



Post 16 remedial policies: a literature review

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Abstract

Remedial interventions in tertiary education are under scrutiny in most OECD countries. They are particularly important in a context of increasing demand for skilled workers. However, they are often costly, and their efficiency in boosting student performance has been questioned. This debate has gained particular relevance in England given recent policy changes that require students who do not get at least a grade C in English or maths in GCSE to repeat exams in these subjects. The objective of this literature review is to provide an overview of recent empirical work on the impact of remediation policies in post-16 education on the outcomes of students, in terms of educational achievements and qualifications. Recent evidence on the impact of traditional remediation interventions suggests that the effects are very mixed: remedial courses appear to help or hinder students differently by state, institution, background, and level of academic preparedness. Some recent studies that evaluate mentoring approaches have found evidence of positive effects and interestingly find that face-to-face services cannot easily be replaced by low-cost technology such as text messages. Another interesting finding is that combined approaches (such as academic support services and financial incentives) can be more effective than the provision of one of these services in isolation. It is also important to note that even when interventions find positive effects in the short run, they can quickly fade out in later years. Finally, studies often find the impact of remediation to vary according to students' characteristics. For example, in certain contexts, women, older students and lower-achieving students have been found to benefit more from remediation services. There is a critical need for more research using rigorous methodologies to understand why certain types of students are more (or less) responsive to certain interventions, and to tailor interventions and pedagogies accordingly.

Keywords: Remediation; post-16 education; training

JEL codes: I23, I24, I28

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Executive Summary

The policy context of this literature review is the requirement for students in England to repeat their GCSE exams in English or maths if they fail to obtain at least a grade C the first time round. The low progression rate in the subsequent years after failing has raised concerns about the quality of remediation available. The objective of this literature review is to provide an overview of recent empirical work on the impact of remediation policies in post-16 education on the outcomes of students, in terms of educational achievements and qualifications. Where available, we also consider longer run outcomes. In particular we draw on evidence from evaluation of evidence in American Community Colleges, although we also draw on evidence from other countries.

- By “remediation policies”, we mean any supplementary courses or interventions designed to improve basic skills for students who failed to achieve the necessary requirement to access higher education programmes, including supplementary courses for those who did not achieve a sufficient score, but also peer-support groups, mentoring – face-to-face or with the use of ICT - and financial incentives. This review focuses on studies that have used rigorous identification strategies, such as randomised controlled trials and regression discontinuity design. The literature review will also address pedagogical innovations and integration of remedial courses within the more general curriculum, although these interventions have not been subject to evaluations using the standard rigorous methods.

- Recent evidence on the impact of traditional remediation interventions suggests that the effects are very mixed: remedial courses appear to help or hinder students differently by state, institution, background, and level of academic preparedness. This makes it difficult to draw general conclusions from available studies. The studies reviewed here suggest that remediation programmes can in principle generate positive results, but often do not. Thus the fact that they are available does not necessarily mean that students benefit from them.

Indeed in principle there may be negative effects that offset positive effects. In terms of research, it is important to open up the ‘black-box’ of remediation strategies and identify which types of intervention have an impact on students’ outcomes and in what context. There is much evaluation work to do here. Although there are some examples of successful interventions, it is not clear what aspects made it successful and whether this is transferable to other contexts. Studies that evaluate mentoring approaches have found evidence of positive effects and interestingly find that face-to-face services cannot easily be replaced by low-cost technology such as text messages. Another interesting finding is that combined approaches (such as academic support services and financial incentives) can be more effective than the provision of one of these services in isolation. Finally, it is also important to note that even when interventions find positive effects in the short run, they can quickly fade out in later years.

- We also consider whether interventions have different effects on different groups of student (by gender, age and other demographics). More research is needed to understand why certain types of students are more (or less) responsive to certain interventions.

1. Introduction

Students who do not get at least a grade C in English or maths in GCSEs are now obliged to repeat these subjects in the following year and re-sit exams (i.e. from 2014 onwards in England). These requirements apply to students in schools and further education (FE) colleges, as well as those on apprenticeships and traineeships. Recent figures from the Department for Education (2016) reveal that fewer than 25% of students subsequently obtain a grade C in both English and maths.¹ Moreover, students from disadvantaged background disproportionately fail to achieve these new requirements. In light of these new policy requirements, it is important to investigate existing evidence on the efficacy of interventions aiming to improve mathematics and English attainment for students older than 16 years old. The present survey looks at recent empirical work on the impact of remediation policies in post-16 education on the outcomes of students, in terms of school achievements and qualifications. We also consider long run outcomes, including continuation to higher education and subsequent labour market earnings, where evidence is available. By “remediation policies”, we mean any supplementary courses or interventions designed to improve basic skills for students who failed to achieve the necessary requirement to access higher education programmes. This includes traditional programmes such as supplementary courses for those who did not achieve a sufficient score, but also peer-support groups, mentoring – face-to-face or with the use of ICT - and financial incentives. The literature review will also address pedagogical innovations and the integration of remedial courses within the more general curriculum, as well as the role of new technologies in learning. However, these last intervention types have few rigorous studies investigating how the content of courses and the pedagogical innovations can further boost the outcomes of students placed in remediation. This review draws on and adds to the literature review by Maughan et al. (2016), which was recently published by

¹https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/514296/SFR12_2016.pdf

the Education Endowment Foundation.

Much of the recent economic literature on remedial policies focuses on the experience of American community colleges. This literature review will give an overview of the recent findings in this context, as well as in other countries such as the UK, Israel and Italy. For the most part, we have tried to select studies with a rigorous methodology for discussion here, although we do not claim to be comprehensive. Table 1 summarizes the studies analysed hereafter.

The growing demand for skilled labour in advanced economies partly explains why remedial policies have been used increasingly in the American context for first-year college students. A substantial number of adult students, including recent immigrants and workers displaced by structural shifts in the labour market, also enrol in remedial courses. Completing higher education is an important investment for future labour market outcomes, even for the marginal student.² Over the past three decades in particular, the earnings premium associated with a college education has risen substantially.

Nearly one-third of first-year College students in the United States participate in remedial courses in reading, writing, or mathematics (National Center for Education Statistics 2003 in Angrist, Lang, and Oreopoulos 2009). This raises the question of academic preparedness in high school, a critical issue both in the American and British context. According to Bridget Terry Long, "the fact that we have [in the US] 35 to 40 percent of our first-year students going into remediation - or developmental courses, as they are sometimes called - has so many important implications. Among other concerns, it raises the question of whether or not students are actually getting postsecondary training in college, or whether the higher education system is spending too much time simply trying to address the problems of the K-12 system."³

In recent years, the debate over the efficiency of remedial policies has been steadily

² Despite important heterogeneity across potential college students, the Oreopoulos and Petronijevic (2013) study concludes that the investment in higher education appears to pay off for both the average and marginal student.

³ Interview available here: <https://www.gse.harvard.edu/news/uk/14/08/rethinking-remediation>.

growing in the US. It includes estimation of the cost of such policies, as well as the place of remediation policies within the higher education system. The social costs of not offering remediation are of great concern, given the growing demand for skilled labour in the United States (Bettinger and Long 2009, Bailey, Jeong, and Cho 2010). However, remediation comes at great expense to colleges and universities, with efforts estimated to cost over a billion dollars a year at public colleges alone (Breneman & Haarlow, 1998). The Alliance for Excellent Education (Kraman, D'Amico, and Williams 2006) estimated that the cost of the delivery of remediation nationwide in the US totalled \$1.4 billion in the form of direct costs to students and institutions.⁴ The most recent estimate suggests that the direct cost of remediation is actually as high as \$7 billion annually (Scott-Clayton, Crosta, and Belfield 2014). Importantly, these estimates do not account for the opportunity cost of time for students enrolled. Remedial courses are often assumed to be offered for a lower cost at community colleges.⁵ Consequently, at least ten states in the US have elected to focus their remediation efforts at the two-year colleges and more are considering doing so (Bettinger and Long 2009). In several states, including Indiana, South Carolina, and Tennessee, four-year institutions are prohibited from offering remedial education and are expected to make arrangements with community colleges to provide the remediation of students accepted for admission (Long and Boatman 2013). In 2012, at least seven states restricted or eliminated state funding for remedial courses at some of their four-year colleges, thereby forcing these institutions to fund remedial courses strictly through the use of tuition and fees. All of the above demonstrates that in the American context, the effectiveness and costs of remediation policies are under great scrutiny.

In this review, we will largely focus on evaluation evidence coming from the US, although we will also draw on some evidence for other countries. In Section 2, we will identify the methodological challenges behind the evaluation of remedial policies and methods used to

⁴ Another study estimated the annual cost of remediation to be between \$1.9 and \$2.3 billion at community colleges and another \$500 million at four-year colleges (Strong American Schools 2008), while yet another study estimates that states and students spent more than \$3 billion on remedial courses in 2011 (Center 2012).
⁵ Bettinger and Long (2009) focus on Ohio, where public colleges spent approximately \$15 million teaching 260,000 credit hours of high school-level courses to freshmen in 2000; another \$8.4 million was spent on older students (Ohio Board of Regents 2001).

assess the efficacy of these programmes. In Section 3, we will discuss recent evidence on the effect of traditional remedial interventions in various contexts, and the puzzle behind these mixed results. In Section 4, we will try to investigate the relative impact of different remedial tools beyond traditional remedial courses, and discuss how the effects might vary with respect to students' characteristics. We conclude in Section 5 and make suggestions for future interventions and research.

2. Identifying the impact of remedial policies: methodological challenges

The studies considered here investigate the effects of remedial policies on student outcomes by measuring the statistical association between policy interventions aimed at boosting post-16 educational achievements and student outcomes. The main methodological challenge is to establish whether these estimated statistical associations are the result of causal links between remedial policies and student outcomes. In order to understand the impact of remedial education policies, descriptive studies have often compared the outcomes of students placed in remediation to those who are not. However, selection issues preclude a straightforward analysis because there are inherent differences between students placed in remediation from those who do not need to be. In addition, enrolment in a particular college may be an endogenous choice reflecting both student ability and preferences about remediation. For example, as pointed out by Bettinger and Long (2009), a student who is willing to avoid remediation might choose a college with a very low placement threshold. However, this second concern may not be so much of an issue as several studies have highlighted the surprise of many students when they are placed in remediation. Another concern is related to the fact that assignment to remediation does not mean that students complete the sequence of courses. More recent studies have focused on the potential discouragement effect of being assigned to remediation.

The present literature review focuses on studies that have used rigorous identification strategies, such as randomised controlled trials and regression discontinuity design. These methodologies have several advantages. Students participating in a trial are randomly allocated to either the group receiving the treatment under investigation or to a group

receiving standard treatment (or placebo treatment) as the control. Randomisation ensures that students getting different remedial courses or support services - such as counselling or mentoring - are, on average, comparable on other dimensions. It is therefore credible to interpret results as reflecting the causal influence of programmes. However, these experiments are usually expensive, especially if the experiment has to be sufficiently large scale to allow investigation of heterogeneous effects. Another popular method is “regression discontinuity design”, a quasi-experimental method that elicits the causal effects of interventions by assigning a cut-off or threshold above or below which an intervention is assigned – typically a test-score. Most of the studies using this method focus on students just at the margin of needing remedial courses (i.e. scoring just below the cut off for college-level courses). However, these strategies are only suitable for identifying effects of remediation on those students close to the margin of the exam cut-off. Far less is known about the effectiveness of remediation in helping students with greater academic needs, though there is some suggestive evidence that more-intensive remediation can have positive effects (Boatman and Long 2010). Scott-Clayton, Crosta, and Belfield (2014) emphasise the need to focus on identifying which students should be assigned to these courses. However, as noted by Long and Boatman (2013), the local estimation strategy might partly explain the inconsistent findings on the impact of remediation on students’ outcomes.⁶

Using a number of different measures is crucial for assessing the short-run and long-run effects of remedial policies. Quantitative measurements typically include course success, course retention, programme persistence, progression through sequential levels of developmental courses, progression to college-level courses, and course/programme GPA. Qualitative measurements include student perception and satisfaction with various elements of the programme. It is also important to account for college major choices, and longer-term educational outcomes, such as total credit accumulation and degree

⁶ Using longitudinal data from Tennessee, Boatman and Long (2010) estimate the effects of placement into varying levels of mathematics, reading, and writing courses for students attending public four- and two-year colleges and universities. Similar to other research, they find negative effects for those students on the margin of needing any remediation. However, at the other end of the ability spectrum, the negative effects of remediation were much smaller and occasionally positive.

completion. Finally, few studies to our knowledge look at long-run outcomes such as measures of employment, wages, health or crime. A notable exception is the study by Zeidenberg, Jenkins, and Calcagno (2007) which provides estimates of the long-term impact of remediation using institutional data from a cohort of students enrolled in different community colleges in Florida and followed for more than five years. These authors have shown that enrolment in a remedial course has a positive effect on a student's probability of earning a credential, persisting, or transferring. However, the methodological approach does not control for the effects of socioeconomic status and student motivation, which may be positively correlated with enrolment in the programme and also with the probability of completing a credential.

3. Remediation: Barrier or gateway?

This section looks at recent evidence on the impact of traditional remediation interventions, by which we mean supplementary courses for students who did not achieve sufficient scores to be admitted to higher education. These courses are usually not integrated into the higher education curriculum *per se*, but undertaken by college students before they can engage in postsecondary coursework. Traditionally, studies have compared students assigned to remediation to their peers who have not been assigned to these courses, and have found a negative - although not causal - association between remediation and students' future performance. The more recent literature has used more rigorous methodologies (discussed in Section 2). All studies analysed in this section rely on rigorous identification strategies, with a particular focus on regression discontinuity design. As discussed by Long and Boatman (2013), existing research suggests that the effects of remediation are very mixed: remedial courses appear to help or hinder students differently by state, institution, background, and level of academic preparedness. The mixed conclusions of existing research presents a puzzle about why remediation can have such different effects.

Bettinger and Long (2009) examine the effects of remediation in Ohio and conclude that remedial students at Ohio colleges are more likely to persist in college and complete a bachelor's degree than students with similar test scores and backgrounds who were not

required to take the courses. In contrast, focusing on Florida, Calcagno and Long (2008) suggest that remediation might promote early persistence in college, but it does not necessarily help community college students make long-term progress toward a degree. Students on the margin of requiring math remediation were also slightly more likely to persist to their second year of college than their non-remedial peers. However, students in need of reading remediation were slightly less likely to pass their subsequent college-level English composition than their peers who did not require a remedial reading course. In Texas, Martorell and Mc-Farlin Jr (2011) use longitudinal administrative data and use a regression discontinuity research design. They find that remediation programmes have little effect on persistence, degree completion, and a range of other educational outcomes. They also find no effect on labour-market earnings. Finally, in their study, Bailey, Jeong, and Cho (2010) provide descriptive evidence of the impact of the “Achieving the Dream project”.⁷ Using survey analysis, they observe that only 20 percent of students referred to math remediation and 37 percent of those referred to reading remediation complete a gatekeeper course in the relevant subject area within three years.⁸ Fewer than 50 percent of students referred to remediation actually complete the entire sequence. This percentage is even lower for men, older students, African-American students, part-time students, and students in vocational programmes. The students assigned to the lowest levels of math remediation are the least likely to advance into college-level courses, with only 10 percent of this group ever completing a college-level math course.

Critics of remediation policies also question whether the courses remove the incentive for students to adequately prepare while still in high school. Surprisingly the existing literature on college remedial education has not taken this into account, with the important exceptions of Martorell, Isaac McFarlin, and Xue (2014) and Scott-Clayton and Rodriguez (2015). The former study finds that students whose placement exam scores requires them to be in remediation are no less likely to enrol in college than are students who score just

⁷ The “Achieving the Dream: Community Colleges Count” initiative was conducted for 250,000 students from 57 colleges in seven states in the US.

⁸ According to the authors, placement into mathematics remediation is more common than placement into English (i.e., reading and/or writing) remediation, but participation in English remediation may be a more serious concern as some evidence suggests that reading and writing deficiencies have more-negative effects on a student’s college success.

above the remediation placement cut-off. There is little benefit found to students' skills from being enrolled in the remediation course. On the other hand, placement on the remediation course does not appear to have a discouragement effect.

In principle, remediation can potentially affect outcomes in a negative way. Duchini (2016) reviews the potential detrimental effect of assignment to remediation. On the one hand remediation should help students to recover basic skills in order to improve their performance and to increase their college retention. On the other hand, assignment to remedial courses might increase the chances of dropping out because remedial courses usually do not count towards degree completion, but as a prerequisite for college-course attendance. Hence, they increase the overall workload for students who are assigned to them. Assignment to remediation might be perceived as a negative signal on student's ability to pursue a college degree. Finally, assignment to remediation might generate a social stigma, as peers might consider students who are placed in these courses as "less academically able". All these factors may act as a disincentive for first-year students and increase their probability of drop-out. It is crucial to better assess the impact of perception of one's own abilities on the dropout decision, in order to determine the optimal timing of remedial policies (Stinebrickner and Stinebrickner 2012). Using a novel data set of Italian undergraduate students, Duchini (2016) investigates the impact that assigning students to remediation has on enrolment decisions. Results indicate that students do not get discouraged when placed in remedial courses. However, in this context, the assignment to remediation does not trigger any positive and significant effect on either persistence or performance in college. De Paola and Scoppa (2014) also explore this issue in the context of Italian higher education and find more positive results. They use a fuzzy regression discontinuity design to identify the causal effect of remedial courses relying on the fact that students were assigned to the treatment if their performance in a placement test was below a certain cut-off point. From this analysis, it emerges that students attending the remedial courses whose results were just below the cut-off point acquire a higher number of credits than students whose results were just above the cut-off. They also find that remedial courses reduce the probability of dropping out from an academic course.

Lavy and Schlosser (2005) find evidence of positive effects of remediation policies in the

context of Israeli high schools. Specifically, they evaluate the short-term effects of a remedial education programme that provided additional instruction to underperforming students. The intervention prepared students for the matriculation exams. Using a comparison group of schools that enrolled in the programme later and implementing a difference-in-differences estimation strategy, the authors found that the programme raised the school mean matriculation rate by 3.3 percentage points.

These studies show that remediation programmes can in principle generate positive results, but often do not. Thus the fact that they are available does not necessarily mean that students benefit from them. Indeed in principle there may be negative effects that offset positive effects. In terms of research, it is important to open up the ‘black-box’ of remediation strategies and identify which types of intervention have an impact on students’ outcomes and in what context.

4. Which remedial tools for whom?

Given the increasing interest that colleges and policy makers are showing in remedial policies, it is crucial to identify in which context and for which type of student remedial education is effective. Traditional classroom interventions have proven to vary in terms of their impact on student outcomes. New pedagogic approaches designed to boost students’ outcomes deserve a closer look, although there are few rigorous evaluations. This section tries to open the “black box” of remediation, summarising recent evidence on various remedial tools, such as integrated courses, mentoring, peer-mediation, and IT-based approaches. It also sheds light on the importance of heterogeneous effects.

4.1. More integrated in-class remediation services

According to Long (2014), more research is needed on the placement process to remediation. Better assessment will help colleges tailor their support services and reduce the number of students who are unnecessarily placed into remediation. This is relevant in the American context but also important to consider in England. Long suggests using

multiple measures, including information about a student's high school GPA, courses taken, and/or years since high school graduation, rather than relying on a single exam - as high-stakes placement exams are poor predictors of college readiness (Center 2012).⁹

In the recent review by Maughan et al. (2016) for the EEF, there was a call for a more integrated approach to remediation, rather than withdrawing students from mainstream courses. However, to our knowledge there are few rigorous studies that examine this issue. An important contribution in this regard is given by the Jenkins, Zeidenberg, and Kienzl (2009) study conducted by the Community College Research Center (CCRC) at Teachers College, Columbia University, on the outcomes of the Integrated Basic Education and Skills Training programme (I-BEST). Under the I-BEST model, basic skills instructors and college-level career-technical faculty jointly design and teach college-level occupational courses for adult basic skills students. Instruction in basic skills is thereby integrated with instruction in college-level career-technical skills. The I-BEST model “challenges the conventional notion that basic skills instruction ought to be completed by students prior to starting college-level courses”. The approach thus offers the potential to accelerate the transition of adult basic skills students to college programmes. Complete College America (Center 2012) has also concluded that this is a promising approach; they suggest that students with few academic deficiencies should be placed in college-level courses with co-requisite built-in supports such as just-in-time tutoring and required self-paced computer labs.¹⁰ While Jenkins, Zeidenberg, and Kienzl (2009) find positive effects of the programme on educational outcomes (college credits, occupational certificates, basic skills), it should be borne in mind that the methodology (using observational approaches) does not necessarily allow for correction of potential selection bias caused by unobserved characteristics.

⁹ Recent research (Burdman 2012) shows that college placement tests have little correlation with students' future academic success, raising serious questions of how then to assess students remedial needs. Focusing on a different set of colleges, Scott-Clayton, Crosta, and Belfield (2014) come to the same conclusion: using information from a student's high school transcript, rather than solely relying on placement-test scores, would substantially reduce the number of students placed into courses incorrectly.

¹⁰ In addition to the Community College of Baltimore County, other institutions that have initiated similar programmes include the University of Maryland at College Park, Austin Peay State University in Tennessee, and Texas State University San Marcos.

In her paper examining the effects of these developmental courses redesign efforts, Boatman (2012) concludes that students exposed to redesigned developmental mathematics courses had more positive outcomes than similar students both from other, non-redesign institutions and from prior cohorts at the same institutions.¹¹ The results of this research suggest that the instruction and delivery methods of remedial courses are associated with an improvement of student academic outcomes. Using RCTs, Scrivener, Weiss, Ratledge, Rudd, Sommo, and Fresques (2015) focus on the impact of the City University of New York's (CUNY's) Accelerated Study in Associate Programmes (ASAP), launched in 2007, a comprehensive and long-term programme designed to help more students graduate and help them graduate more quickly, and found a positive effect of this approach. ASAP offers blocked or linked courses for the first year and offers a seminar for the first few semesters, covering topics such as goal-setting and study skills.¹² The colleges have main sessions, similar to traditional fall and spring semesters, followed by shorter intersessions between each semester. ASAP advisers encourage students to take classes during intersessions to achieve full-time status and to continue accumulating credits. ASAP substantially improved students' academic outcomes over three years, almost doubling graduation rates. ASAP increased enrolment in college and had especially large effects during the winter and summer intersessions.

Finally, several studies emphasize the efficiency of methods where learning taking place within a meaningful context for the students. Again, there is still a lack of rigorous quantitative evidence of the impact of this pedagogical approach in the UK context. The study by Dalby and Noyes (2015) provides qualitative evidence. They describe organisational approaches to teaching functional mathematics that are centralised or situated within vocational departments. It is focused on students in FE Colleges. Based on

¹¹ The largest positive effects on persistence occurred at Austin Peay State University, which eliminated its developmental math courses entirely and created two core college-level courses, Fundamentals of Mathematics and Elements of Statistics, which were linked to additional tutoring workshops.

¹² The programme provides a tuition waiver that fills any gap between financial aid and college tuition and fees. It also provides free MetroCards for use on public transportation, contingent on participation in key programme services, and free use of textbooks. It requires students to attend college full time and encourages them to take developmental courses early and to graduate within three years.

cases studies, the authors suggest that integrated, contextualised functional mathematics is more accessible and engaging to vocational students who struggled with GCSE than a more traditional academic approach

4.2. Evidence on mentoring and peer-mediated academic interventions

One of the goals of student coaching is to motivate the students to complete tasks. Research has also found that many community college students have little knowledge of course requirements and are unsure if their courses will meet requirement needs (Goldrick-Rab 2010). Therefore, mentoring is a remedial tool that might adequately address these needs and has become increasingly popular.

Several studies have noted the importance of continuous mentoring services in remediation courses (Angrist, Lang, and Oreopoulos 2009, Bettinger and Baker 2011). For instance, Grossman and Tierney (1998) focus on the mentoring programme "Big Brothers Big Sisters". Mentors were carefully screened, trained, and matched with a youth whom they met, on average, three or four times a month for approximately a year. The programme also provides careful professional supervision of these matches. The study used a random assignment procedure and showed that mentoring had a significant positive effect on young people aged 10 to 16. Over the 18-month follow-up period, those participating in Big Brothers Big Sisters Programmes were significantly less likely to display negative behaviours (e.g. substance abuse; violence or truancy). They were also more confident about their school performance and got along better with their families.

Interestingly, a very recent contribution by Oreopoulos and Petronijevic (2016) suggests that technology is not a good substitute for mentoring. Using a randomised controlled trial, they investigate whether technology - specifically, online exercises and text and email messaging - can be used to generate comparable benefits to one-on-one coaching interventions but at lower costs among first-year university students. They find large positive effects from the coaching programme, as coached students realize a 0.3 standard deviation increase in average grades and a 0.35 standard deviation increase in GPA. In

contrast, they find no effects from either the online exercise or the text messaging campaign on any academic outcome, both in the general student population and across several student subgroups. These results suggest that the benefits of personal coaching are not easily replicated by low-cost interventions using technology. When comparing the text messaging campaign and the coaching service, their results suggest that “proactively and regularly initiating conversations with students” are important design features to incorporate in future interventions that use technology to reach large populations of students.

Some recent literature has focused on the interaction between providing mentoring and addressing credit constraints. There is considerable research on the effects of financial incentives on their own with findings both in the US and in Europe suggesting a detrimental effect of tuitions fees on college completion.¹³ Angrist, Lang, and Oreopoulos (2009) is an important contribution about the interaction between mentoring and financial incentives. This study reports on the impact of the Student Achievement and Retention Project (Project STAR), a randomized evaluation of academic services and incentives at one of the satellite campuses of a large Canadian university. The study considers three types of treatment: academic support services, financial incentives, and a combination of both. Results suggest that the combination was the most effective treatment. Student interest in support services was lower than expected. On the other hand, interest in services as reflected in sign-up rates and service usage was markedly higher in the group that was also offered cash incentives. Service use was highest for women and for subjects in the combined group. The combined treatment also raised the grades and improved the academic standing of women. These differentials persisted through the end of second year, though incentives were given in the first year only.

The effects of financial incentives seem however to dissipate over time. Scrivener and

¹³ The review by Deming and Dynarski (2009) suggests that reducing college costs can increase college entry and persistence in the US context. In another context, Garibaldi, Giavazzi, Ichino, and Rettore (2012) use a regression discontinuity design on data from Bocconi University in Italy, and showed that a 1,000 euro increase in continuation tuition reduces the probability of late graduation by 5.2% when the benchmark probability is 80%. This decline is not associated with an increase in the dropout rate or a fall in the quality of students’ performance.

Weiss (2009) focus on the effect of enhanced counselling at two community colleges in Ohio using a randomised control trial. They find that students randomly assigned to an intervention consisting of increased counselling (meeting with a programme counsellor twice a term for two terms) and a small stipend registered for classes at a higher rate than did students in the control group. The effects dissipated after the intervention had ended. Brock and Richburg-Hayes (2006) investigation of the Opening Doors Scholarship programme in Louisiana tested the effects of financial incentives and individual college counselling. Students could receive as much as \$1000 per semester for their academic performance. College counsellors followed up with students and reminded them of the incentive. Opening Doors students signed up for more credits than those in the control group and were more successful in passing courses and also were more likely to persist in college four semesters after random assignment. The programme increased registration rates during the first "post-programme" semester - that is, the semester after the programme's enhanced counselling services ended. The programme did not, however, meaningfully affect academic outcomes in subsequent semesters.¹⁴

Angrist, Lang, and Oreopoulos (2009) find that students who had access to incentives and counselling had higher academic performance in college. However, they did not find any effect of counselling on its own. Bettinger and Baker (2011) investigate the impact of coaching in the context of *InsideTrack*, a student coaching service, providing coaching to students from public, private, and proprietary universities. The coach contacted students regularly to develop a clear vision of their goals, to guide them in connecting their daily activities to their long term goals, and to support them in building skills, including time management, self-advocacy, and study skills.¹⁵ Using data from 17 different randomized studies, authors conclude that students who were randomly assigned to a coach were more likely to persist during the treatment period, and were more likely to be attending the university one year after the coaching had ended. They also observe an increase in college

¹⁴This study was conducted before Hurricane Katrina hit the Gulf Coast in August 2005, interrupting the follow-up period.

¹⁵ In details, the coaches focus significant time assessing the student's life outside of school, which *InsideTrack* has found to be the leading influencer on student persistence and completion. Topics such as personal time commitments (work scheduling), primary care-giving responsibilities, and financial obligations are common during a student-coach interaction.

retention after 24 months. There are two interesting differences between Bettinger and Baker (2011) and the intervention studied by Angrist, Lang, and Oreopoulos (2009). In the latter study counselling was voluntary and students had to find the counsellors. In the intervention studies by Bettinger and Baker (2011), the coaching is also voluntary but the counsellors attempted to find students and provide both proactive and continuing outreach. Another key difference is that the advisers in the study by Angrist, Lang, and Oreopoulos (2009) were trained students in later years of their study, not full-time coaches and were not supported by the process and technology infrastructure that *InsideTrack* utilizes. In future research, it would be interesting to know if there are specific characteristics of the college coaches which increase their efficacy. We also do not know the specific types of coaching services and the specific actions of coaches which are most effective in motivating students. This issue is particularly important as today more and more coaching services are provided by students. Again, as pointed out by Angrist, Lang, and Oreopoulos (2009) in their experiment, peer advising was considerably more popular than supplemental instruction for both sexes.

Peer-advising interventions clearly merit further exploration. Wexler et al. (2015) provides an overview of research on peer-mediated reading and mathematics interventions for students with academic difficulties and disabilities, where most studies have used an experimental or quasi-experimental design. Interventions using a formal peer-mediated strategy overall had the largest impact on comprehension and less on reading fluency.¹⁶ Peer-mediation has also been used in order to transform course design in the American context. An initiative was implemented in the California State University System (in Epper and Baker 2009), where some of the redesign methods being pursued by team members include encouraging "time on task" with online homework, using student assistants for supplemental instruction and replacing some lecture time with small group work. This programme aimed at improving student outcomes in developmental math, but no robust evaluation has been provided to support the efficacy of this approach.

¹⁶ Effect sizes for comprehension ranged from 0.84 to 2.73.

4.3. IT-based innovative pedagogies

Institutions are experimenting with incorporating learning technology such as self-directed learning labs and online-learning models, and with using high-tech classrooms (Epper and Baker 2009). These newer models of remediation attempt to better target students' academic needs and help them to move more quickly through their remedial courses. However, we have limited evidence on which types of students benefit from these interventions. The initiative described in Bakker et al., (2012) suggests that use of an online tool in high quality, contextual eLearning is correlated with gains in vocational mathematics although the evidence here is limited because of the small number of people in the treatment group, and in the absence of control group and proper identification strategy. In the case of mathematics interventions, "modularization" offers shorter, more tailored math segments that would enable students to save time by only enrolling in modules that address their deficiencies. This has been adopted by the Pellissippi State Technical Community College in Tennessee (in Epper and Baker 2009), where preliminary results from the pilot phase of the redesign showed an increase in retention rates compared to traditional lecture sections. However, to our knowledge, this initiative has not yet been properly evaluated. The new approach integrates individualized computer-assisted instruction with classroom instruction.¹⁷ Game-Based Learning have also gained increasing attention in mathematics learning. Epper and Baker (2009) refer to digital Game-Based Learning experts, who explain that games-based learning are effective precisely because the learning takes place within a meaningful context. What students must learn is directly related to the environment in which they learn and demonstrate it. However, as Epper and Baker say, one of the challenges for implementation will be reconciling what we know about the "net generation" learner profiles with what we know about the developmental student population. Moreover, critical infrastructure issues have to be addressed. Further investigation of the impact of IT-based interventions is needed.

¹⁷ There is one hour per week in the classroom and one hour in the math computer lab. Students are required to spend two additional hours per week working in the lab where instructor or tutor support is available. The curriculum is divided into 9 modules, covering the mathematics topics that were previously covered in three levels of developmental math courses. The new structure treats all developmental math students as being in a single course, but students have different software assignments, depending on their performance on a placement test taken prior to beginning the course.

4.4. Heterogeneous effects by student characteristics

We briefly comment on heterogeneous effects reported for different interventions.

Several studies have observed substantial gender gaps both in the take-up rate of remedial services and in the outcomes of such services. The study by Angrist, Lang, and Oreopoulos (2009) provides evidence of a gender gap in signing up. The authors suggest that same-sex advisor matching may explain the greater use of advisors for females. Students were also more likely to e-mail a same-sex advisor. These results point to a role for gender matching in the use of academic services. Moreover, gender differences in the use of services remain for same-sex advisor pairs. The estimates for women suggest the combination of services and fellowships offered in the “Student Fellowship Programme” had a larger impact than fellowships alone.

In Florida, Long and Calcagno (2010) find that the effects of remediation differ by student background and demographics. Women experienced more positive effects from placement into remediation than men. Another interesting pattern observed in Florida was that older students placed into remediation realized more positive effects in a host of outcomes in comparison to younger students in remediation.¹⁸ One potential explanation for this finding is that older students are more focused or ready to take advantage of "refresher" courses. It may also be the case that older students have a greater need for developmental courses because they have been out of high school for a longer period. Family income also appears to be related to the effectiveness of remediation. In Florida, Pell Grant recipients in remediation experienced more negative outcomes than their peers in remediation not receiving Pell Grants in terms of persistence, associate degree completion, transfer rates, and credits earned. Because income is often highly correlated with high school quality, the underlying cause of these differences may be academic preparation.

Myhill et al. (2012) is one the few studies reporting results on a writing intervention in the UK. This study does not take place in a context of remedial programme. However, it gives

¹⁸ Similarly, Jacob and Lefgren (2004) found evidence of heterogeneous effects across students' ages.

insight on the impact of providing students – in this case 13-year-old students – with schemes of work to support embedded grammar where a meaningful connection could be made between grammar and writing. The study adopts various methodologies (RCT, text analysis, and student and teacher interviews) and looks at the impact of such an intervention on the writing and metalinguistic understanding of students.¹⁹ Results show that the intervention was more likely to benefit those in the sample who were already the more able writers, and teachers' linguistic subject knowledge was a significant mediating factor on the intervention being successful

Although heterogeneous effects are often found, it can be difficult to understand what the explanation is. More research is needed to understand why certain types of students are more (or less) responsive to certain interventions.

5. Conclusion

Although there has been considerable research into the effects of remediation policies (especially in the US), the findings on the effectiveness of remediation programmes generally are quite mixed. The mixed findings with regard to American community colleges have several potential causes. First, the most common empirical strategy to credibly identify the effect relies on local estimation strategies (i.e. on the marginal student). The characteristics of marginal students might differ in different regions and contribute to the explanation for different effects depending on the context (and if the effects of remediation vary through the distribution of students). We lack evidence on how remedial interventions systematically affect students with different characteristics (such as family background, demographics and prior attainment). Secondly, most studies give limited information on the actual content of the intervention, when the remediation consists of traditional remediation courses in math and English. It would be useful to have more

¹⁹ The study looks at whether contextualised teaching of grammar would improve student outcomes in writing and in metalinguistic understanding, and looked at the impact of teachers' previous linguistic subject knowledge (LSK) as a determining factor in learner success.

information on the impact of integrated innovative pedagogies on different types of student but so far the literature has been limited, being based on a small number of case studies. Finally, the remediation placement process has also been questioned, with some doubts about whether this should rely on a single examination.

It seems important to consider a more integrated approach of remedial courses, rather than withdrawing students from mainstream lessons.²⁰ Although the literature on this topic is still limited, no studies have found that withdrawing students from other classes had significantly positive impacts on outcomes. In the American higher education system, remedial courses usually do not count towards degree completion, but as a prerequisite for college-course attendance. Hence, they increase the overall workload for students who are assigned to them. This is also relevant to the English context.

Recent evidence shows that peer-mediated support – for example, peer tutoring – is an effective tool for remediation. This remedial tool is an example of a policy that could be implemented and evaluated in an English context. However, the quality of the training of services providers seems to matter a lot. Recent studies have shown that well-trained mentors are important for impacting on students' academic achievements. Therefore, an approach solely based on peer-intervention might not be sufficient to tackle the challenge of the increasing number of students in need for remedial interventions in the UK context.

New pedagogic approaches such as contextualized functional mathematics are interesting routes to explore. Qualitative studies also suggest to combine both linguistics and phonics approach in integrated English courses. Although they are interesting approaches, we do not know whether they are effective for improving students' outcomes given the lack of credible identifications strategies in these studies. More evidence is needed to assess which pedagogy is the most effective for teenagers and adults in these subjects. The development of new technologies gives opportunity for new, less costly pedagogic approaches. However, the most recent research on the topic reveals that personal relationships are still

²⁰ On top of the Jenkins, Zeidenberg, and Kienzl (2009) study, it is worth mentioning evidence from a RCT of the impact of a catch-up reading approach that involved withdrawing ninth-grade students from other classes (Somers et al. 2010). The study did not find significantly positive impacts on outcomes.

crucial in developing students' motivation and in providing them with relevant personal and professional skills. Finally, research suggests that continuous support to learners over time via direct interaction with service providers is often important for interventions to be effective.

Table 1: Summary of the studies

Authors	Country/State	Target group	Intervention	Outcome	Identification strategy
Angrist, Lang, and Oreopoulos (2009)	Canada	All first-year students entering in September 2005, except those with a high school grade point average (GPA) in the upper quartile	1) Support services including access to mentoring by upper-class students and supplemental instruction. Peer advisors and Facilitated Study Groups (FSGs) voluntary, course-focused, weekly sessions 2) Financial incentives up to the equivalent of a full year's tuition 3) Combination of (1) and (2)	The combined treatment raised the grades and improved the academic standing of women. Persistent effects, though incentives were given in the first year only.	RCT
Bailey, Jeong, and Cho (2010)	US	250,000 students from 57 colleges in seven states.	Achieving the Dream: Community Colleges Count initiative	Fewer than 50% of students complete the entire sequence, even lower for men, older students, African-American students, part-time students, and students in vocational programmes.	Survey
Bettinger and Baker (2011)	US	Students from two- and four-year schools and public, private not-for-profit, and proprietary colleges.	Coaching was voluntary but the counsellors attempt to find the students and provide both proactive and continuing outreach to the students. Coaches were full-time coaches, supported by the process and technology infrastructure.	Positive effect on enrolment. The effects persisted for at least one more year after the coaching had concluded. Positive effect on college retention after 24 months.	17 RCT

Bettinger and Long (2009)	Ohio	Traditional-age freshmen at public colleges below ACT cut-off exam	Traditional remediation courses in math and English	Increase in persistence in college and bachelor's degree completion. English remediation is estimated to have a strong discouragement effect on students who intended to major in English-related fields.	Instrumental variables strategy based on variation in placement policies and the importance of proximity in college choice.
Brock and Richburg-Hayes (2006)	Louisiana	Students registered at least half-time in two technical colleges	Students could receive as much as \$1000 per semester for their academic performance. College counsellors followed up with students and reminded them of the incentive.	Positive effect on full time enrolment in college, courses passed, number of credits, rates of registration in college in the second and third semesters after random assignment.	RCT
Calcagno and Long (2008)	Florida	College students below CPT cut-off exam	Traditional remediation courses in math and English	Positive short-term effects on early persistence in college, but it does not necessarily help community college students make long-term progress toward a degree.	RDD
De Paola and Scoppa (2014)	Italy	Freshmen in a public university below a placement test cut-off	160 h of lectures, were carried out at the beginning of the academic year and covered both mathematics and language skills (not compulsory)	Positive effect on the number of credits and negative effect on drop out.	Fuzzy RDD (remediation was not compulsory)

Grossman and Tierney (1998)	US	At-risk 6–18 year olds from poor, single-parent homes	"Big Brothers Big Sisters": well-educated young professionals, trained, and matched with a youth whom they met, on average, three or four times a month for approximately a year. No particular aspects of academics are targeted, but emphasis on continuity and consistency in mentor relationships.	Significant effect on drugs use and violent behaviour, positive effect on school attendance. Increase in confidence about school performance and improvement of family relationships.	RCT
Guskey et al. (2009)	Kentucky	15- to 16-year-old students	Ramp-up Programme on literacy skills: 40 self-selected teachers in 18 schools. Variety of instructional strategies over 2 years: independent reading, 'read aloud/think loud/talk aloud', whole- and small group instruction, writing instruction, and cross-age tutoring.	Positive effect on students on reading outcomes. Decrease in the number of students scoring at lowest level, and decrease in the gap between black and white students.	RCT
Lavy and Schlosser (2005)	Israel	Underperforming high school students	Individualized instruction in small study groups of up to five students for tenth, eleventh, and twelfth graders.	Positive effect on school mean matriculation rate (increase by 3.3 percentage points).	Diff-in-diff gradual implementation of the reform
Martorell and McFarlin (2007)	Texas	College students	Traditional remediation courses in math and English	Little effect on persistence, degree completion, or a range of other educational outcomes. No effect on labour-market earnings.	RDD

Martorell, Isaac McFarlin, and Xue (2014)	Texas	College students	Traditional remediation courses in math and English	Discouragement effect: students whose placement exam scores would require them to be in remediation are no less likely to enrol in college than are students who score just above the remediation placement cut-off.	RDD
Myhill et al. (2012)	England	13-year-old students	Provision of schemes of work to support embedded grammar where a meaningful connection could be made between grammar and writing		Mixed method: RCT, text analysis, student and teacher interviews
Scott-Clayton and Rodriguez (2015)	US	Six institutions within a large urban community college system	Remediation courses in reading, writing and math	Little effect on students' skills, but little evidence of discouragement effect. Students take remedial courses instead of college-level courses. Diversionary effects are larger for the lowest-risk students.	RDD
Scrivener and Weiss (2009)	Ohio	Low-income students at two community colleges in Ohio	Meeting with a programme counsellor twice a term for two terms to discuss academic progress and resolve any issues that might affect their schooling, and a small stipend (\$300 for two semesters)	Positive effect on registration rates for classes but the effects dissipated after the intervention had ended.	RCT

Scrivener Weiss Ratledge Rudd Sommo Fresques (2015)	CUNY (NY, USA)	Low-income students at three community colleges	Accelerated Study in Associate Programmes (ASAP): comprehensive advisement from an adviser with a small caseload and enhanced career services and tutoring, blocked or linked courses for the first semester, a tuition waiver, free MetroCards.	Positive effect on students' academic outcomes over three years, almost doubling graduation rates, increase in college enrolment, 40% of the treated group had received a degree, compared with 22 %of the control group.	RCT
Wexler et al. (2015)	USA	11- to 18-year-old students	Studies included those with some formal teacher- led linguistic skills training, followed by students working in pairs or small groups for shared activities, sometimes using a computer- assisted programme, and partner reading.	Interventions using a formal peer-mediated strategy had the largest impact on comprehension and less on reading fluency.	Synthesis of evidence on peer-mediated academic interventions
Zeidenberg, Jenkins, and Calcagno (2007)	Florida	Cohort of community colleges students	“Student success”: courses that teach students how to write notes, take tests, and manage their time; that help students explore their learning styles; and that encourage students to develop plans for college and careers	Positive marginal effect on a student’s chances of earning a credential, persisting, or transferring.	logistic regressions

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