

Proposal Cover Sheet

Title: Analyzing the Transition from Developmental to Supplemental Education

Initiative: [IU Learning Analytics Fellows Program](#)

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ABSTRACT

Efforts to broaden access to higher education have drawn new attention to remedial education. Traditionally, schools assign under-prepared students to non-credit "developmental" courses, most commonly in reading and mathematics. While such courses fit neatly into schools, they usually deliver paltry rates of completion, future enrollment, and graduation for students placed in them. This means in turn that schools routinely make highly consequential decisions based on a single data point from a test whose predictive validity may be unknown. Many now argue for increased focus on more major-specific developmental course (if any) and "supplemental" approaches that are embedded directly in introductory courses or offered alongside them. These include peer-assisted study sessions, centralized drop-in services like writing centers, and a range of other options. While the simmering debates between proponents of developmental and supplemental approaches have heated up, both approaches (a) represent significant investments by institutions and learners, (b) have proven difficult to rigorously evaluate, (c) could be more readily evaluated with learning analytics, and (d) could be more readily improved with learning analytics. The proposed project will explore all manner of accessible IUB evidence regarding undergraduate developmental and supplemental instruction. The project will then search for ways to use this data to study and enhance the precision with which students are placed in or offered these services and the success of these services. The actual research techniques used will depend on the nature of the student data that is ultimately accessed. It is hoped that sufficient data will be accessed to allow (a) propensity scoring analysis to compare students placed into developmental courses with similar students who were not, and (b) repeated-measures analysis of variance to examine the impact of dependent variables associates with supplemental instruction with dependent variable concerning student outcomes. Given the large investment by students, programs, and schools in remedial education, the proposed project has the potential to dramatically impact success among struggling undergraduates at Indiana University.

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Most colleges and universities offer some form of remediation or assistance for struggling learners. Traditionally, these services attracted little attention in the US. However, efforts to increase college attainment and success have drawn new attention to both the cost and the effectiveness of these practices.

The Growth of Developmental Education and Resulting Controversy

Non-credit remedial courses seem to be attracting the most attention. In the US, they are typically referred to as *developmental education* (DE). Students are usually placed in DE courses based on their score on placement tests. Most DE courses focus on English or Mathematics, and students usually must pass those classes (and sometimes the placement test) before they are allowed to enroll in for-credit courses. Proponents argue that high quality DE courses give struggling students the time and focus to prepare for more rigorous introductory courses (Boylan et al., 1995, 1997, 2007).

As reported in the *Wall Street Journal*, the number of college students taking at least one DE course rose from 1.04 million in 2000 to 2.7 million in 2012 (Mitchell, 2014). This trend reflects a sharp rise in college enrollment among low-income, minority, and older populations, and increasing expectations regarding mathematical proficiency (Oakley & Burdman, 2015). A recent editorial expressing concern over growing DE placements pointed out that 85% of community college students in California were required to take at least one remedial math course. The increased focus on DE in mathematics is highlighted in a "Dear Colleague Letter" posted by the National Science Foundation in 2014. As a field-driven (rather than mission-driven) agency, the NSF is chartered to reflect the consensus of the scholarly communities. Hence "DCLs" represent rare efforts to direct the community and signify a major concern across the entire foundation. Citing the obstacles that initial mathematics courses present for all STEM-related majors and careers, the DCL sought new proposals for "innovative early state work...to improve the learning of the content of developmental mathematics, independent of setting, and the design and development work on interventions and tools, including technology-enhanced learning approaches." The proposed Student Learning Analytics research aims to lay the groundwork for such work.

As with other aspects of education, stakeholders and researchers have debated the effectiveness and return on investment from DE. There is broad agreement that only a fraction of students who test into DE reading and math courses go on to graduate (estimates range from 10-25%). Pointing both to these statistics and the population of students who end up in DE, some have used the term "remedial ghettos" to describe these programs. The president of the right-wing Fordham Foundation argued that perhaps these students should simply not be admitted to college (Petrelli, 2013; 2014). Others point to studies of comparisons of students just above the placement test cutoff with students just below the cutoff that prove remedial courses substantially increase dropouts (Scott-Clayton, Crosta, & Belfield, 2014). Others have questioned the predictive validity of placement tests, pointing to evidence the high-school GPAs are more precise (Oakley & Burdman, 2015), and studies showing that over half of students place in remedial English and mathematics could have earned a C or better *without* remediation (Scott-Clayton, 2014). In particular, the Community College Research Center at Columbia University has been quite critical of DE (e.g., Baily et al., 2009, 2010, 2012, 2013) and have challenged the evidence that Boylan and other proponents have marshalled to support DE. Indeed, transforming DE is one of the five core principles behind the 2009 creation of an organization called *Complete College America*; their 2012 report is one of the most comprehensive critiques of DE to date.

These debates point to the fundamental challenges associated with evaluating the effectiveness of DE (Grubb, 2001; Levin & Calcagno, 2008). But, the persistence of DE in the face of these blistering critiques also points to institutional factors favoring DE courses. Because DE courses fit within the existing course-based structure of most schools, it is a relatively straightforward matter to organize them and charge tuition for them. Current law allows students to use up to one year of Pell Grants for remedial coursework. As such DE course represent a significant revenue stream for some institutions; most of the alternative described next introduce financial, logistical, and evidential challenges that this proposal aims to explore.

A Shift Towards More Contextual and Supplemental Approaches

Some of the concerns over conventional (i.e., "general") DE courses reflects a broader shift towards more "contextual" models of cognition, learning, and instruction (e.g., Sticht & Hickey, 1997). Some states and colleges have stopped requiring remedial courses, while others are breaking them up into smaller more specific segments. In

2012, a consortium of several higher education organizations (including Complete College America) concluded that the domain-general nature of many remedial courses was at the core of the problem. At minimum, the consortium argued that incoming students should be required to declare a "meta-major" (such as social science, health science, STEM, etc.) so that any DE courses (but particularly English and mathematics) could be tailored and contextualized to those majors (Dana Center, et al, 2012). In a 2015 update, a larger version of that same consortium argued that remediation should "be provided in conjunction with gateway courses in the student's academic or career area of interest through co-requisite or other models with evidence of success in which supports are embedded in curricular and instructional strategies" (Achieving the Dream, et al., 2015).

On the face, this seems like a strong endorsement of well-established alternative to DE known as *supplemental instruction* (SI). SI has been widely used since the 1980s to enhance student engagement and support success in lower-level undergraduate courses that generate a high proportion of withdrawals and failing grades; it is often offered as an optional support, though some schools require some students who score below a particular threshold to participate in some form of SI. Perhaps the most popular is the Peer-Assisted Study Sessions (PASS) model widely shared by the International Center for Supplemental Instruction (<http://www.umkc.edu/asm/si/>), PASS typically has upper-division undergraduates who have successfully completed the course offer regular face-to-face meetings where current students compare notes, discuss readings, develop tools, predict test items, etc.

Another widespread form of SI targets student writing, via drop in "writing centers" that provide students with free assistance on their papers, projects, and reports, typically in individualized tutorial sessions (Carino, 1995). Distinguishing them from composition courses, writing center tutors generally provide non-prescriptive and non-corrective feedback. Rather than proofreading and editing, writing centers typically focus on the purposes and function of writing, facilitating the students' revision of their own work by discussion the topic and helping them identify patterns of grammatical errors (Murphy & Law, 2013).

Dozens of studies have shown that SI reduces attrition, improves achievement, keeps students in challenging majors, is cost effective in terms of increased tuition streams, and increases graduation rates (Topping, 1996; Bowman-Perrott, Davis, & Vannest, 2013). Nonetheless, PASS and other similar models of SI still represents a significant financial and logistical investment for institutions and students. In the shift away from remedial courses and towards supplemental instruction, many institutions support academic and writing assistance via fees associated with enrollment in general or for specific courses. However, such fees, along with tuition, are continuing to rise at a pace that far outstrips inflation. SI also requires schools to recruit, train, and pay peer mentors, and then find space and schedule meetings. Conventional SI also requires students both schedule for and then attend sessions, and is not suitable for online students. While there is extensive evidence showing that SI is cost effective in terms of reduced attrition and increased grades, some observers have critiqued (a) the non-experimental nature of most prior SI research, (b) the lack of complete institutional return-on investment (ROI) analyses, (c) and the complete lack of ROI analyses of learners' time.

A particularly worrisome finding in several studies is that SI sometimes focuses too closely on past test questions and discourages more conceptual meaning-oriented engagement in student study skills more broadly. This points at the centrality of *assessment evidence* in the entire remedial education landscape. Most remedial placements are based on a scores on a single test and the success of remedial programs is mostly based on completion and grades, which are often based on teacher-developed classroom assessments. This seems risky given the modest reliabilities of many classroom assessment, wide variations in test-preparation and increased concerns over cheating (due to smartphones and social media). Given the importance and cost of remediation, increased attention to student data and more sophisticated methods are needed.

Proposed DE and SI Analytics

The aforementioned 2015 consortium report also argued "every student should be kept on track...through the institution's use of effective mechanisms to generate, share, and act on academic performance and progression data." (p. 1). Fortunately, many institutions are now starting to take advantage of the plumes of data being generated by their learning management systems and registrars' offices to examine precisely these sorts of questions. Placement tests are increasingly completed online, and placement programs are increasingly tracking student success. The proposed study aims to use learning analytics to explore remedial and supplemental instruction at IU Bloomington, with a particular focus on mathematics, English, and informatics. Specifically, the proposed study will search for and analyze student data that can shed useful new light on (a) the existing placement systems and the predictive validity of their assessments, (b) placement and completion rates in non-credit bearing DE courses, (c) success of students after completing DE courses, (d) and access and impact of formal PASS courses and other peer tutoring methods, and (e) use and impact of the Writing Centers. It is expected that awarded funds will be used to

provide summer support for Joshua Quick, a doctoral student in Learning Sciences who has an MS in Applied Statistics and a keen interest in Learning Analytics.

The actual research techniques used will depend on the nature of the student data that is ultimately accessed. It is hoped that scores on placement exams will be accessed along with data on placement and grades in DE courses, enrollment and grades in subsequent credit bearing courses will be analyzed, and graduation data will be accessed. This will make it possible to use propensity scoring to maximize the likelihood of comparing equivalent samples of IU undergraduates who are required to take DE courses with peers with slightly better scores who are allowed to enroll in credit bearing courses. It is also hoped that sufficient data on SI will be accessed to allow for repeated measures analysis of variance of independent variables concerning participation (e.g., frequency and intensity) and nature (required vs. optional, course vs. department vs. college, etc.) on dependent variables like grades, continuation in major, and graduation). It is assumed the hierarchical linear modeling will be used to account for interclass correlations and the attendant variance associated with particular classes and cohorts.

Given the significant investment of resources by students, programs, and colleges in remedial and supplemental instruction, the research has significant potential for improving undergraduate learning. In particular, given the evidence that placement in DE courses leads to dramatically reduced graduation rates, the proposed study might shed important new light on the current placement practices and the effectiveness of those courses. Additionally, the proposed research promises to result in new solutions the remarkably thorny problem of evaluating the effectiveness of optional SI programs.

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