematics in order to teach mathematics well (see for example Greenberg and Walsh, 2008 and Usiskin, 2001). Faculty need real insight into mathematics, a general framework of thinking and speaking mathematically, to prepare students for the next level of mathematics instead of just covering a topic in isolation. In addition to a solid background in mathematics, the language faculty use to introduce and develop a particular concept must prepare students for the next level—even if that level will be covered in a subsequent course.

Faculty must, therefore, understand the ultimate goal behind teaching certain topics and have the background to teach their students what they will need to know in order to succeed. One professor noted, for example, that how methods of solving inequalities was taught would either prepare or hinder students from moving on to the next level of quadratics. Another professor cited, as the basis of his long-standing collaboration with the early college school mathematics teacher, that teacher's background in physics as well as mathematics and his comfort using complex mathematical functions for a variety of purposes. His background informed and enriched his teaching.

Such understandings go both ways. Another professor was grateful to his 6th and 9th grade early college school mathematics teacher partners for helping him sort out, during their curriculum development work, where content was indeed superficial as opposed to where it appeared to be superficial to him—because he does not work with 14-year-olds. They have helped him to distinguish between genuinely shallow approaches and what is developmentally appropriate for young students.

By virtue of their ambitious goals, the often poor mathematics backgrounds of their students, and the commitment of so many early college schools to STEM curricula where mathematics plays a central role, the teaching of mathematics has taken a front and center position among the curricular concerns of early college schools. As they grapple with the various challenges they must overcome in order to declare success, many early college schools have developed the vision, curricula and values that could transform the teaching of mathematics. As in English, longstanding and deep relationships between those who teach the discipline at different levels invariably lead to shared understandings that serve students better. And students, exposed to different and higher sets of performance expectations, tend to rise to the occasion and perform at levels they never thought possible (see, for example, Goldenberger and Bayerl, 2008).

COLLEGE READINESS BEYOND THE BASICS

Intentional college-ready curriculum development in all disciplines is common within the early college schools context. Such necessary efforts take into account and address the structural autonomy of both secondary and postsecondary sectors that too often result in a lack of understanding or action supporting what should be shared goals. Designing backwards from college/university practices or often unspoken assumptions yields rich curricula and confident students and addresses what is too often viewed as the rigidity and resistance to change of some college/university faculty. Here are two examples—in history and chemistry—of courses designed backwards to prepare college-ready students.

A dedicated history teacher at an early college school worked with his college counterpart for several years, attended her classes, and shaped the syllabus of his high school class around hers so that early college students in his class would already be familiar with some of the language, people and events they would be confronting in the college class. He also offers a weekly seminar to review important points from the college course with students. He works with them

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not only to answer questions they have but also to model how to ask and answer such questions by oneself. He persists in this endeavor, which is largely uncompensated, because his students consistently tell him that this was the experience that best prepared them for college.

A nationally recognized professor of chemistry at a major university has developed a high school text, originally piloted in a local school district and currently being used at an early college school, which has as its goal preparing students as independent and as group learners able to cope with the infinite variety of approaches to introductory chemistry they may confront in first year college courses (Stacy 2010). Her text includes topics

covered in the state standards, but does so in such a way as to develop students’ learning abilities and give faculty time to focus on how students learn, rather than on just covering content.

Although the text was piloted in a local school district, it is in the early college school, working with an experienced teacher (who was part of the original pilot but left to do graduate work with the professor and is now teaching in the partner early college school), that the implementation of these materials has moved to deeper, richer levels of student involvement in their own learning.

As one experienced secondary school/early college teacher observed, “It is so easy to be an island when teaching high school. If you are not thinking all the time about what kids really need for college, it is simple to focus on the day-to-day or yearly goals and not to look forward to college.”

STUDENT SUPPORT IN EARLY COLLEGE

Standards tend to focus on academic content, but college readiness also requires students to exhibit other skills in order to be successful in college. From their inception, early college schools understood the importance of, and integrated into initial designs, social and emotional

supports for student success, as well as the development of what David Conley (2007) characterizes as “academic behaviors” and “contextual skills” necessary to ensure student achievement. These college readiness attributes help students develop and sustain their focus on academic goals and internalize the key assumptions, attitudes, approaches and mores that contribute to success in both secondary and postsecondary contexts (see, for example, Dweck 2010 and Smilkstein 2003).

Although virtually all high schools have “home room” or “advisory” or “college prep” courses, efforts in the early colleges are more sustained and intentional because their students are exposed to college-level courses earlier than their peers and need a jumpstart to prepare them for a positive experience. Early college advisory efforts share some telling characteristics, each of which will be discussed separately below. All of these combine to create powerful experiences for students whose skills in particular disciplines are enhanced by the attention paid by their early college schools to the cultivation of extra-academic attitudes, skills, and abilities.

Beginning Early

At one early college school partnered with a large research university, initial efforts to engage the middle school students with whom the early college school was launched were enhanced by their working closely with a highly regarded, award-winning professor at the university. She has published widely on the social/emotional developmental needs of students (Weinstein 2002). Her research has demonstrated the insidious nature of self-fulfilling prophecies for students who receive the message from an early age that they are not very smart and are not college material. The new early college became a laboratory for demonstrating the validity of her research.

This early college school has profited as well from its association with a large public charter school organization. Their extensive college readiness materials involve faculty, students, and parents in a comprehensive system of supports and resources. The net effect is an insistence that students become college-ready in an environment where all adults with whom they come into contact assume this will happen.

Based on highly respected and current research on environments that support students and their families, this school’s combination of early and sustained interventions offers ideal conditions for student success. The materials—approaches based on research that supports success—would lend themselves to much wider adoption as long as schools were willing to focus the time and resources necessary for wide-scale implementation. Although not all early college schools begin in middle school, the common lament of those who work in early college schools that do not have a 6th grade is that they



wished they had more time. For these early college schools, advisory begins in the 9th grade, but follows many of the same, comprehensive patterns.

An Intentional and Comprehensive College Readiness Curriculum

The evolution of one initiative highlights the need for age-appropriate college readiness materials and the advantages of being part of a national network. When graduate students in education were assigned to work on college readiness with the partner early college, their first attempt involved bringing the materials developed for the first-year seminar for university students to the early college. (The first-year seminar is a common model designed to introduce new college students to the skills, resources and pathways to success in higher education.) These materials proved to be age-inappropriate and were not particularly relevant to the needs of first-year high school students. Although it was clear to participants that their presence alone (four graduate students were at the early college several days a week) made a difference, the fact remained that the college syllabus did not travel well, and they needed to find more appropriate materials.

At this point, the lead graduate student attended an early college network convening where he spoke with an assistant principal from a sister early college who had just piloted a set of college readiness materials and offered to share them with him. The assistant principal had been looking in vain for a suitable college readiness advisory curriculum. She had convinced the university with which her early college was associated to hire a consultant to adapt David Conley's academic behaviors and contextual skills into a multi-year (8th and 9th grade) advisory curriculum, and was currently piloting it with her students. Her only regret was that the consultant had not been asked to create a tool to assess the effectiveness of the curriculum. She contacted the



associate director of her early college network who shared with her relevant survey instruments that were part of a larger evaluation study at another early college school. They were designed to answer the question, "How do early college course experiences influence students' college readiness?"

The surveys were created to align selectively with Conley's (2007) college readiness model. Specific aspects of his model were emphasized, based on the goals and needs of the early college school for which it was designed. As such, the three measures of college readiness used in the surveys represent Conley's key cognitive strategies of intellectual openness, inquisitiveness, analysis and interpretation. Library and research paper skills represented Conley's overarching academic skills of writing and research. And the study skills measured by the survey represented Conley's academic behaviors of self-monitoring, metacognitive skills, time management, and preparing for exams.

Both the assistant principal and the graduate student will rely on these materials to assess the effectiveness of the Conley-based college readiness materials they are using in their advisories at the two early college schools.

By itself, this series of events demonstrates the value of belonging to a network. The skein of interrelationships and shared concerns, materials, and goals underscores the advantage of early college networks that facilitate, in any number of ways, communication among their constituents. Materials and assessments developed for similar purposes make the rounds as faculty and administrators who share the same kinds of students and goals speak to each other, enrich understandings, and collaborate to provide quality experiences for their students.

At the original early college, the graduate students are now working with all faculty involved in advisories and developing intentional materials for all grades, focusing on college readiness. The salutary presence of graduate students provides role models for the students and has helped the faculty enrich advisories at all grade levels. Professional development initiatives and new approaches have resulted from the initial attempt to locate and use appropriate college readiness materials.

Especially for early college schools not located on a college campus, but for all early college schools regardless of location, the intentional college readiness curriculum must be reinforced early and to the greatest extent possible with sustained and incremental exposure to the college partner. Since early college students will be sitting in college courses sooner rather than later, there is an urgency about intentional contact with higher education.

Such interactions take a number of forms before the students spend extended amounts of time on a campus taking college classes; an early college school's focus on college readiness must be supported by frequent forays into the world of higher education. They include the following:

- at the end of advisory, making day-long visits to campus, where student guides accompany early college students on interest-related campus tours,
- shadowing college students for a full day and attending their classes with them,
- using college students as peer tutors and counselors for the early college schools,
- having college students involved in related college initiatives adopt an early college student as a little brother or sister,
- inviting early college students to campus activities, ranging from sports events to concerts,
- orienting early college students to the college library so they can do original research on well-defined topics,
- offering six-week non-credit science workshops to first-year early college students, and
- offering three- or four-week workshops taught by college professors from various disciplines to early college students during college intersession.

All these events share the same goal: They strengthen the conviction that every early college student will attend college. Through familiarity with a college campus, they reinforce the college readiness curriculum that provides students with the essential social/emotional attitudes, academic behaviors, and contextual skills. All help make attending college a foregone conclusion for early college students.

It Takes a Village

From their inception, early college schools understood that preparing students for college involves everybody at the school: faculty, administrators, guidance counselors, college faculty and students, and parents. Faculty preface remarks with "when you go to college" and take the time to build in assignments relevant to their discipline that relate to the college-going process—reviewing college requirements, looking into financial aid opportunities, and so forth. One early college school has themed college readiness weeks where everybody in the building is focused on one aspect, such as "producing quality work." Others strive to teach students about realities in higher education by not

The early college school offers a wrap-around environment of college going as the goal and a universal commitment to making it a reality for every student.

accepting late work or extra credit assignments. Sometimes these actions fly in the face of district practices that focus more on retaining and passing students than on preparing them for college success.

Good faculty in all schools are always on the lookout for students who are underperforming; they try to reach out to them to discover reasons and solutions. But the early college school offers a wrap-around environment of college going as the goal and a universal commitment to making it a reality for every student. The impressive statistics associated with early college high schools are not accidental. They support the effectiveness of comprehensive, intentional, early, and ongoing

approaches that reinforce one another and that permeate the environment. Students are not singled out, sorted, and tracked. Early college schools assume that all students are college material, and an impressive number of students accept and act upon that assumption. They rise to the occasion by completing college courses while still in high school and then going on to continue their education after high school.

CONCLUSION

When secondary and postsecondary professionals work together, it is often difficult to predict what they will discover. Not all sites need the same things, nor do they necessarily learn the same things about themselves, but the steady part of the equation is the necessity for dialogue and the obligation to develop a process that supports it. Without dialogue and the possibility of change, all the well-meaning lists and research available are doomed to have little impact on practice.

Messiness and uniqueness are part of the mix. Personal associations that began as curriculum development projects to facilitate site-based understanding envelop entire departments and spread out across whole states to reconcile standards and college readiness; professional mentor partnerships serendipitously uncover the astonishing ability of early college students to take charge of their own learning; individuals who might never speak with each other during the course of their professional lives discover common ground in the students they share and in the unique contribution each makes by enriching the understandings and approaches of newfound colleagues. In all such situations the students are the real winners.

Because they go against the grain, early college school/college relations are fragile. Established practice exists because it is supported by established policy. Creating a new model confronts one not only with the challenge of the unknown but with the challenge of the known as well. Dismantling the old while simultaneously creating the new can be exhausting and often alienates those committed to or trapped in the status quo. Yet change occurs when the known and comfortable are challenged to become better. Those who are doing the challenging, in this case those working within the early college model, deserve to be supported, especially if the results of their work are so much better than business as usual.

Ultimately, relationships between the secondary and postsecondary sectors will only be changed by policies that insist on the need for a seamless educational experience for students as they move from secondary through the various levels of postsecondary education. State standards for high school graduation must be wedded to comprehensive college readiness initiatives that acknowledge the larger educational goals of the nation. Policies will have to acknowledge that implementation depends on educators being given the time and space to work together as colleagues.

We have identified the comprehensive skills and abilities students need in order to make a successful transition from secondary to postsecondary education. But we must move beyond the well-researched, exhaustive lists of such skills and abilities to tackle the much larger challenge of translating them into real ways of knowing, embedded in the minds and lives of the students whose lives we wish to enrich. The early college school, which joins the disciplinary expertise of college faculty with the pedagogical insights of high school faculty, offers a replicable model of essential human intervention. Secondary and postsecondary educators working together yield a powerful change model in which students emerge as the victors, rather than the victims, of our educational system.

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