DEVELOPMENTAL EDUCATION PRACTICE GUIDE PROTOCOL VERSION 3.0

Topic Area Focus

This protocol guided the review of research that informs the What Works Clearinghouse (WWC) practice guide entitled "*Strategies for Postsecondary Students in Developmental Education – A Practice Guide for College and University Administrators, Advisors, and Faculty*." This protocol was used in conjunction with the *WWC Procedures and Standards Handbook (Version 3.0).*

The purpose of the practice guide is to provide recommendations on best practices for postsecondary developmental education. Specifically, the guide identified evidence-based practices that help postsecondary students with developmental education needs successfully transition into credit-bearing courses and, eventually, attain their postsecondary objectives. The practice guide was developed by the WWC, with the assistance of a panel of experts.

This practice guide protocol contains information on 1) the purpose statement that guided the work of the panel and the research team, 2) procedures for conducting the literature search, 3) eligibility criteria for reviewing relevant studies, and 4) technical issues including attrition and group equivalence (with reference to *WWC Procedures and Standards Handbook 3.0*).

Based on the guidance articulated in this protocol, the WWC

1. Conducted searches of research literature to identify relevant studies
2. Screened studies to determine relevance and application to the practice guide
3. Assessed eligible studies against WWC evidence standards

Studies that were related to a recommendation for the practice guide were used to identify the strength of evidence for each recommendation. The WWC standards for practice guides are outlined in the *WWC Procedures and Standards Handbook 3.0,* Table IV.5 (Levels of Evidence for Practice Guides). Evidence is rated as strong, moderate, or minimal, according to established criteria for practice guides. (See Appendix A, and http://ies.ed.gov/ncee/wwc/pdf/reference_resources/wwc_procedures_v3_0_standards_handbook.pdf#page=36.)

In addition to studies that met WWC evidence standards, studies that did not meet WWC evidence standards were used to provide examples of practices.[1] For practice areas that were rated as having "strong" levels of evidence, studies that met standards generally had enough information to impart about effective implementation of the practices. For practice areas that were rated as having "moderate" or "minimal" levels of evidence, the most scientifically rigorous publicly available studies were used to elaborate on practice recommendations and

[1]This differs from the procedures for WWC intervention reports, which report findings only for studies that met WWC evidence standards.

provide illustrative examples of practices and strategies to be applied, even if these studies did not meet WWC standards.

Purpose Statement

Not all students who arrive on college campuses are prepared to do college-level work in all subjects. Developmental education, also known as remedial education, involves courses that are usually offered on a noncredit basis and are intended to help students get up to speed so that they can succeed in credit-bearing courses at their institutions. The practice guide, "*Strategies for Postsecondary Students in Developmental Education – A Practice Guide for College and University Administrators, Advisors, and Faculty*," focuses on interventions for incoming and current postsecondary students that aim to promote successful completion of developmental education, with primary emphases on both increasing developmental education completion rates and increasing the rate of degree or certification attainment.

The guiding questions for the practice guide are

1. What practices are effective in helping students in developmental education successfully complete developmental education and transition to college-level, credit-bearing work?
2. What practices are effective in helping students who are placed into developmental education to attain their desired credential?
3. What practices help students be college ready by the time of enrollment and avoid developmental education?
4. What practices are effective in placing students appropriately into developmental education?
5. How can the practice be adapted by college faculty, administrators, and staff to be effective in their institution?
6. What are effective strategies to teach and advise students in developmental education to maximize their academic success?
7. How should practices be managed and/or coordinated to maximize students in developmental education outcomes?

For each practice guide recommendation, the panel assessed the following:

- Is the practice effective for students in developmental education, and what is the level of evidence regarding the practice?
- Does the effectiveness of the practice or intervention appear to differ by type of outcome?
- Which practices or interventions are particularly effective for subgroups of students? [For example, students placed into lowest levels of developmental education, students placed into the middle level of developmental education, students placed into higher levels of developmental education (e.g., students within certain range of the cutoff scores), students older than 25 who are placed in developmental education, traditional-age students placed into developmental education (enrolled within 1 year of high school or General Educational Development graduation), dual-enrolled students (high school and

college), low-income students.]

- What is the scale and scope of practice implementation currently, can the practice be widely implemented, and how?

Identifying Studies for Review

Studies were identified by a broad search of electronic databases. The specific search strategy is detailed in Appendix A. Keywords for the search strategy were developed in consultation with content experts. The keywords were tested and refined before use. The search was then implemented in several databases. Once interventions were identified for review, the WWC supplemented the electronic database search with targeted searches of government agency websites, relevant nonprofit organizations that might fund research on relevant interventions, and contacts with active researchers.

Eligibility Criteria

Studies must have met several criteria to be eligible for review. These relate to the population that was sampled, the study design that was used, the outcomes that were measured, and when the study was conducted. Each of these is discussed below.

Populations to Be Included

To be eligible for review under this protocol and used for a **strong, moderate, or minimal evidence rating**, a study must have included postsecondary students in the United States or Canada (including students who have not yet started their college careers) ***at least two-thirds*** of whom are in, have been recommended for, or are at risk for being placed into developmental education.

To be eligible for review under this protocol and used for a **moderate or minimal evidence rating**, a study must have included postsecondary students in the United States or Canada (including students who have not yet started their college careers) ***at least 40 percent*** of whom are in, have been recommended for, or are at risk for being placed into developmental education.

If the study did not specify the proportion of students in developmental education, the study authors were asked to provide this information.

In general, the WWC determines a study rating based on average intervention effects and reports subgroup analyses only for groups that are identified in the protocol as being of theoretical, policy, or practical interest. For studies reviewed under this protocol, the default subgroups included a) gender, b) first-generation college students, c) racial/ethnic minorities, d) students from low socioeconomic status backgrounds (e.g., Pell Grant recipients), e) academically unprepared students (e.g., students one versus two courses away from being college ready or students at different levels of developmental education), f) students of different age groups (e.g., 18 and under; ages 18–22; ages 23–26; older than 26 years); and g) community college students.

To be eligible for review as a subgroup analysis, impact estimates must have been available for all groups in a subgroup analysis (e.g., results for both males *and* females are required, not just males *or* females) and a test of the interaction between subgroup membership and intervention condition must be reported or derivable from reported statistics (using, for example, techniques described in Altman & Bland, 2003).

As discussed in the *WWC Procedures and Standards Handbook* (*v. 3.0;* see Section III.B.4, p. 17), if a study presented findings separately for several groups of students without presenting an aggregate result, the WWC queried authors to see whether they conducted an analysis on the full sample of students. If the WWC was unable to obtain aggregate results from the author, the WWC averaged the results across subgroups within a study for use as the primary finding and presented the subgroup results as supplemental analyses.

Types of Studies Reviewed

To be included in the review, the study must have been available in English and have met the following four broad criteria:

1. **Study designs.** To be eligible for review, a study must have been a primary analysis of the effects of an intervention. If a study did not examine the effects of an intervention, or if it was not a primary analysis (e.g., if it was a meta-analysis or other literature review), then it was not eligible for review.

   In addition, the study must have had an eligible design. Eligible study designs included randomized controlled trials and well-controlled quasi-experimental designs (defined as studies using a well-matched comparison group and regression discontinuity designs). The WWC currently does not have standards for other types of quasi-experimental designs, such as the instrumental variable approach and interrupted time-series designs. Therefore, studies using those types of research designs were not eligible for review under this protocol.

2. **Practices**. The recommendations in the practice guide focused on interventions or practices to improve students' progress through developmental education, credit attainment, academic achievement, and degree attainment. The practices to be included were a) early assessment programs for at-risk high school students; b) practices to modify information used to make placement decisions; c) performance-based monetary incentives; d) practices to teach metacognition, productive persistence, and college success skills; e) practices that accelerate, compress, or mainstream developmental education; f) contextualized instruction; g) enhanced and early alert advising; and h) comprehensive and integrated support programs. These eight practice areas were narrowed from a broader list of 21 practices/interventions in consultation with practice guide panelists. Brief descriptions of the eight practice areas are found in Appendix B.

Based upon review of the evidence, the expert panel decided not to include practice recommendations for early assessment programs for at-risk high school students, and contextualized instruction (without compression or acceleration) in the practice guide. The expert panel also found little evidence to support broad practices to teach metacognition, productive persistence, and college success skills. With evidence on positive effects of teaching self-regulated learning to students in developmental education, the expert panel refined this practice recommendation to teaching self-regulated learning.

3. **Timeframes.** Studies must have been published or reported after 1995 to be eligible for review under this protocol.

4. **Types of comparisons.** Studies reviewed under this protocol must have used "business as usual" comparison groups that were generally similar to each other across studies. "Business as usual" comparison groups are those in which students may receive the usual services offered to students in the setting (e.g., advising, tutoring). In these studies, comparison groups must not have involved explicit assignment of students to other putatively effective interventions or variations of the same intervention that was delivered to the intervention group. Studies for which the type or nature of the comparison group was not clearly "business as usual" were referred to the review team leadership for consultation, to ensure that comparison conditions were similar across studies.

Types of Outcomes Included

To be eligible for review a study must also have assessed a relevant outcome domain. Eligible outcome domains included a) progress through developmental education, b) credit accumulation, c) academic achievement, d) transfer to a four-year postsecondary institution, e) degree attainment, and f) labor market outcomes. Measures of actual behavior were preferred to those that measure intentions and related constructs. When studies presented results for both types of measures for an outcome (i.e., both intention to enroll and actual enrollment), the WWC concentrated on actual behaviors.

For most outcomes in the postsecondary domain, the longest follow-up period available for a variable was selected as primary; findings from any earlier time points were included in the supplemental tables. In the access and enrollment domain (defined below), the *first* measure of enrollment (e.g., enrolled versus not enrolled) was selected as primary. Measures of enrollment that occurred *after* the first semester or year of college fell under the credit accumulation domain, and the longest follow-up period was selected as the primary measure.

Relevant outcome domains. The content expert (or experts) was responsible for grouping outcomes into domains. For reviews conducted under this protocol, these domains are

- **College access and enrollment**, which refers to the process of applying to, actually enrolling, and attending a postsecondary institution. Examples of ways that enrollment

might be operationally defined in studies include: (a) applied vs. did not apply to college, (b) number of applications completed, (c) attended vs. did not attend a postsecondary institution or enrolled vs. not enrolled in the first semester or year of college, (d) selectivity of enrollment institution, (e) full time vs. part time enrollment, and (f) 4-year college or institution vs. 2-year college or institution vs. non-enrollment.[2]

- **Progress through developmental education**, which refers to the process of completing required developmental coursework. Examples of ways that progress through developmental education might be operationally defined include a) completed versus did not complete developmental education coursework, b) completed versus did not complete first college-level course in which remediation was needed, and c) grades earned in developmental courses. Passing college-level courses in the area of required developmental education is the preferred measure.

- **Credit accumulation and persistence**, which refers to progress toward the completion of a degree, certificate, or program. As mentioned under "outcome period relevance," the primary focus for this outcome domain is upon the longest time period observed for the outcome (or outcomes) in this domain. Examples of ways that credit accumulation might be operationally defined in studies include a) number of credits earned toward degree completion, b) proportion of degree-bearing versus non-degree-bearing credits earned, c) ratio of credits earned to credits attempted, and d) enrollment persistence. If a study assesses credit accumulation and enrollment persistence, the former is the preferred measure.

- **Academic achievement**, which assesses the extent to which students adequately complete expected coursework. Examples of ways that academic achievement might be operationally defined in studies include grade-point average, departmental final exams, and the ratio of courses passed versus failed.

- **Transfer to a four-year institution**, which refers to students' transition to a bachelor's degree granting program or institution, typically from a two-year postsecondary institution that does not have any baccalaureate-degree granting programs (or may have few, selected ones). National Student Clearinghouse records are the preferred data source (which may be integrated into state longitudinal data systems).

- **Attainment (college degree)**, which refers to the completion of a degree, certificate, or program. Examples of ways attainment might be operationally defined in a study include certificate completion rates and degree completion rates. Official school records are the preferred data source.

- **Labor market** refers to outcomes related to employment after the postsecondary

[2] This domain is relevant to the population of students placed at risk for developmental education, and the Early Assessment practice area.

experience. Examples of ways that labor market outcomes might be operationally defined in studies include (a) employed vs. not, (b) employed full-time vs. employed part-time, (c) employed in field of study vs. not, and (d) income earned.

Statistical and Technical Issues/ Review of Studies Against WWC Evidence Standards

All studies were reviewed against the WWC Evidence Standards, using the *WWC Procedures and Standards Handbook (Version 3.0)*. Generally, these standards assess outcome reliability and validity, attrition, baseline equivalence, and similar methodological and statistical issues. This review determines the overall WWC study rating (see the Procedures and Standards Handbook Version 3.0 for further details). Details related to sample attrition in randomly controlled trials (RCTs) and baseline equivalence in quasi-experimental designs and high-attrition RCTs are further articulated in this protocol.

Sample Attrition

The *WWC Procedures and Standards Handbook* discusses the sample attrition standards used by the WWC.

This review used the **liberal** boundary for attrition. The selection of this boundary was based on the assumption that most attrition in studies of interventions focused on improving outcomes for students in developmental education is due to factors that are not strongly related to intervention status.

Baseline Equivalence

If the study design is a randomized controlled trial or regression discontinuity design with high levels of attrition, or a quasi-experimental design, the study must have demonstrated baseline equivalence of the intervention and comparison groups for the analytic sample.

If demonstration of baseline equivalence is required for a study, the following pre-intervention (or baseline) characteristics were used:

- A continuously-scaled baseline measure of academic achievement (e.g., high school grade point average, SAT/ACT scores), and
- A baseline measure of student socioeconomic status (e.g., FAFSA expected family contribution, family income, free- or reduced-price lunch status, parent education levels, Pell grant eligibility)

In cases where multiple baseline measures of socioeconomic status (SES) and/or academic achievement were available, the content expert was responsible for selecting the variable (or variables) to be used in the baseline equivalence assessment before the equivalence assessment being performed. For example, if both math and verbal scores on a college entrance exam were

available, and the primary outcome is whether students passed their first college level math course, then the content expert could have decided that the score on the math portion of the entrance exam is the only achievement measure on which baseline equivalence should be assessed. However, if the primary outcome is attainment, then the content expert could have decided to assess equivalence on both the math subtest and the verbal subtest.

Procedures for Statistical Adjustment for Studies with Baseline Covariate Imbalance

These procedures applied to all studies for which baseline equivalence must have been demonstrated (i.e., RCTs with high attrition and quasi-experimental studies).

If a pretest was available for an outcome and the difference between conditions at baseline is shown to be within the range that requires statistical adjustment, the statistical adjustment is needed only for that outcome. For example, if vocabulary, reading comprehension, and reading fluency are available as pre- and post-intervention measures, and the pre-intervention difference in reading comprehension requires statistical adjustment, only the analysis of reading comprehension was adjusted for baseline differences in reading comprehension.

For outcomes that did not have a pretest or close proxy, if the difference between conditions at baseline on one of the required covariates was shown to be within the range that requires statistical adjustment, then adjustment is required only for the covariate in the adjustment range. For example, if academic achievement was judged to be within the range that requires statistical adjustment and SES is very closely balanced (i.e., it is not in the adjustment range), then all outcomes without pretests was adjusted for the measure of academic achievement, and adjustment for baseline SES was not required.

Conditions Under Which Studies that Do Not Meet WWC Standards or are Ineligible May Be Used

In WWC practice guides, recommendations result from an interplay between the panelists and the WWC standards. As a result, studies that are ineligible for review or that do not meet WWC standards may be used as evidence to support a rating for a practice recommendation. Such studies were considered when no studies or only one study met standards in a practice area (such as the recommendations, “Assess levels of postsecondary readiness using multiple academic measures,” and “Shorten the time students spend in developmental education.”) For example, researchers have investigated the relationships between alternate or multiple measures for developmental placement and later postsecondary outcomes using correlational models. Few experimental or quasi-experimental studies have been conducted to assess the effectiveness of multiple measures for placement, and therefore, a more expansive view of the evidence was considered.

Many quasi-experimental studies do not meet WWC group design standards due to lack of establishing baseline equivalence on both an approved measure of prior academic achievement and an acceptable measure of students’ socio-economic status. In this practice guide, Review

Team Leadership assessed how closely balanced the intervention and comparison groups were at baseline for the measures that were used, and the range of covariates that were controlled for in the statistical models. Studies that nearly met WWC group design standards were considered as evidence to support a minimal rating.

For example, one study was not eligible for review because it did not have an eligible outcome (the dependent variable was a retake of the COMPASS test, and as articulated above academic achievement outcomes are required to be at the final course grade level and above to be eligible). Were it eligible, it would not meet WWC standards due to a large pre-intervention difference on the COMPASS between the intervention and comparison groups. However, the cited effect size (g = +0.08) controls for this difference by subtracting the pre-intervention effect size from the raw post-intervention effect size. This study was used as evidence in a minimal evidence rating.

Studies that controlled for students' baseline characteristics with a rigorously conducted analyses but that may not have had a continuously scaled measure of students' prior academic achievement in the estimation models could be used as credible evidence to support a minimal evidence rating. However, if the study had a confounding factor completely aligned with one of the groups, this study would not have been used as evidence even if pre-existing differences had been controlled in the estimation models.

Appendix A.
Practice guide panels rely on a set of definitions to determine the level of evidence supporting their recommendations (Table IV.5), excerpted from the WWC Procedures and Standards Handbook, 3.0, pp. G39-40.

Table IV.5. Levels of Evidence for Practice Guides

Criteria	Strong Evidence Base	Moderate Evidence Base	Minimal Evidence Base
Validity	The research has high internal validity and high external validity based on studies that meet standards.	The research has high internal validity but moderate external validity or high external validity but moderate internal validity.	The research may include evidence from studies that do not meet the criteria for moderate or strong evidence.
Effects on relevant outcomes	The research shows consistent positive effects without contradictory evidence in studies with high internal validity.	The research shows a preponderance of evidence of positive effects. Contradictory evidence must be discussed and considered with regard to relevance to the scope of the guide and the intensity of the recommendation as a component of the intervention evaluated.	There may be weak or contradictory evidence of effects.
Relevance to scope	The research has direct relevance to scope—relevant context, sample,	Relevance to scope may vary. At least some research is directly relevant to scope.	The research may be out of the scope of the practice guide.

	comparison, and outcomes evaluated.		
Relationship between research and recommendations	Direct test of the recommendation in the studies or the recommendation is a major component of the intervention tested in the studies.	Intensity of the recommendation as a component of the interventions evaluated in the studies may vary.	Studies for which the intensity of the recommendation as a component of the interventions evaluated in the studies is low, and/or the recommendation reflects expert opinion based on reasonable extrapolations from research.
Panel confidence	Panel has a high degree of confidence that this practice is effective.	The panel determines that the research does not rise to the level of strong but is more compelling than a minimal level of evidence. Panel may not be confident about whether the research has effectively controlled for other explanations or whether the practice would be effective in most or all contexts.	In the panel's opinion, the recommendation must be addressed as part of the practice guide; however, the panel cannot point to a body of research that rises to the level of moderate or strong.
Role of expert opinion	Not applicable.	Not applicable.	Expert opinion based on defensible interpretation of theory.
When assessment is the focus of the recommendation	Assessments meet the standards of *The Standards for Educational and Psychological Testing.*	For assessments, evidence of reliability meets *The Standards for Educational and Psychological Testing* but with evidence of validity from samples not adequately representative of the population on which the recommendation is focused.	Not applicable.

Appendix B. Literature Search Strategy

To find studies investigating effectiveness of interventions for students in developmental education, or placed at risk for developmental education, the population terms were combined with practice-related search terms. Database searches were conducted for practice recommendations in abstract, publication title, and subject terms. The literature search for Integrated, Multiple Supports required more reliance on the supplemental search strategy (websites and reference harvesting), since the practice required specific bundling of at least four, of a specified set of six practices. To further specialize the searches, methodological terms were added to the literature searches for two practice recommendations: 1) Early Assessment and 2) Enhanced and Early Alert Advising.

Population Terms

The population search terms were as follows (for Accelerated Instruction, Contextualized Instruction, Metacognition, Enhanced Advising; Performance-Based Monetary Incentives; and Multiple Measures for Placement)

(("Community college*" OR "two-year college" OR "two year college" OR "technical college*" OR "junior college*" OR "Developmental education" OR "developmental course*" OR "developmental class*" OR "historically black college*" OR "Historically black universit*" OR "access institution*" OR "open-access institution*" OR "Hispanic serving institution*" OR "Hispanic-serving institution*" OR "two-year institution*" OR "two year institution*") **OR** ((Remedial OR Non-credit OR Noncredit OR "basic skill*" OR Compensatory OR Underachiev* OR Under-achiev* OR "under achiev*" OR Underprepared OR under-prepared OR readiness OR Underrepresented OR under-represented OR "low SES" OR poor OR "low-income" OR Socioeconomic OR Developmental OR "academic problem*" OR "pre-college math*" OR "pre-college English") AND (college* OR postsecondary OR post-secondary OR universit* OR "institution* of higher learning" OR "Liberal arts" OR Freshm* OR Sophomore* OR First-year* OR beginning OR faculty)))

The population search terms for Early Assessment were:

((“High school*” OR “secondary school*” OR “10th grade*” OR “Tenth grade*” OR “Grade* 10” OR “Grade* ten” OR “11th grade*” OR “Eleventh grade*” OR “Grade* 11” OR “Grade eleven*” OR “12th grade*” OR “Twelfth grade*” OR “Grade 12” OR “Grade* twelve” OR “prospective student” OR incoming*) OR ((freshman or freshmen OR sophomore* OR junior* OR senior*) N/5 (“high school*” or “secondary school*”)

AND

(“at risk” OR “at-risk” OR underprepared OR developmental OR “developmental education” OR “under achievement” or “underachiev*” Or remedia*)))

Methodological Terms (added to Early Assessment; Enhanced & Early Alert Advising)

(“Control group*” OR random* OR “comparison group*” OR regression OR “matched group*” OR baseline OR treatment OR experiment OR evaluation OR impact OR effect* OR causal OR intervention OR posttest OR post-test OR pretest OR pre-test OR QED OR quasi* OR RCT OR propensity OR affect OR investigat* OR outcome* OR result* OR predict* OR improve* OR examin*)

Practice-Related Search Terms

Accelerated Instruction

((accelerat* N5 (learn* OR course* OR sequenc* OR education* OR entry OR course-work OR coursework)) OR (accelerat* AND program*) OR “accelerated entry” OR “accelerated learning” OR “accelerating students” OR modular OR modular* OR mainstream* OR fast-track OR “fast track” OR co-requisite OR corequisite OR ((compress* OR intensive OR abbreviated OR condens* OR restructure* OR redesign* OR integrate*) N5 (course OR sequence OR curricul* OR class OR semester)) OR “compressed course” OR time-shorten* OR “time shorten*” OR (two N5 (“one semester” OR one-semester)) OR “refresher course” OR self-pac* OR ((“paired developmental” OR supplemental) N5 support*) OR “college prep*”)

Contextualized Instruction

((Contextualiz* OR Applied OR Embedded OR theme-based OR anchored OR infused OR "functional context" OR situational OR "subject-area" or "subject area") AND (teaching OR education OR instruction OR learning OR literacy OR curriculum)) OR ("writ* to learn" OR writ*-to-learn OR I-BEST OR "academic-occupation integration" OR "workplace N5 literacy"))

Early Assessment

(“Early assessment” OR “early assess*” OR placement OR “exit exam” OR “early assessment program” OR “Early Assessment Program (EAP)” OR “California Early Assessment program” OR Compass OR Accuplacer OR “ACT Educational Planning and Assessment” OR “EPAS” OR “Florida Postsecondary Education and Readiness Test” OR “PERT” OR “Tennessee Seamless Alignment and Integrated Learning Support” OR “SAILS” OR “college readiness” OR “college-readiness” OR “college prepar*” OR “testing programs” OR “academic readiness” OR “academic support services” OR “educational measurement” OR “educational evaluation” OR

“college school cooperation” OR “readiness for college” OR “placement exams” OR “college transition” OR “Achieving the dream”)

Enhanced and Early Alert Advising

(advising OR “advisor*” OR adviser OR “academic counsel*” OR “guidance” OR “mentor*” OR “Coach*” OR “early alert” OR “early-alert” OR “early warning” OR “early-warning” OR “system of notification” or “student retention specialist*” OR “Puente program” OR attainment OR graduat* OR persist* OR retention OR retain)

Metacognition

(Metacogn* OR Meta-cogn* OR Self-question* OR “Self-Regulat* N20 learning” OR “written summariz*” OR “Think* aloud” OR Think-aloud OR “Strateg* knowledge”)

Student Success Courses/First Year Experience (Contexts for Metacognition)

(("college adjustment course*" OR "college adjustment program*" OR "college adjustment class*" OR "college adjustment seminar*" OR "college seminar*" OR "college success course*" OR "college success program*" OR "college success class*" OR "college success seminar*" OR "college survival course*" OR "college survival program*" OR "college survival class*" OR "college survival seminar*" OR "college transition course*" OR "college transition program*" OR "college transition class*" OR "college transition seminar*" OR "first semester seminar*" OR "first year college experience" OR "first year experience course*" OR "first year experience program*" OR "first year experience class*" OR "first year experience seminar*" OR "first year new student orientation course*" OR "first year new student orientation program*" OR "first year new student orientation class*" OR "first year new student orientation seminar*" OR "first year orientation course*" OR "first year orientation program*" OR "first year orientation class*" OR "first year orientation seminar*" OR "first year seminar*" OR "freshman experience course*" OR "freshman experience program*" OR "freshman experience class*" OR "freshman experience seminar*" OR "freshman orientation course*" OR "freshman orientation program*" OR "freshman orientation class*" OR "freshman orientation seminar*" OR "freshman seminar*" OR "freshman success course*" OR "freshman success program*" OR "freshman success class*" OR "freshman success seminar*" OR "freshman transition course*" OR "freshman transition program*" OR "freshman transition class*" OR "freshman transition seminar*" OR "freshman year experience course*" OR "freshman year experience program*" OR "freshman year experience class*" OR "freshman year experience seminar*" OR "learning skills course*" OR "learning skills program*" OR "learning skills class*" OR "learning skills seminar*" OR "learning strateg* course*" OR "learning strateg* program*" OR "learning strateg* class*" OR "learning strateg* seminar*" OR "new student orientation course*" OR "new student orientation program*" OR "new student orientation class*" OR "new student orientation seminar*" OR

"orientation course*" OR "orientation program*" OR "orientation class*" OR "orientation seminar*" OR "student life skills course*" OR "student life skills program*" OR "student life skills class*" OR "student life skills seminar*" OR "student success course*" OR "student success program*" OR "student success class*" OR "student success seminar*" OR "study skills course*" OR "study skills program*" OR "study skills class*" OR "study skills seminar*" OR "study strateg* course*" OR "study strateg* program*" OR "study strateg* class*" OR "study strateg* seminar*" OR "success course*" OR "University 10* orientation course*" OR "University 10* orientation program*" OR "University 10* orientation class*" OR "University 10* orientation seminar*" OR "university seminar*")

Multiple Measures

((“placement polic*” OR “placement test” OR “placement practice*” OR Accuplacer OR Compass OR “course placement” OR “placement accuracy” OR “standardized testing” OR “CCSS-aligned assessment*” OR “CCSS-aligned assessment*” OR “Common Core State Standards-aligned assessment* OR Common Core State Standards (CCSS)-aligned assessment*”) OR ((placement OR placed OR place OR placing OR assess* OR assign* OR “predict*” OR “validation stud*” OR “boosted student*” OR “validate”) AND (gateway OR “college ready” OR “college-ready” OR “academic performance” OR “Multiple Measure*” OR “multiple-measure*” OR “combination* of measure*” OR “multiple academic measure*” OR “Highest level of math” OR “math background” OR “academic background” OR “college plan*” OR Motivation OR “years of math” OR “high-stakes exam*” OR “placement exam” OR “measure* of preparedness” OR “testing instrument” OR “self-placement” OR “counselor recommendation*” OR “advisor recommendation*” or “adviser recommendation*” OR essay OR “transition course” OR “transcript data” OR “culture-fair test*” OR “test* of new learning abilit*” OR SAT OR “high school achievement test*” OR ACT/SAT OR SAT/ACT OR ((ACT)N5(predict* OR exam* OR scor* OR test* subscore* OR math)) OR (High school and (GPA “grade point average*” OR “class rank” OR Algebra OR trigonometry OR grade* OR preparation OR “achievement”)))))

Integrated, Multiple Supports

(“Accelerated Study in Associates Programs” OR ASAP) OR ((“City University of New York” OR CUNY”) AND “Accelerated Study in Associates Programs” OR ASAP))

Databases Searched

The 10 databases searched were

ProQuest/EBSCO

1. ProQuest Education journals
2. ProQuest dissertations
3. Education Research complete
4. Academic Search Complete
5. ERIC
6. Wilson Education Full Text
7. SocINDEX with Full Text
8. PsycInfo
9. EconLit with Full Text
10. Social Sciences Full Text (H.W. Wilson)

In addition, the bibliographies of all studies screened for review for the Developmental Education Practice guide were mined for additional relevant studies not identified in the systematic literature search.

Finally, the following websites were reviewed for potentially relevant studies:

1. American Association of Community Colleges (AACC)
2. American Math Association of Two Year Colleges (AMATC)
3. Association for Career and Technical Education
4. Better High Schools (re: Early Assessment)
5. Carnegie Foundation for the Advancement of Teaching
6. Center for Teaching, Vanderbilt University
7. Center for the Study of Higher Education and its related—Higher Ed in Review

8. Center for the Study of Higher Education at Berkeley (CSHE)

9. City University of New York (Accelerated Study in Associate Programs, research)

10. Community College Research Center (CCRC) at Teachers College, Columbia University

11. Cornell Higher Education Research Institute working papers

12. Council for the Study of Community Colleges (CSCC)

13. Developmental Education Initiative (DEI)

14. Education Commission of the States (research briefs)

15. Independent research cited from ACT, ETS, Noel-Livitz or testing companies for Multiple Measures or Early Assessment

16. Institute for Higher Education Leadership and Policy (news blasts)

17. Mathematica

18. MDRC

19. Metacognition and Memory Lab, Columbia University

20. National Academic Advising Association (NACADA)

21. National Association for Developmental Education

22. National Bureau of Economic Research (NBER)

23. National Center for Career and Technical Education, Southern Regional Education Board

24. National Center for Education Statistics (research publications using NCES datasets)

25. National Center for Postsecondary Improvement

26. National Center for Postsecondary Research

27. National Center for Public Policy and Higher Education (news blasts)

28. National College Transition Network (News blast about research; re: Early Assessment)

29. National Council on Learning and Reading

30. RAND
31. RP Group
32. Stanford Center for Education Policy Analysis (CEPA)
33. WISCAPE working papers

In addition, forward citation searches (using Google Scholar) were conducted for all studies identified from the larger remedial education search.

Appendix C. Brief Descriptions of Practices[3]

1. Early assessment

Early assessments measure high school juniors' readiness for college-level coursework and can inform on the need for skill building in math, reading, or writing before formal remediation (Barnett, Fay, Bork, & Weiss, 2013). The purpose of early assessments is to identify high school students who are underprepared for college-level coursework, to offer structured support to identified students to help them get ready for college. Early assessments include items that assess college readiness and exist on college placement exams. Often a point of debate, early assessments assume students will take responsibility for finding the help they need (Community College Research Center, 2014).

2. Practices to modify information used to make placement decisions

Most 2-year, open-access institutions—92% by one estimate (Parsad, Lewis, & Greene, 2003)—require most of their incoming students to take brief, standardized assessment tests in math, reading, and writing. In doing so, they are following recommendations for mandatory assessment and placement found in the best practices literature (Hughes & Scott–Clayton, 2011). Results are used to place students into either developmental or college-level courses (Scott–Clayton, Crosta, & Belfied, 2014). While tests assess math and English knowledge and skills, the results also are used to determine placement in other subject areas (Hughes & Scott–Clayton, 2011). One alternative to placement based exclusively on the results of these testing modules is to complement the test results with other measures that can predict success. Suggested measures include high school grade-point average, units of prior math/English, time elapsed since last course, and highest level of math/English previously taken.

3. Performance-based monetary incentives

[3] This list of practices will be further modified after the Expert Panel reviews the evidence in the nine practice areas. The protocol will be edited to reflect the final practice recommendations.

Unlike traditional financial aid support—which is based largely on past performance as well as financial need—performance-based incentives are monetary awards that are disbursed to students based on their performance in their current classes. These awards are in addition to the financial aid packages students receive (e.g., Pell Grants). Although in certain instances the awards may reduce the amount of loan dollars taken and grant dollars awarded, they usually result in a net financial gain for students (see Patel & Valenzuela, 2013). Students are allowed to use the awards for any purpose (that is, not necessarily for educational expenses; Scrivener & Coghlan, 2011). The awards are usually distributed at predetermined time points throughout the semester, rather than in a lump sum payment. The rationale behind this disbursement structure is that it encourages students to meet academic milestones. The short-term goal of such initiatives is to encourage students to perform better in (and complete) their classes. A longer-term goal is to support their progress through developmental and degree requirements to achieve graduation or transfer (Patel, Richburg–Hayes, de la Campa, & Rudd, 2013).

4. Practices to teach metacognition

John Flavell coined the term *metacognition* in the late 1970s, referring to a person's "cognition about cognitive phenomena" or "thinking about thinking" (Flavell, 1979, p. 906, as cited in Lai, 2011). The foundational knowledge and skills involved in metacognition have been observed by educators and psychologists for decades prior, and have theoretical foundations in the work of James, Piaget, and Vygotsky (Fox & Riconscente, 2008). Metacognition has two primary aspects: 1) self-knowledge about cognition and 2) self-regulation of cognition (numerous citations in Lai, 2011). As summarized by Teaching Excellence in Adult Literacy (2012), metacognitive knowledge refers to what individuals know about themselves as cognitive processors, about different approaches that can be used for learning and problem solving, and about the demands of a particular learning task. Metacognitive regulation refers to adjustments individuals make to their processes to help control their learning, such as planning, information management strategies, comprehension monitoring, debugging strategies, and evaluation of progress and goals.

Metacognition involves three key abilities: 1) to use prior knowledge to plan a strategy for approaching a learning task; 2) to take necessary steps to problem-solve and reflect on and evaluate results; and 3) to modify one's approach as needed. Flavell, who coined the term, offered an example: "I am engaging in metacognition if I notice that I am having more trouble learning A than B; if it strikes me that I should double check C before accepting it as fact" (1976, p. 232). Interventions typically involve training instructors or providing instructors with materials to support the use of different instructional techniques that foster students' metacognition. Instructional strategies to foster students' metacognition may involve modeling of "think alouds" in which instructors (live or videotaped) self-correct errors and narrate thought processes; provide outlines, visual aids, or other tools for regulating and monitoring thinking; direct instruction on metacognitive strategies; and facilitate group discussion on tools of metacognitive thinking such as semantic maps of reading passages. Metacognitive strategy instruction may be embedded in the instruction of a semester-long course or taught as a supplement to a course.

5. Practices that accelerate, compress, or mainstream developmental education

Community colleges (and some other postsecondary institutions) have implemented practices to compress or accelerate college students' progress through developmental education courses to college credit–bearing courses. Practices incorporated in the search include

- *Compression or fast-tracking:* Offering developmental courses in a compressed period so students may complete more levels of coursework in a single term
- *Mainstreaming, co-requisite instruction, and paired developmental support:* Mainstreaming students into college-level courses with a pairing in a developmental course or with supplemental support services such as tutoring (Zachry Rutschow & Schneider, 2011)

Other practices to accelerate student progress through developmental education coursework may include restructuring and/or reducing the sequence of courses needed to enroll in college-level courses (Zachry Rutschow & Schneider, 2011; Edgecombe, 2011). Accelerated developmental education reforms may also be referred to in the literature as "intensive, compressed, condensed, and time-shortened…" (Edgecombe, 2011, p. 4). Some models of acceleration may intentionally link developmental education curricula to students' occupational or disciplinary interests (such as developmental education course redesign for STEM majors or contextualized instruction to students' occupational interests).

6. Contextualized instruction

Perin (2011) described two types of contextualization practices for students in developmental education: contextualized instruction and integrated instruction. While discipline-area instructors would integrate instruction of reading, writing, and math in discipline-specific applications (for integrated instruction), instructors of reading, writing, and math would contextualize instruction of reading, writing, and math in conjunction with a content-area instructor (for contextualized instruction). In contextualized instruction, the primary emphasis is the teaching of reading, writing, and math, with the specific subject matter (such as medicine or computer science) as a backdrop. In integrated instruction, the main purpose is the teaching of academic or vocational content, with basic skills in reading, writing, or math infused into a content-area course. Drawing from an extensive literature review, Perin (2011) articulated the core principle of contextualized instruction as connecting basic skills instruction to real-world applications, to improve the intrinsic motivation to learn mechanics of reading, writing, and math while building on prior knowledge and individually meaningful topics and content.

Other terms used to describe contextualized teaching and learning include content-area literacy, embedded instruction, writing-to-learn, integrative curriculum, theme-based instruction, anchored instruction, curricular integration, academic–occupation integration, infused instruction, developmental education learning communities, workplace literacy, and functional context education (Perin, 2011, p. 3).

7. Enhanced advising and early alert/early warning advising

Enhanced advising. Advising, guidance, and counseling services[4] have developed to help students at all levels make occupational choices, understand the relationship between school and subsequent employment, and address a variety of academic and personal issues (Grubb, 2001). Some colleges have looked to create more intensive advising experiences (Zachry Rutschow & Schneider, 2011). More intensive advising is often called "enhanced advising" (Zachry Rutschow & Schneider, 2011) or "intrusive advising" (Escobedo, 2007). Enhanced advising replaces the quick, transactional structure of traditional advising (e.g., a concentration on class schedules and financial aid procedures) with a more holistic structure where advisers ask deeper questions and engage more with the student to assist with his or her planning for success in college from a variety of angles (Campbell Jackson, 2014). Three elements of enhanced advising are supports for students to 1) set long-term goals, 2) monitor progress toward long-term goals, and 3) overcome obstacles toward long-term goals.

Early alert/early warning advising. Early alert and intervention is a systematic effort designed to identify and support students at risk of attrition to improve their retention, persistence, and success (Lynch–Holmes, Troy, & Ramos, 2012). Early alert systems, which identify students in need of an intervention, are an increasingly common way to address ongoing needs of students that may not be evident before enrollment (Donnelly, 2010). Kuh, Kinsey, and Buckley (2007) state that early alert systems (i.e., early warning systems) are especially important for students with two or more risk factors, including being academically underprepared.[5] Early alert systems have the potential to create a more cohesive and centralized approach to communicating with students and monitoring their academic progress (Faulconer, Geissler, Majewski, & Trifilo, 2014). They present an opportunity to systematically increase the network of both referrers (e.g., faculty, instructors, community members) and responders (e.g., advisers, early alert staff, the office of the registrar, the office of first-year programs, residence life, student success centers) [Lynch–Holmes et al., 2012].

8. Comprehensive and integrated support programs

Many of the reforms designed to improve success rates for community college students have been short term and have addressed no more than a few barriers to student success (Scrivener & Weiss, 2013). Although some interventions have produced positive results (e.g., Zachry Rutschow & Schneider, 2011; Scrivener, Sommo, & Collado, 2009; Jenkins, Zeidenberg, and Kienzl, 2009), many of these are short lived (Moman, 2002; Karp & Stacey, 2013; Calcagno & Long, 2008) and only affect a few of the targeted educational outcomes (Cousert, 1999;

---

[4]Advising is sometimes referred to as "counseling" (Grubb, 2001), "coaching" (Bettinger & Baker, 2011), or "mentoring" (Visher, Butcher, & Cerna, 2010).

[5]Other risk factors include not entering college directly after high school, attending college part time, being a single parent, being financially independent, caring for children at home, working more than 30 hours per week, and being a first-generation college student.

Scrivener & Weiss, 2013). To address the shortcomings of singular or not systemically integrated interventions, intensive, full-time programs with comprehensive support have been created.

The illustrative example provided for this practice is the Accelerated Study in Associate Programs (ASAP) at the City University of New York. This multi-faceted program provides integrated, multiple supports and incentives to low-income community college students in need of developmental courses to build their reading, writing, or math skills upon postsecondary enrollment. The ASAP program includes the following components: required full-time enrollment, consolidated block scheduling in the first year, a non-credit seminar covering topics such as goal-setting and academic planning, comprehensive student advising services, tutoring services, career and employment services, a tuition waiver, free public transportation vouchers, and free textbooks for classes.

The criteria for inclusion in the integrated, multiple practices involved a combination of four of the six following practices, implemented over multiple years (as a long-lasting intervention)

1. Full time attendance
2. Accelerated instruction
3. Enhanced Advising
4. Tutoring
5. Block scheduling/cohort model
6. Non-financial aid monetary support/monetary incentives

References

Altman, D. G., & Bland, J. M. (2003). Interaction revisited: The difference between two estimates. *British Medical Journal, 326*(7382)*,* 219.

Barnett, E. A., Fay, M. P., Bork, R. H., & Weiss, M. J. (2013). *Reshaping the college transition: States that offer early college readiness assessments and transition curricula.* New York, NY: CCRC Community College Research Center, Teachers College, Columbia University. Retrieved from http://ccrc.tc.columbia.edu/media/k2/attachments/reshaping-the-college-transition-state-scan.pdf

Bettinger, E., & Baker, R. (2011). *The effects of student coaching in college: An evaluation of a randomized experiment in student mentoring.* (Working paper number 16881). Cambridge, MA: National Bureau of Economic Research.

Calcagno, J. C., & Long, B. T. (2008). *The impact of postsecondary remediation using a regression discontinuity approach: Addressing endogenous sorting and noncompliance.* New York, NY: National Center for Postsecondary Education.

Campbell Jackson, C. (2014, October 28). *Enhanced advising at the University of Akron* [Video file]. Retrieved from https://www.youtube.com/watch?v=a1mZz2mz8ns

Community College Research Center. (2014). *Early assessments and transition curricula: What can states do.* New York, NY: CCRC Community College Research Center, Teachers College, Columbia University. Retrieved from http://ccrc.tc.columbia.edu/media/k2/attachments/reshaping-college-transition-policy-brief_1.pdf

Cousert, D. (1999). *The effects of a mentoring intervention program on retention of students in community college*. Available from *ProQuest Dissertations and Theses* database. (UMI No. 9951937)

Donnelly, J. E. (2010). Use of a web-based academic alert system for identification of underachieving students at an urban research institution. *College and University*, *85*(4), 39–42.

Edgecombe, N. (2011, February). *Accelerating the academic achievement of students referred to developmental education*. A working paper in the CCRC assessment of evidence series. New York, NY: Community College Research Center (CCRC), Teachers College, Columbia University. Retrieved from http://academiccommons.columbia.edu/catalog/ac:146646

Ellis, A. K., Denton, D. W., & Bond, J. B. (2014). An analysis of research on metacognitive teaching strategies. *Procedia—Social and Behavioral Sciences, 116*, 4015–4024.

Escobedo, G. (2007). A retention/persistence intervention model: Improving success across cultures. *Journal of Developmental Education, 31*(1), 12–14, 16–17, 37.

Faulconer, J., Geissler, J., Majewski, D., & Trifilo, J. (2014). Adoption of an early-alert system to support university student success. *Delta Kappa Gamma Bulletin, 80*(2)*,* 45–48.

Flavell, J. H. (1976). Metacognitive aspects of problem solving. In L. B. Resnick (Ed.), *The nature of intelligence* (pp. 231–236). Hillsdale, NJ: Erlbaum**.**

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist, 34*(10), 906–911.

Fox, E., & Riconscente, M. (2008). Metacognition and self-regulation in James, Piaget, and Vygotsky. *Educational Psychology Review, 20*, 373–389.

Grubb, W. N. (2001). *"Getting into the world": Guidance and counseling in community colleges.* New York, NY: Community College Research Center, Teacher's College Columbia University.

Hodara, M. (2011). *Reforming mathematics classroom pedagogy: Evidence-based findings and recommendations for the developmental math classroom.* (CCRC Working Paper No. 27). New York, NY: Teachers College, Community College Research Center (CCRC), Columbia University.

Hodara, M. (2013, July). *Improving students' college math readiness: A review of the evidence on postsecondary interventions and reforms*. (CAPSEE Working Paper). New York, NY: Teachers College, Center for Analysis of Postsecondary Education and Employment (CAPSEE), Columbia University.

Holschuh, J. P., & Paulson, E. J. (2013, July). *The terrain of college developmental reading*. Executive summary and paper commissioned by the College Reading & Learning Association. Retrieved from http://www.nade.net/site/documents/breaking%20news/TheTerrainofCollege91913.pdf

Hughes, K. L., & Scott–Clayton, J. (2011). *Assessing developmental assessment in community colleges.* (CCRC Working Paper No. 19, Assessment of Evidence Series). New York, NY: Community College Research Center, Teachers College, Columbia University. Retrieved from http://ccrc.tc.columbia.edu/media/k2/attachments/assessing-developmental-assessment.pdf

Jenkins, D., Zeidenberg, M., & Kienzl, G. (2009). *Educational outcomes of I–BEST Washington state community and technical college system's integrated basic education and skills training program: Findings from a multivariate analysis.* (CCRC Working Paper No. 16). New York, NY: Community College Research Center, Teachers College, Columbia University.

Karp, M. M., & Stacey, G. W. (2013). *What we know about nonacademic student supports*. New York, NY: Community College Research Center, Teachers College, Columbia University. Retrieved from http://ccrc.tc.columbia.edu/media/k2/attachments/what-we-know-about-nonacademic-student-supports.pdf

Kilpatrick, J., Swafford, J., & Findell, B. (Eds.). (2001). *Adding it up: Helping children learn mathematics*. Washington, DC: National Academies Press.

Kuh, G. D., Kinzie, J., & Buckley, J. A., with Bridges, B. K., and Hayek, J. C. (2007). Piecing together the student success puzzle. *ASHE Higher Education Report, 32*(5).

Lai, E. (2011). *Metacognition: a literature review.* New York, NY: Pearson. Retrieved from http://images.pearsonassessments.com/images/tmrs/Metacognition_Literature_Review_Final.pdf

Lynch–Holmes, K. B., Troy, A. B., & Ramos, I. (2012). *Early alert & intervention: Top practices for retention.* Boston, MA: ConnectEdu.

Moman, F. (2002). *The effects of a mentoring intervention on student retention in a community college*. Available from Education Resources Information Center (ERIC No. ED480766).

Parsad, B., Lewis, L., & Greene, B. (2003). *Remedial education at degree-granting postsecondary institutions in fall 2000.* (NCES 2004–101). Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Patel, R., Richburg–Hayes, L., de la Campa, E., & Rudd, T. (2013). *Performance-based scholarships: What have we learned? Interim findings from the PBS demonstration.* Policy Brief. New York, NY: MDRC.

Patel, R., & Valenzuela, I. (2013). *Moving forward: Early findings from the Performance-Based Scholarship Demonstration in Arizona.* New York, NY: MDRC.

Perin, D. (2011). *Facilitating learning through contextualization.* (CCRC Working Paper No. 29). New York, NY: Community College Research Center, Teachers College, Columbia University.

Scott–Clayton, J., Crosta, P. M., & Belfied, C. R. (2014). Improving the targeting of treatment: Evidence from college remediation. *Educational Evaluation and Policy Analysis*, *36*(3), 371–393.

Scrivener, S., & Coghlan, E. (2011). *Opening doors to student success: A synthesis of findings from an evaluation at six community colleges.* Policy Brief. New York, NY: MDRC.

Scrivener, S., & Weiss, M. J. (2013). *More graduates: Two-year results from an evaluation of Accelerated Study in Associate Programs (ASAP) for students in developmental education*. New York, NY: MDRC.

Simpson, M. L., & Nist, S. L. (2000). An update on strategic learning: It's more than textbook reading strategies. *Journal of Adolescent & Adult Literacy, 43*(6), 528–541.

Teaching Excellence in Adult Literacy. (2012, February). *Fact sheet: Metacognitive processes*. Washington, DC: Author. Retrieved from https://teal.ed.gov/

Visher, M., Butcher, K., & Cerna, O. (2010, February). *Guiding developmental math students to campus services: An impact evaluation of the Beacon Program at South Texas College.* New York, NY: MDRC. Retrieved from http://www.mdrc.org/publications/540/overview.html

Zachry Rutschow, E., & Schneider, E. (2011, June). *Unlocking the gate: What we know about improving developmental education*. New York, NY: MDRC.