American Council on Education®

Estimating the Return on Investment (ROI) for Instructional Improvement Efforts

An Overview of the ROI Tool (beta version)

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CONTENTS

Background & Goals 1
What Is the ROI Tool? 1
How Was the ROI Tool Developed? 3
Corequisite remediation redesign 4
Blended introductory coursework redesign 5
Other instructional reform efforts 6
How Does the ROI Tool Work? 6
Step 1: Enter Institution Information 7
Step 2: Select Instructional Improvement Effort of Interest 7
Step 3: Enter Course-Level Information 8
Step 4: Review Anticipated Post-Effort Course Pass Rates 8
Step 5: Enter Institutional Financial Information 8
Step 6: Enter Effort-Related Costs and Cost Savings 9
Step 7: Select Institution's Enrollment Strategy 9
How Are the ROI Estimates Derived? 9
Calculations for total additional net revenue 9
Additional net revenue due to post-redesign FTE enrollment and retention 9
Cost savings 11
Calculations for total additional costs 11
Piloting of the Tool 12
Appendix A – Impact of Select Instructional Improvement Efforts on Course Pass Rates 14
Appendix B – Data Components Checklist 16
Required 16
Recommended 17
Optional 17
Appendix C – Questions for Pilot Institutions 18
References 19

BACKGROUND & GOALS

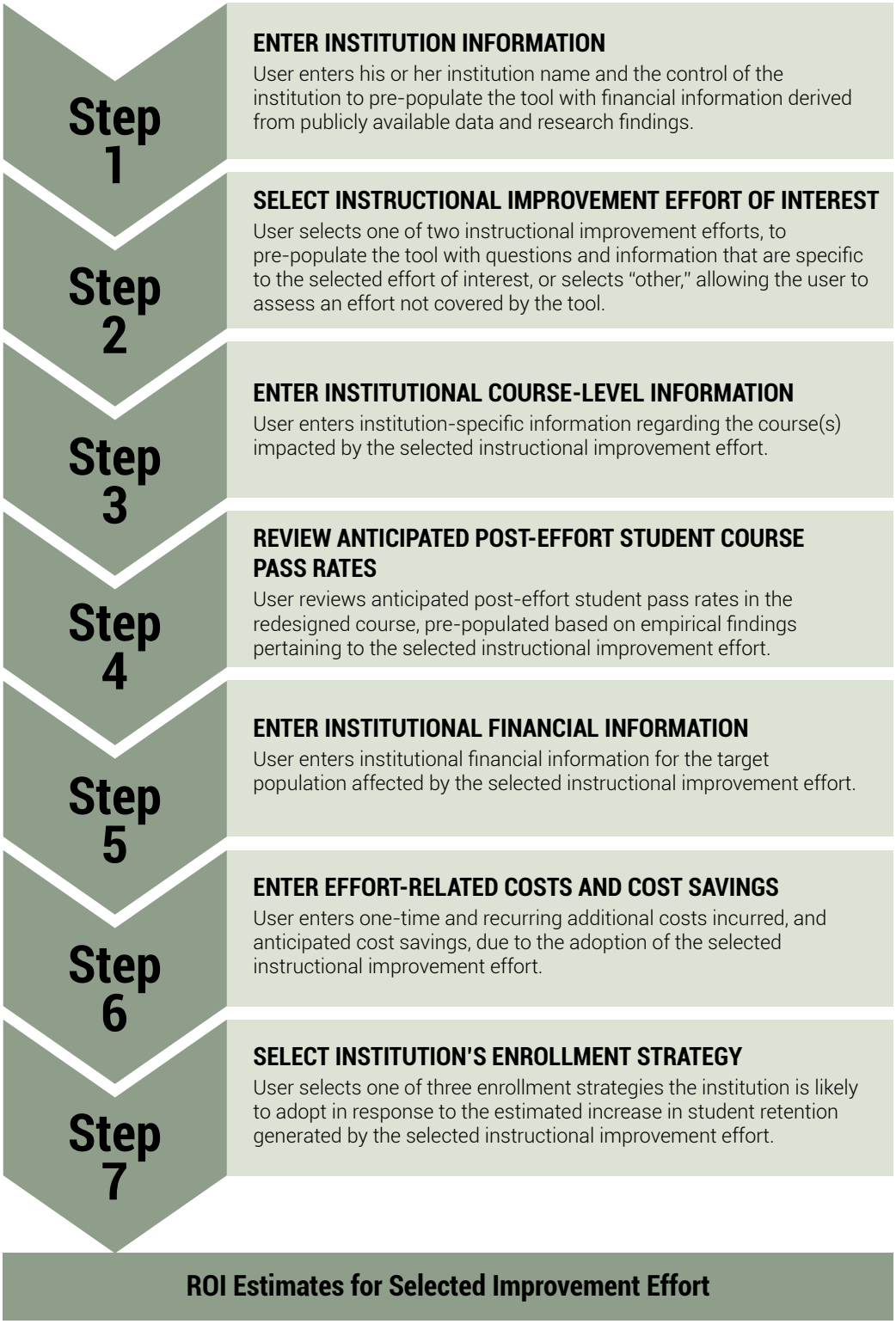
Institutional leaders are under strong pressure to improve instructional quality and student outcomes, while maintaining or reducing costs under increasingly limited budgets and with an uncertain future. The high initial costs of reforms or new initiatives, and the conventional view of the relationship between instructional expenditures and net revenue, are often discouraging and can obscure the potential fiscal benefits of many reforms (Brown and Kurzweil 2017). As a consequence, institutional leaders are rarely aware of the revenue that initiatives may generate, or of decreases in expenditures, which can offset some reform costs or result in net revenue for the institution in the long term. In fact, most institutions focus on the success of implemented reforms in terms of improved student outcomes, with little to no data collected regarding the cost-effectiveness of the reform or initiative. Gaining a better sense of their potential financial return on investment (ROI) can greatly assist institutional leaders in deciding whether, and how much, to invest in a particular reform initiative.

To this end, the American Council on Education (ACE) and Ithaka S+R have partnered to develop a tool to assist institutional leaders in understanding more fully the potential ROI for specific types of instructional improvement reforms. The ROI tool builds on the framework developed in an ACE white paper by Jessie Brown and Martin Kurzweil, which describes how instructional improvement initiatives can generate institutional revenue through improvements in student outcomes. The tool aims to engage users in a simple and systematic evidence-driven exercise, helping them think through the key components of the instructional reform they are considering, the sources of cost of the reform, and the potential ROI of the reform. This overview paper describes the first publicly available version of this ROI tool (beta version), how it was developed, and how it can be used to estimate a potential ROI for select instructional improvement efforts.

WHAT IS THE ROI TOOL?

The ROI tool draws on data and information collected through the empirical literature on the impacts of select instructional improvement efforts, and direct institution-specific inputs by the user, to estimate a range of the potential short- and medium-term ROI that a given institution can expect from a selected effort or reform that is designed and implemented as intended. The tool, and the resultant ROI ranges it produces, are designed to assist institutional administrators in making decisions about whether, or to what extent, to invest in select instructional improvement efforts on their campuses. It aims to achieve this by walking the user through a series of seven systematic steps.

Figure 1. ROI Tool Summary



Through each step, the tool gathers institution-specific inputs and provides additional targeted information to the user to promote further thought or information-gathering surrounding specific reform components. The user is able to view all the backend information and formulas included in the tool to understand the data behind the ROI estimates. It is important to note that the ROI tool was not designed to calculate precise ROI figures nor intended to be used as a sole or primary resource for decision-making regarding investing in instructional improvement reforms. The tool focuses on deriving the estimated financial ROI of reforms that aim to improve instructional quality. It includes two specific reforms with pre-filled impact estimates, whose results do not generalize to other instructional improvement efforts. The tool does not provide estimates regarding other types of ROI that may be of equal or greater value to the administrator (e.g., improvements in student or faculty satisfaction and engagement). However, the tool can also be used to estimate ROI and impact using other evidence-based interventions and quantifying the return based on inputs and outcomes entered by the institution. The ROI tool is intended to serve as an additional resource or guide to help administrators gather relevant and useful information regarding the potential impact on student course pass rates and retention and the potential financial ROI of a particular type of instructional reform at a given institution, and consequently to assist in making a decision about whether to invest in such a reform.

HOW WAS THE ROI TOOL DEVELOPED?

The foundation of the ROI tool rests on the proposed framework by Jessie Brown and Martin Kurzweil, in which investments in instructional improvement efforts increase revenue (and/or decrease expenditures) through a feedback loop powered by improvements in student outcomes brought on by the effort itself. Although there are no studies that directly address the impact of instructional improvement interventions on institutional net revenue, the authors show that improved student course pass rates and retention rates generated by instructional improvement efforts are in turn associated with increases in net revenue through increased tuition revenue and cost savings or decreased revenue inefficiencies (e.g., redundant spending on course retake due to low course pass rates, or spending on recruiting and onboarding new students due to high attrition rates).[1]

1 The financial return on investment to student success efforts is a topic that is gaining attention in the field, and multiple organizations are producing tools to support institutions with their ROI calculations. Of particular note, in mid-2018, EDUCAUSE released an Excel-based ROI tool that provides similar functionality to the ACE tool, although unlike the ACE tool, it does not embed research-based estimates of the impact of particular reforms. The materials associated with the EDUCAUSE ROI tool can be found at https://www.educause.edu/ipass-grant-challenge/return-on-investment-toolkit.

To calculate the ROI, the tool estimates the additional net revenue a reform will yield, subtracts the additional (financial) cost associated with the effort, and divides by the total additional cost.

> Additional net revenue = additional net revenue generated by the change in the number of full-time equivalent (FTE) students enrolled and/or retained at the institution plus cost savings realized by the reform.
>
> Additional costs = additional initial one-time direct costs and additional average annual recurring costs of implementing the effort.
>
> ROI = [additional net revenue - additional costs] / additional costs

The ROI tool focuses on scalable instructional improvement efforts that have high potential for yielding a positive ROI through increased student course pass rates, subsequently increasing retention rates, as evidenced through empirical research findings. We drew on Brown and Kurzweil's findings to identify instructional improvement reforms backed by research evidence from at least two separate studies that provide a) empirical findings regarding the impact of the effort on students' course pass rates and b) adequate information regarding the key components and features of successful efforts such that they are replicable. Through our research, we identified two types of instructional improvement efforts, described below, to include in the tool. Once we identified these instructional improvement efforts, we developed the structure of the tool to ensure that it captures the necessary user inputs to estimate the additional net revenue and additional costs associated with the effort (to derive the ROI range estimates), and to provide users with useful information that further informs their thinking and decision-making along the way.

Understanding that other instructional intervention efforts exist or are emerging, there was not substantial enough empirical literature to quantify the return for such efforts. We added an "other" option for users who are interested in using the tool to examine the potential ROI for other instructional improvement efforts than those listed, such as the implementation of an online faculty development course (more details below).

Corequisite remediation redesign

Corequisite remediation redesign involves replacing prerequisite remediation with corequisite remediation. It shifts the timing and delivery of remedial or developmental academic support so that it is provided to students simultaneously with college-level coursework (i.e., corequisite), rather than separately as a prerequisite to college-level coursework. In recent years, the field of higher education has seen a movement toward corequisite remediation, which started even before evidence began to emerge regarding its positive outcomes for students and potential cost-effectiveness for institutions.

Presently, a number of states have implemented corequisite remediation statewide, or have committed to do so, and findings are encouraging. To our knowledge, all implementing states and institutions have observed improvements in student outcomes after shifting from a prerequisite to a corequisite model, with increases in student pass rates for the college-level course ranging from 16 percent to 344 percent (see Table 1 in Appendix A for more details). Further encouraging evidence comes from a randomized controlled trial in which 907 remedial algebra community college students were randomly assigned to a traditional prerequisite course (two different types) or a corequisite course

(the college-level statistics course plus remediation workshops). The study found that students in the corequisite model passed the college-level course at significantly higher rates than their counterparts in the prerequisite courses, and went on to accumulate more credits at their institutions in the longer term (Logue, Watanabe-Rose, and Douglas 2016).

Corequisite remedial reform has a number of key components, most notably extended instructional time and reduced class size. In corequisite remediation, students take a college-level course and a paired remedial workshop simultaneously (Daugherty et al. 2018). College-level coursework in the corequisite model typically requires more classroom time than in the traditional model, extending the course by an additional 20 minutes to an hour for all students taking the course. The college-level course is paired with an hour-long support lab or workshop every week, which is mandatory for all developmental students (Boatman 2012). The college-level course has an integrated student population, enrolling both remedial and on-grade level students (Jenkins et al. 2010). The college-level course is generally restricted to around 20 students per one instructor. Ideally, the same faculty member teaches both the college-level course as well as the support workshop, for continuity (Belfield, Jenkins, and Lahr 2016). In all cases, corequisite remedial courses have an increased emphasis on active learning, offering regular low-stakes assessments to provide students with more frequent feedback (Dana Center Mathematics Pathways 2017). Faculty also modify pedagogy to incorporate more student-centered learning, including peer-led group work and interactive student presentations. One of the reasons corequisite remedial reform works well is that the small class size helps to build a sense of community, creating a social support network for students. In addition to remedial course content, the support lab often focuses on fostering non-cognitive mechanisms, including self-efficacy, self-esteem, and confidence to build students' social-emotional development (Bailey and Jaggars 2016; Kim and Minsu 2016).

Blended introductory coursework redesign

Blended introductory coursework redesign involves the redesign of large, introductory courses where some portion of traditional, face-to-face delivery is replaced with asynchronous, technology-assisted course delivery that is active, learner-centered, and focused on the mastery of specific learning objectives. The National Center for Academic Transformation (NCAT) pioneered the concept of blended introductory course redesign two decades ago, with many institutions replicating their redesign efforts successfully.

We identified three sources of data that studied blended introductory course redesign efforts for 19 courses at 15 institutions in 13 states, and that offer both pre- and post-design data. These sources provide information on the percentage of students who passed the traditional course prior to the redesign and those who passed the blended course after the redesign. To our knowledge, all implementing states and institutions have observed improvements in student outcomes after the blended learning coursework redesign, with increases in student course pass rates ranging from 2 percent to 170 percent, and an average 30 percent student course pass rate increase across all the redesigned courses (see Table 2 in Appendix A for more information). It is important to note that most institutions undergoing this effort saw a reduction in direct costs as a result, irrespective of any increase in course pass rates.

Blended courses typically offer 30 to 79 percent of their content online. Blended introductory coursework redesign has a number of key components, including the shift from summative to formative assessment and online tutorials. As opposed to purely using midterms and final exams to gauge student progress, the online learning platform embeds regular, low-stakes quizzes to allow students to check on their own understanding more frequently than in a traditional introductory course (McKenzie et al. 2013; Twigg 2005b). Grading is automated within the online courseware platform, reducing faculty labor costs needed for grading. The online learning platform also promotes content mastery by offering short video lectures (usually five to 20 minutes in length), practice exercises, online discussion forums, and the aforementioned quizzes. Blended courses also offer tutoring services online or through computer lab sessions with teaching assistants, connecting students to personalized supports when they are struggling with new material (Means et al. 2010). Finally, blended courses offer the opportunity for more active learning, with in-class time reoriented toward small group work and clicker questions and away from traditional lecture-based content, shifting students from passive recipients of information to active student learners (Vaughn 2010).

Other instructional reform efforts

Institutions can experiment with the tool to estimate returns on other types of instructional reforms by supplying both inputs and outcomes. Institutions can enter either anticipated inputs and outcomes of reform efforts being considered for implementation, or the actual inputs and outcomes of initiatives already implemented. To test how the tool could be used to estimate the return of implemented reforms, we worked with a public university to estimate the return of having their faculty complete the online ACUE Course in Effective Teaching Practices.[2] Estimated returns are based on actual data demonstrating the difference of the average pass rate of courses taught by faculty who completed the ACUE course and the pass rate of courses taught by a cohort of matched faculty who had not yet taken the course.

HOW DOES THE ROI TOOL WORK?

The beta version of the tool is in Microsoft Excel format and must be operated on Microsoft Windows to avoid technical issues. It consists of several tabs, including an "Instructions" tab, an "Inputs" tab where the user inputs information through the seven steps described below, and an "Estimated Returns" tab that presents estimated ROI ranges (lower bound and upper bound) for one year, three years, and five years post-implementation as well as the estimated ROI based on the user's own expectations regarding the impact of the reform on student outcomes. The tool also includes a "Formulas" tab that presents all the backend calculations of the tool, and an "Additional Details" tab with additional instructions or information for the different steps, which can be accessed through embed-

2 The ACUE instructional reform effort involves faculty members going through a comprehensive, online ACUE course to learn, practice, and reflect on evidence-based teaching practices. Developed in collaboration with and endorsed by ACE, this ACUE course addresses more than 200 teaching strategies across core competencies, including designing an effective course, establishing a productive learning environment, using active learning techniques, promoting higher-order thinking, and utilizing assessments to inform instruction and promote learning. Upon completion, faculty earn a certificate in effective college instruction. Using a six-level evaluation approach, ACUE works with institutional partners to measure the impact of its program on faculty, student, and institutional outcomes.

ded links provided in the Inputs tab. Each of the seven steps in the Inputs tab has a specific color to distinguish it from the others and to help the user match each step with its associated calculations and formulas in the formulas tab. All cells in the inputs tab that require an entry by the user are shaded in yellow.

Before engaging in the seven steps of the tool in the Inputs tab, the user should have the following information at hand, or have identified colleagues who can provide the information:

- The type of instructional improvement effort of interest to the user, stakeholder, or group of stakeholders. The beta version of the tool currently offers information for two specific instructional improvement efforts: corequisite remediation redesign and blended introductory coursework redesign (see Step 2 of the tool), and also allows the user to assess an effort other than the two specified in the tool's dropdown menu.
- Data and information regarding course enrollment, student course pass rates, credit requirements, and retention rates for the course(s) that will be affected by the instructional improvement effort. This includes estimates of the number of course sections and students affected by the reform (see Step 3 of the tool).
- Information regarding the anticipated initial and recurring additional costs of designing and implementing the instructional improvement effort at the given institution (see Step 5 of the tool).

For more details on the data needed to complete the tool, please consult the checklist in Appendix B.

Step 1: Enter Institution Information

The user enters the name of the institution, as well as whether the institution is public or private, which will pre-populate other sections of the tool with publicly available institutional financial information pertaining to net tuition and fees revenue, state and local appropriations (primarily for public institutions), and education-related expenses (see Step 5). The user can choose to rely on this institution-wide information, or input his or her own financial information that is specific to the target population.

Step 2: Select Instructional Improvement Effort of Interest

The user selects one of the two instructional improvement efforts from a dropdown menu.[3] The tool uses the selection of an effort to pre-populate various parts of the tool, including instructions for each section, information on the key components of the effort and cost considerations, and effort-specific data derived from empirical findings in the literature (see Step 4). The user is also able to consider these key components and costs, and consequently the type and level of resources to invest in its implementation to maximize the impact on student outcomes and the estimated ROI.

3 The user can also select "other" from the dropdown menu to assess an effort not explicitly included in the tool. It is important to note, however, that selecting "other" will not pre-populate the tool with any additional information or data from the literature.

Step 3: Enter Course-Level Information

The tool helps the user identify and quantify comparable pre- and post-reform course information and outcomes. This data allows the tool to calculate 1) pre-effort FTE enrollment in the course and subsequent FTE enrollment at the institution (fall-to-fall retention) using the current student course pass rate and retention rate, and 2) post-effort FTE enrollment in the course. Information entered in Step 3 also helps the user think through the potential for improvement based on existing or past course success and retention rates.

Step 4: Review Anticipated Post-Effort Course Pass Rates

When selecting one of the two instructional improvement efforts, the tool provides the user with lower bound and upper bound estimates of the anticipated student course pass rates in the redesigned course and the resultant anticipated number of additional students retained at the institution. Anticipated student course pass rates are predicted using analyses of data points from empirical studies of the selected instructional improvement effort, and the pre-effort pass rate entered by the user in Step 3 (see Appendix A for more detailed information).

Users can also input their own anticipated post-effort student course pass rate based on content expertise or institutional knowledge. The tool uses this information to estimate the number of additional students retained at the institution (fall-to-fall) due to the effort, which in turn informs additional net revenue estimates.[4] This section also allows the user to reflect on and further explore the potential impact of the reform, and to weigh the anticipated impacts on student retention against the estimated ROI outputs from the tool.

Step 5: Enter Institutional Financial Information

The user enters institution-specific financial information regarding per FTE student net tuition and fees revenue, state and local appropriations, and education-related expenses for the group of students to be affected by the reform, if available. Alternatively, the user has the option of allowing the tool to draw on publicly available, institution-wide financial information from the Integrated Postsecondary Education Data System (IPEDS), which appears in a table next to the input cells.[5] The tool uses the financial information, whether entered by the user or supplied by the tool, to estimate the additional net revenue generated through changes in the number of FTE students enrolled via the number of credits that a student earns upon completion, and through retaining additional students due to the effort. The user can also use this information to consider how these figures factor into the effort's potential ROI through changes in the number of FTE students enrolled and retained.

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4 For those using the tool to assess an effort other than the two specified in the dropdown menu, this is a required step because the tool does not generate estimated new post-effort student pass rates.

5 IPEDS is a database of surveys completed by institutions, including an annual finance survey on institutional revenues and expenses. The tool incorporates three measures from the 2015-16 Finance Survey in the IPEDS database: 1) net tuition and fees revenue, per FTE; 2) state and local appropriations, per FTE; and 3) education and related expenses, per FTE, all from FY 2016. "IPEDS Data Center," National Center for Education Statistics, https://nces.ed.gov/ipeds/use-the-data.

Step 6: Enter Effort-Related Costs and Cost Savings

The user enters additional initial and recurring direct costs the institution will incur due to the adoption of the selected effort, as well as potential cost savings. The tool draws on the literature in the field to provide information and instructions that help the user think through these costs and cost savings. The additional initial and annually recurring direct costs of implementing the effort solely comprise the additional costs component of the ROI calculation, while the cost savings are factored into the additional net revenue.

Step 7: Select Institution's Enrollment Strategy

The user selects one of three enrollment strategies his or her institution is likely to adopt in response to the estimated increase in student retention generated by the selected instructional improvement effort. The tool uses this information to estimate the change in the total number of additional students enrolled and retained at that institution due to the effort (which in turn determines changes in revenue and costs). In addition to thinking through whether and how the institution might respond to estimated increases in student enrollment, the user can explore how different institutional responses influence the estimated ROI ranges.

HOW ARE THE ROI ESTIMATES DERIVED?

The ROI estimates are derived by estimating the total additional net revenue and total additional costs generated by the effort. We generate lower bound and upper bound ROI estimates to account for potential variation and allow the user to consider more or less conservative estimates. Next, we describe how the tool calculates revenue and costs. See the document providing a step-by-step walk-through of the tool for a more detailed description of these calculations, using examples from a hypothetical institution.

Calculations for total additional net revenue

Total additional net revenue generated by the effort is a result of 1) additional net revenue generated from enrolling and/or subsequently retaining additional students due to the effort, as well as 2) cost savings brought on directly by the effort. It is important to note that net revenue may at times be negative.

Additional net revenue due to post-redesign FTE enrollment and retention

Additional net revenue may be generated by the redesign of the course itself, as well as from additional students retained, fall-to-fall, through the effort. Because institutional per student revenue and costs are provided based on FTE counts, it is possible that the redesigned course generates positive or negative revenue for the institution if the number of credits assigned to that course changes once the

effort is implemented (Manning et al. 2014).[6] It is important to note that the tool assumes that the number of students that will enroll in the post-redesign course is the same as the number of students currently enrolled in the course that is being redesigned, across all sections. Consequently, the tool estimates, in dollar amounts, any additional net revenue (negative or positive) generated by a change in the number of FTE students enrolled in the redesigned course based on changes in the number of credits assigned to the course pre- and post-redesign (and not by a change in the student course pass rate). This is achieved by calculating the net revenue from pre-redesign course enrollment, and subtracting it from the net revenue from post-redesign course enrollment.[7]

The tool also estimates additional institutional revenue generated from retaining additional students, fall-to-fall, through the effort. To achieve this, using a formula that estimates the relationship between pre-redesign and post-redesign based on the empirical literature, the tool first predicts the post-redesign student course pass rate based on the pre-redesign course pass rate entered by the user (see Appendix B for details on how the formula was derived). In parallel, it also allows users to enter their own anticipated post-redesign student course pass rate. The tool then estimates the number of additional students that would be retained through the effort, fall-to-fall, using the predicted student pass rate for the redesigned course, as well as the fall-to-fall retention rates for students who pass the pre-redesign course and for those who do not pass it. The tool assumes that the fall-to-fall retention rate for students who successfully pass the course of interest, and for students who do not, remains the same pre- and post-redesign.[8] Lastly, the tool calculates additional revenue (compared with revenue generated pre-redesign) for those additional FTE students retained at the institution due to the effort, using the financial information entered by the user in Step 5. Similarly, the tool calculates the additional education-related costs incurred for educating those students, which is then subtracted from the additional revenue generated by the retention. It is likely that the marginal cost associated with educating additional students enrolled is less than the education-related costs averaged across currently enrolled students (Baum and McPherson 2011). To our knowledge, there are no empirical studies that estimate how the cost of educating a marginal student should be discounted. In the absence of such information, the tool assumes that only 70 percent of the average institutional education and related expenses applies to each additional student retained through the effort.

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6 For example, if a pre-redesign remedial course sequence enrolls 1,000 remedial students in the three-credit prerequisite course, and 200 remedial students in the three-credit college-level course, it brings in tuition and state appropriation revenue for 120 FTE students (assuming the institution uses 30 credits to indicate FTE). After the redesign to corequisite remediation, if a new corequisite five-credit college-level course enrolls 1,000 remedial students, it brings in tuition and appropriations revenue for 166 FTE students. Assuming the institution's education and related expenses per FTE are less than the net tuition and fees revenue and appropriations, the redesign will have generated additional net revenue for the institution, regardless of the change in student outcomes. If, on the other hand, the institution's education and related expenses per FTE are greater than the net tuition and fees revenue and appropriations, the increase in the number of FTE students will result in a decrease in net revenue.

7 Net Revenue Change from Change in FTE: (Tuition Revenue and Appropriations: Post-Effort FTE minus Education and Related Expenses: Post-Effort FTE) - (Tuition Revenue and Appropriations: Pre-Effort FTE minus Education and Related Expenses: Pre-Effort FTE)

8 For instance, if the fall-to-fall retention rate of students who enroll in the prerequisite course and ultimately pass the college-level course within one academic year is 80 percent, the assumption is that the fall-to-fall retention rate of students who pass the redesigned corequisite remediation course is 80 percent.

Cost savings

Although the initial investment in an instructional improvement effort can be significantly costly for the institution, and consequently overshadow potential returns on the investment down the road, some instructional improvement efforts bring about annual cost savings irrespective of their impact on student outcomes. For example, corequisite remedial redesign is accompanied by an often significant reduction in prerequisite course sections offered, which also reduces staffing and facilities costs associated with these sections. Similarly, cost savings from blended introductory coursework redesign come mostly from the fact that hybrid courses meet fewer times per week, saving on facilities costs and faculty salaries and benefits. Multiple sections are also often combined into fewer, larger sections in this redesign model, reducing the number of faculty needed to teach the course. For example, Georgia State University was able to reduce the cost of course delivery for its blended psychology course by 17 percent, since the course only met once per week in person as opposed to twice a week prior to the reform, saving on faculty salary costs (The National Center for Academic Transformation 2006). In Virginia Tech's blended linear algebra course, instructors' time was reduced by 73 percent compared with the traditional model of the course, thanks to the online learning platform. Labor hours for course assistants also declined by 73 percent in the redesigned model of the course, resulting in an overall 77 percent decline in course cost per student (to $21 per student from $91 in the traditional model) (The National Center for Academic Transformation 2001). The tool requires the user to estimate the average annual cost savings, in dollar amounts, generated by the reform.

The tool also incorporates cost savings brought on by changes in retention caused by the effort. More specifically, institutions are asked to consider their enrollment strategy in light of the increase in the number of students that would be enrolled the following year through the estimated increase in retention. Institutions may offset an increase in retention by enrolling fewer first-year students the following year, which in turn offsets the additional tuition and appropriations revenue. However, this means that the institution will recruit fewer first-year students. According to some estimates, the cost to recruit a single undergraduate student is $536 at public institutions and $2,357 at private institutions (Ruffalo Noel Levitz 2018). As such, the tool calculates the amount saved by multiplying the appropriate cost to recruit and the number of first-year students who would have otherwise been enrolled. These may be conservative estimates, as other reports have factored in additional costs associated with first-year students, including the costs to process their enrollments, orient them, and support them (Blum and Jarrat 2014).

These estimated cost savings are added to the additional net revenue from post-effort enrollment and retention to calculate the total additional net revenue for the effort.

Calculations for total additional costs

The total additional costs of the reform are generated through the additional initial one-time cost of designing and implementing the effort, and the additional recurring annual costs associated with the reform. It is important to note that these are initial and recurring costs associated with the reform that the institution would not otherwise incur. For example, if an institution's annual cost of $20,000 for offering prerequisite remediation is expected to grow to $50,000 under corequisite remediation, then the institution's additional recurring cost is $30,000.

It is also important to distinguish between cost savings and a decrease in cost. For instance, if the introduction of blended learning leads to a decline in the number of classrooms needed, this should be considered a cost savings, and should therefore be added to the total additional net revenue, rather than be treated as a decrease in the total additional recurring annual cost.

One-time costs for corequisite remedial course redesign may include salaries and benefits for the personnel needed to develop and pilot the redesigned course, as well as the cost of a new adaptive learning technology platform and any additional computers for a computer lab. Some institutions have also incurred marketing costs related to publicizing the new course to students. Recurring costs include faculty salaries and benefits for newly added sections of the college-level course, faculty professional development modules, and the additional cost of tutoring and advising services for developmental students that were not offered pre-reform.

One-time costs for blended introductory coursework redesign include the cost of hiring, salaries, and benefits for instructional designers who lead the redesign of course curricula, assignments, and assessments, as well as the cost of purchasing a new online learning management system. Recurring costs generally include faculty professional development modules and instructing faculty members in online learning pedagogy best practices.

The tool requires the user to input the additional one-time initial costs, as well as the estimated additional average annual costs, in dollar amounts, generated by the reform. The addition of these two costs equals the effort's additional cost to the institution. These costs are subtracted from the total additional net revenue generated through the effort, and the result is divided by the costs, to calculate ROI.

PILOTING OF THE TOOL

Upon completing a fully functioning version of the ROI tool, and a complete draft of this accompanying overview paper, we convened several institutions to serve as project partners and pilot the tool, review the overview paper, and provide feedback on their experience through a list of 10 questions. Four public, four-year universities served as pilot institutions:

- Bowie State University (MD)
- California State University, Los Angeles
- Delta State University (MS)
- San Diego State University

To facilitate feedback, we shared a series of 10 questions (see Appendix D) that we asked institutions to either formally respond to in writing or be prepared to discuss during a 60-minute debriefing call.

At three of the four institutions, the director of the institution's Center for Teaching and Learning, as well as a few staff members, piloted the tool. At one institution, the only staff to engage with the tool was a high-level administrator in the institutional research office. All four institutions used the tool to assess either blended introductory coursework redesign or "other" (no institution used it to assess

corequisite remediation redesign), completed all required parts, which generated ROI estimates, and provided extensive and detailed feedback on the tool's format, instructions, content, and functionality. As a result, we made three significant improvements to the tool, and corresponding edits to the overview paper:

- Revised the wording select questions to better align it with the terminology used by institutional administrators
- Added a checklist that presents and describes all the user-inputted data that the tool requires, to serve as a reference in the early stages of the exercise.
- Made revisions to how the tool calculated the retention rate for students who do not pass the course of interest.

APPENDIX A – IMPACT OF SELECT INSTRUCTIONAL IMPROVEMENT EFFORTS ON COURSE PASS RATES

Table 1. Corequisite Remediation Redesign[9]

		COLLEGE-LEVEL COURSE PASS RATES		
STATE	IMPLEMENTING INSTITUTION(S)	COURSE SUBJECT	PREREQUISITE MODEL	COREQUISITE MODEL
CO	All 13 Colorado Community College System colleges[1]	English	31%	64%
GA	Five University System of Georgia institutions (one HBCU and four state colleges)[1]	Math	20%	63%
		English	16%	71%
IN	Ivy Tech Community College (multiple campuses)[1]	English	37%	55%
NY	Three CUNY community colleges (Bronx, Manhattan, Queens)[2]	Math	14%	57%[10]
TN	All 13 two-year public institutions[3]	Math	12%	51%
		English	31%	59%
WV	All 9 West Virginia Community and Technical Colleges (WVCTC)[1]	Math	14%	62%
		English	37%	68%

1 Complete College America, n.d.

Note: college-level course pass rates in the prerequisite model are calculated over two academic years, rather than one. As such, differences between pass rates in the two models in these data may be slightly underestimated.

2 Logue, Watanabe-Rose, and Douglas 2016

Note: college-level course pass rates over one academic year were provided by the authors via email communication on December 26, 2018.

3 Belfield, Jenkins, and Lahr 2016

9 For ease of viewing, all percentages presented in this table were rounded to the nearest integer.

10 Earlier versions of this paper and the ROI tool included incorrect pass rates of this study that have since been corrected.

Table 2. Blended Introductory Course Redesign[11]

			COLLEGE-LEVEL COURSE PASS RATES	
STATE	IMPLEMENTING INSTITUTION(S)	COURSE SUBJECT	TRADITIONAL MODEL	BLENDED MODEL
AL	University of Alabama[1]	Spanish 101	75%	82%
		Spanish 102	90%	92%
	Calhoun Community College[1]	Statistics	65%	82%
FL	Florida Gulf Coast University[2]	Fine Arts	55%	89%
GA	Georgia State University[1]	Algebra	72%	88%
IN	Indiana University–Purdue University at Indianapolis (IUPUI)[2]	Sociology	61%	75%
IO	University of Iowa[2]	Chemistry	75%	87%
ME	University of Southern Maine[2]	Psychology	72%	81%
MI	Wayne State University[1]	Algebra	36%	43%
MO	Missouri State University[3]	Psychology	75%	76%
	University of Missouri–St. Louis[1]	Algebra	63%	78%
NM	University of New Mexico[2]	Psychology	58%	75%
NC	UNC Greensboro[1]	Pre-Calculus I	23%	62%
		Pre-Calculus II	40%	59%
		Algebra	38%	51%
		Statistics	30%	40%
PA	Drexel University[2]	Computer Programming	51%	62%
VA	Virginia Tech[2]	Linear Algebra	80%	87%
WA	Eastern Washington University[1]	Psychology	74%	77%

1 Twigg 2005a
2 Twigg 2005b
3 Hudson et al. 2014

11 For ease of viewing, all percentages presented in this table were rounded to the nearest integer.

APPENDIX B – DATA COMPONENTS CHECKLIST

Required

- ☐ Institution's name as it appears in IPEDS and the control of the institution (public or private)
- ☐ Instructional improvement effort the tool will assess
- ☐ Number of students enrolled in the pre-redesign course across all sections
  - If you are using the tool for corequisite remediation redesign: the number of students who enroll in the prerequisite course that is being redesigned, as well as the number who subsequently enroll in the college-level course within the same academic year
- ☐ Number of credits a student earns if they pass the pre-redesign course
  - If you are using the tool for corequisite remediation redesign: the number of credits a student earns if they pass the perquisite course, as well as the number of credits a student earns if they pass the college-level course
- ☐ Percentage of enrolled students who pass the pre-redesign course
  - If you are using the tool for corequisite remediation redesign: the percentage of students who enroll in the prerequisite course that ultimately pass the college-level course within one academic year
- ☐ Fall-to-fall retention rate of enrolled students who pass the pre-redesign course
  - If you are using the tool for corequisite remediation redesign: the fall-to-fall retention rate of students who enroll in the prerequisite course and ultimately pass the college-level course within one academic year
- ☐ Fall-to-fall retention rate of enrolled students who don't pass the pre-redesign course
  - If you are using the tool for corequisite remediation redesign: the fall-to-fall retention rate of students who enroll in the prerequisite course and don't pass the college-level course within one academic year
- ☐ Number of credits in total a student needs to be enrolled in at your institution within one academic year to be considered a full-time equivalent (FTE) undergraduate student
- ☐ Number of credits in total, on average, undergraduate students at your institution enroll in within one academic year
- ☐ Number of credits a student will earn if they pass the redesigned course
- ☐ Additional initial one-time direct costs of designing and implementing the initiative
- ☐ Additional average annual recurring direct costs that would not be incurred if not for the initiative

- Average recurring annual cost savings due to the initiative
- Institutional enrollment strategy in response to an estimated increase in fall-to-fall retention

Recommended

- Net tuition and fees revenue per FTE student of the target student population
- State and local appropriations per FTE student of the target student population
- Education and related expenses per FTE student of the target student population

Optional

- Anticipated student pass rate of the redesigned course
    - If you are using the tool to assess an effort other than the two specifically listed, this data is required.

APPENDIX C – QUESTIONS FOR PILOT INSTITUTIONS

Below is a list of the 10 questions that pilot institutions were asked.

- Please describe the instructional improvement effort(s) you used the tool to assess.
- Please list all members of your institution that helped complete the tool, their position at the institution, and the amount of time, in hours, they spent working on the tool. Please also explain how it was decided who would participate and how the tool was shared across participants.
- Are the instructions that are included in the overview paper, the Instructions tab, and on the right side of the Inputs tab clear and concise? Are the questions in which we request inputs clear and concise? In other words, have we provided sufficient information and direction without being unnecessarily technical? If not, please explain how we could make our directives clearer.
- Did you find the descriptions of the key components and common sources of costs of the effort to be useful and in line with what you have experienced or expect?
- Do you think we accounted for all of the factors that may play a role in determining the ROI of an instructional reform implemented at your institution? Conversely, are there factors we included that we've given too much attention to?
- Did you find the additional net revenue and ROI calculated by the tool to be reasonable estimates of the financial impact of the instructional reform at your institution? If not, are you able to identify a particular part or parts of the calculation that either over- or under-estimated the impact?
- Beyond the ROI estimates delivered by the tool, did engaging in this evidence-driven exercise lead to you or your institution rethinking, reconsidering, and/or reassessing whether you will implement the reform, how you will implement it, and to what extent you will implement it?
- As you were completing the tool, were there particular sections, steps, or questions that you found confusing, causing you to refer back to the overview paper or another part of the tool for further clarification?
- If you could change one part of the tool, what would it be? This could be anything, including format/style, content, or other.
- Is there anything else you would like to highlight about your experience engaging with the tool?

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