Pearson

Connections Academy

Full-time virtual school for grades K–12

Efficacy Research Report
April 3 2018

Contents

The corpus of research for this product includes research conducted by our in-house researchers in partnership with customers, and research conducted by third party researchers. All research included in this report meets the standards we have set out for our own efficacy research. These are informed by and aligned with guidance on educational research quality provided by organisations, such as the American Educational Research Association and the What Works Clearinghouse.

Efficacy statements in this report are subject to independent assurance by PricewaterhouseCoopers LLP (PwC). The PwC assurance report is on page 34 and further details can be found in the Pearson Efficacy Reporting Framework dated April 3 2018.

Introduction

In 2013, Pearson made a commitment to efficacy: to identify the outcomes that matter most to students and educators, and to have a greater impact on improving them. Our aspiration is to put learners at the heart of the Pearson strategy; our goal, to help more learners, learn more. Part of our commitment was to publish research regarding the impact of the use of our products on outcomes, and to have the outcomes subject to independent audit. We call this efficacy reporting. There is no rulebook for how to do this, no model to follow. We've had to learn fast during this journey, we've sought guidance from others including external expertise, and we are now some, but not yet all of the way there.

The road taken and the milestone reached

In a first for the education sector, we have published audited efficacy reports on some of our most widely used products. Together, these products represent 18 million learners. This Research Report includes independently audited efficacy statements that have been prepared using the Pearson Efficacy Reporting Framework dated April 3 2018 — which we have used consistently for the Pearson products we are reporting on.

We have sought to use the efficacy reporting process to amplify existing non-Pearson peer reviewed research about our products. We've also sought to foster innovation in efficacy research by conducting new research and placing value on a range of research methods — including implementation studies, correlational and causal designs — ensuring data is collected, analyzed and presented to agreed standards at the appropriate stages in each product's lifecycle. The research conducted for this report, and the efficacy statements produced as a result, are designed based on international best practices such as those set out by the American Education Research Association and the What Works Clearinghouse. We have synthesized these into a set of standards we hold ourselves accountable for in our research and reporting. These are set out in the Pearson Efficacy Reporting Framework dated April 3 2018.

Furthermore, we adhere to the same peer-review processes as other high quality research in the education sector. Our work was independently reviewed and validated by SRI International, a well-known non-profit research center, and shared for discussion at research conferences organized by, among others, the American Education Research Association.

Our body of research contains evidence of statistically significant relationships between the use of our products and learner outcomes like student achievement. We want to be clear, though, that efficacy is not a quality a digital product can possess in and of itself. We recognize that implementation — the way a product is integrated into teaching and learning — also has a significant impact on the outcomes that can be achieved. Our reports do not yet capture the full range of intended product outcomes, nor the variety of different ways of implementing our products. What we do know is that the more we can engage with our customers about best practices that can support the integration of learning technologies into their teaching, the more likely they will be to achieve their desired outcomes.

We have commissioned PricewaterhouseCoopers LLP ('PwC') to audit the efficacy statements set out in our Research Reports. This is to demonstrate that the statements accurately reflect the research that has been carried out. PwC's audit report can be found at the end of this document.
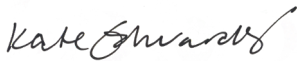
The journey ahead

Delivering on our reporting commitment has never been our ultimate goal; what matters most to us is helping more learners, learn more. Our aspiration is to explore what works, for whom, and why; and to encourage discussion about questions such as: What outcomes matter most to students? What should teaching and learning look like? What evidence should we apply to its design? And how should we evaluate impact?

We are excited to continue partnering with educators and others in the field in order to better understand how interactions between educators, students and learning technology can enhance outcomes. We have also been energized to see others in the education sector begin to focus on efficacy and research — though we recognize that their application in education is still nascent. In order to accelerate the emergence of its full potential we are already developing new ways of partnering with educators, researchers and institutions so we can advance this work together. In doing so, we will continue to advocate for the need to apply rigorous evidence to improve the outcomes of teaching and learning, while also seeking to ensure that evidence captures customers' experiences and is relevant and useful to educators in their practice.

Special thanks

We want to thank all the educators, students, research institutions and organizations we have collaborated with to date. We are spurred on by the growing number of opportunities for us to learn from others in the sector who are beginning to tackle the same challenges. If you are interested in partnering with us on future efficacy research, have feedback or suggestions for how we can improve, or want to discuss your approach to using or researching our products, we would love to hear from you at efficacy@pearson.com. If we, as a sector, tackle this together, we will help more learners learn more.

Kate Edwards

Kate Edwards
Senior Vice President,
Efficacy and Research, Pearson
April 3 2018

Findings in brief

Connections Academy is a full-time, tuition-free, virtual public school program that served more than 70,000 K–12 students in 27 states in the 2017–2018 school year. Pearson sought to explore how Connections Academy schools perform compared to the alternatives.

This Research Report presents findings from two research studies: one quasi-experimental study with Connections Academy students enrolled in GradPoint credit recovery courses during 2015–2016; and one quasi-experimental matched comparison study with students enrolled in a representative sample of Connections Academy schools during the 2013–2014 to 2015–2016 academic years. Our aim in using correlational and comparative study designs was to seek out possible relationships between the use of Connections Academy and students' performance to identify areas of focus for potential future research using more rigorous causal study designs.

The findings appear alongside details of the research studies, including descriptions of the samples studied, methods of analysis, results, limitations and generalizability, and notes on possible future research.

The report also summarizes the context surrounding the findings, including the research that informed the design and development of the product, the history of the product in the market, how educators use the product, and its intended outcomes.

The findings are inseparable from their surrounding context and the design of the studies that produced them. To learn more about these elements, follow the links to our Technical Reports in the **Research studies** section.

In the context of the study of Connections Academy students enrolled in GradPoint credit recovery courses during 2015–2016, Pearson found that:

— Connections Academy students taking GradPoint credit recovery online courses, after failing a course, were almost twice as likely to pass the course than similar students (matched on prior GPA and after adjusting for demographic and enrollment factors) who repeated with a Connections Academy course offering.
— After controlling for prior GPA, subject area, and course level, students who passed GradPoint credit recovery online courses tended to perform as well as students who passed the repeated Connections Academy course offering on math and reading state assessments, as there was no statistically significant difference in performance.
— Connections Academy offers successful intervention solutions for recovering credits to struggling students as evidenced by its high success rate of 85% for GradPoint online credit recovery course completion.

In the context of the study of students enrolled in Connections Academy schools during the 2013–2014 to 2015–2016 academic years, Pearson found that:

— There was no statistical difference in percentage scoring proficient in math and reading between student cohorts in Connections Academy schools and cohorts in brick-and-mortar schools that were matched on prior achievement, and after adjusting for district-mean student mobility and school-mean student SES[1] and other demographic factors.
— Student cohorts in Connections Academy schools statistically outperformed (by 7.9 percentage points) cohorts in other virtual schools (matched on prior achievement) in terms of the percentage scoring proficient in reading on state assessments.
— There was no statistical difference in percentage scoring proficient in math between student cohorts in Connections Academy schools and cohorts in other virtual schools that were matched on prior achievement.

The complete statements are set out in full in the boxes titled "Efficacy statements" on pages 22 and 28. These statements have been subject to assurance by PwC, whose report can be found at the end of this Research Report.

[1] Socioeconomic status

Connections Academy: overview

Product overview

Connections Academy provides full-time, tuition-free, virtual public school to students in grades K–12 across the United States. Founded in 2001, the Connections Academy program is part of Pearson's Online & Blended Learning K–12 group (also known as Connections Education). In the 2017–2018 school year, over 70,000 students were served by Connections Academy schools in 27 states. Most schools are charter schools, overseen by governing boards, while some operate under contracts with districts or other authorizers.

Connections Academy schools aim to enhance and improve the following outcomes:

— Access to education for students who might struggle in conventional settings, both academically and physically, in order for them to achieve academic growth
— Student achievement — in that students become as proficient in subjects, such as math and English, as students in traditional learning settings
— Student progression — in that students pass their course of study and are prepared for their next level of education

The full list of the outcomes this product is intended to support, accompanied by a brief description, can be found in the appendix of this report.

Virtual public schools deliver public school to students via technology, affording flexibility in terms of where, when, and how learning occurs. Hallmarks of Connections Academy schools include an award-winning curriculum delivered via Connexus®, Connections Academy's proprietary Education Management System (EMS); state-certified and specially trained teachers; a personalized approach to learning (Personalized Performance Learning®); and a supportive school community that includes the involvement of a Learning Coach. The Learning Coach is usually the student's parent or is guardian, or another appropriate adult the parent/guardian designates.

Primarily learning from home, students work with teachers online and via phone, while the on-site Learning Coach supports and monitors students' progress. Student socialization occurs online in synchronous classes and clubs, and in person at events like school-organized field trips. Like their traditional public school peers, Connections Academy students are held to the same state standards and are required to take state assessments.
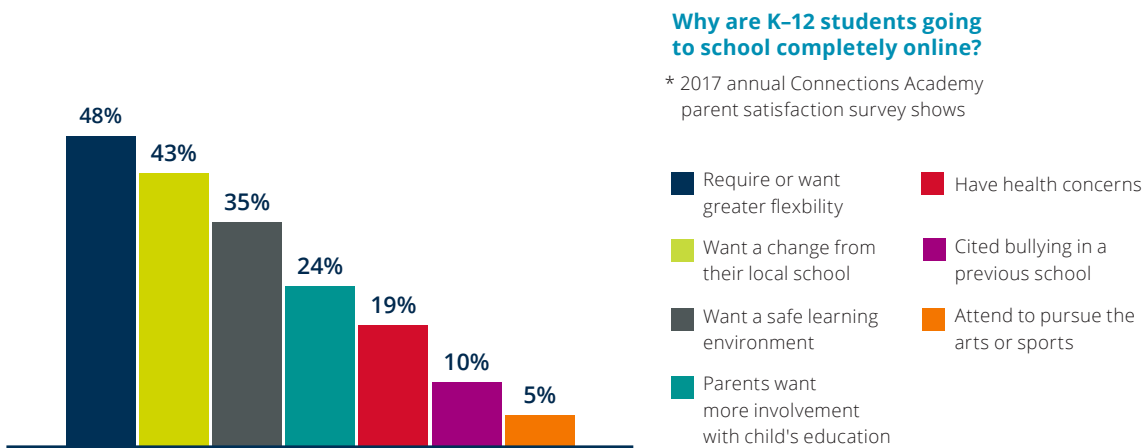
Students served

An important intention of Connections Academy is to exist as a school of choice for students and their families. Full-time virtual schools like Connections Academy provide a valuable public school option for students who, for a variety of reasons, are not finding success in the traditional classroom. Virtual school affords students flexibility in terms of where and when learning occurs and at a pace that best meets the needs of the student.

At this point in time, the reasons students choose Connections Academy are varied, and not always tied to academics. Students who are elite athletes or performers who need a flexible schedule to accommodate rigorous practice schedules, have serious and/or chronic health issues, have been bullied, or are struggling or advanced academically, as well as those who may simply want a high-tech education option, may require something different from what their local public school provides. Additionally, students living in rural areas may choose to enroll for access to expanded course offerings (e.g., foreign languages, Advanced Placement) that may not be available at their local school. Connections Academy schools strive to provide these students with a school experience and approach to learning that meets their needs — what we call Personalized Performance Learning®.

Most Connections Academy schools serve K–12th grade and are state-wide; the student body can represent the geographic span of the state. Connections Academy enrollment data reveals: a fairly even split between female and male students; that most students cite "traditional public school" as their previous school option; and that high school students represent the largest number of enrollments for a grade span (grades 9–12). The second highest represented grade span is middle school (6th–8th grades).

Figure 1: Summary of 2017 annual Connections Academy parent satisfaction survey results

Why are K–12 students going to school completely online?

* 2017 annual Connections Academy parent satisfaction survey shows

- Require or want greater flexbility
- Want a change from their local school
- Want a safe learning environment
- Parents want more involvement with child's education
- Have health concerns
- Cited bullying in a previous school
- Attend to pursue the arts or sports

Note: as respondents were allowed more than one response, totals equal more than 100%

The Learning Triad

Since its inception, the cornerstone of the Connections Academy core model is the Learning Triad — a philosophy that places the student at the center of the learning experience; supported by teachers, the curriculum, and the Learning Coach (see Figure 2), all connected by technology.

Teachers

Students are supported by state-certified and specially-trained teachers. At the beginning of the school year, and within the construct of fulfilling state standards throughout the year, teachers discuss with students and their Learning Coach the student's academic strengths and areas of need to define a personal learning plan for the student, which includes goal-setting and discussions focused on making learning relevant and meaningful to the student. Throughout the school year teachers use real-time data tools and reports in Connexus to systematically monitor student progress. They use this data and regular synchronous contacts with each student to adjust the pace and content of students' lessons and coursework. This data is also used to identify and implement any necessary interventions or enhancements, ensuring students receive the right degree of challenge or support. Teachers regularly connect with their students through online classes (LiveLesson® sessions), phone, and communications tools embedded in Connexus. This allows teachers to provide feedback, help students review progress against their goals and provide interventions as needed. Teachers can use this time to encourage students to develop a positive, growth-oriented mindset and help them understand how their courses can be personally meaningful. They also connect students with one another in LiveLesson sessions and discussions. Connections Academy teachers hold at least a Bachelor's degree; 60% hold advanced degrees.

Curriculum

Delivered via Connexus EMS, the standards-aligned curriculum is designed to meet the needs of diverse learners and offers an expansive catalog of courses including core academics, electives, and Advanced Placement courses. Extracurricular clubs and activities are also offered. The teams responsible for the Connections Academy curriculum combine research-based proprietary content with instructional resources and teaching materials from publishers to create units, lessons, and instructional activities. They also develop interactive, multimedia online educational tools and resources with the aim of engaging students and further supporting their learning. The curriculum provides opportunities for students to engage in meaningful practice, receive specific, actionable feedback from teachers, and reflect upon their mindset and set course-specific goals. Intervention programs to supplement the curriculum and support struggling students are incorporated into curricular offerings.

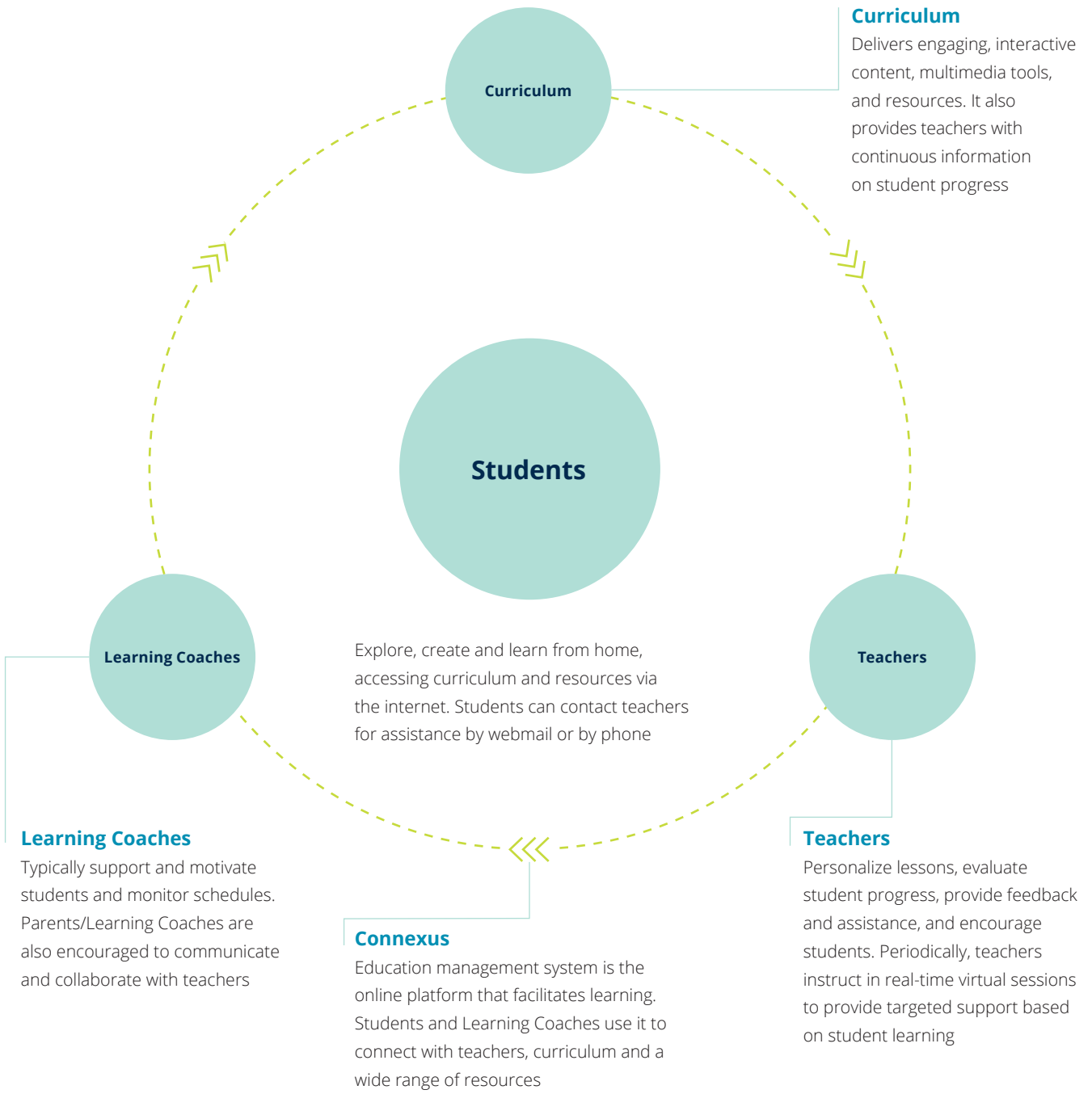## Learning Coaches and Learning Coach support

Students' learning in the virtual environment is supported by Learning Coaches. Usually a parent/guardian, although the Learning Coach can be another adult designated by the student's parent/guardian. Connections Academy requires the involvement of the Learning Coach at grade-appropriate levels, which allows parents to be closely involved in their students' education, while also encouraging students to become increasingly independent learners as they move into higher grades. Connections Academy's Get Coaching! program is dedicated to supporting Learning Coaches; it is designed to help them understand their role and to provide them with tools and strategies to support their students. It also provides access to a community of fellow Learning Coaches. Within Connexus, Learning Coaches also have access to Family 411. This is the family resource center that provides Learning Coaches with links to recorded orientations, interactive tutorials, how-to guides, and digital learning tips, such as information on how to encourage a positive student mindset and the value of productive struggle.

Technology

Virtual school is dependent on technology. Most Connections Academy schools provide students with loaned computers and subsidies for internet connection. The central technology feature at Connections Academy is the proprietary Connexus® EMS technology platform. Students use Connexus to engage with lessons, connect with teachers and classmates, and access a virtual library and communications and planning tools. Connexus is vital to the Connections Academy teachers, who use it to conduct lessons and grade assessments, track students' progress, communicate with students and families, and adjust coursework and lessons in support of each student's learning plan. Parents/Learning Coaches also have insight into students' work and performance via Connexus EMS. Tools within Connexus support students as they set goals, take action on feedback provided by teachers, and engage in intervention programs. These tools also help students to reflect upon their mindset and assess their confidence in their ability to complete their coursework. Technology use is scaled by grade level.

Curriculum
Delivers engaging, interactive content, multimedia tools, and resources. It also provides teachers with continuous information on student progress

Students

Explore, create and learn from home, accessing curriculum and resources via the internet. Students can contact teachers for assistance by webmail or by phone

Learning Coaches
Typically support and motivate students and monitor schedules. Parents/Learning Coaches are also encouraged to communicate and collaborate with teachers

Connexus
Education management system is the online platform that facilitates learning. Students and Learning Coaches use it to connect with teachers, curriculum and a wide range of resources

Teachers
Personalize lessons, evaluate student progress, provide feedback and assistance, and encourage students. Periodically, teachers instruct in real-time virtual sessions to provide targeted support based on student learning

Overview of intended implementation

The intended implementation of Connections Academy is to provide students with a complete, quality school experience, outside the traditional classroom, characterized by a personalized approach to learning. The program is implemented consistently across grade levels, with minor age- and grade-appropriate variations as described below.

Elementary school

In elementary school, students learn foundational educational concepts in reading, writing and mathematics, and are taught study skills. Science, social studies, technology, art, and physical fitness round out the core curriculum, and students work with hands-on instructional resources, including virtual tools, kits, and workbooks. Connections Academy offers electives, activities, and clubs to encourage further exploration. For example, students can take world language courses, learn basic music concepts and conduct home experiments.

A minimum of 30 hours per week is spent learning (or as mandated by school and/or state requirements), and about 15–30% of the school day is centered on interactive online coursework. Students are assigned one expert elementary teacher who works with each student individually and also with groups of students to support and guide students as they engage in their coursework. Teachers have regular synchronous and asynchronous contact with students and use LiveLesson sessions to engage students in online classes and support. A school counselor is also available. Learning Coaches are encouraged to provide a high level of oversight for elementary students, which is generally a commitment of about five hours per day. Learning Coaches typically support students by setting a schedule with varied activities and breaks, assisting with lessons, monitoring student comprehension and grades, and communicating frequently with the teacher.

Middle school

In middle school (6th–8th grades, or 7th–8th grades in some schools) Connections Academy aims to help students continue to develop their language, arts, math, and critical thinking skills through a blend of online and offline work. Electives provide students opportunities to learn new skills, find art in everyday life, and explore new technologies. Students can also join clubs to explore areas of interest. For example, students can learn about robotics or write for the school newspaper. When available in a school and approved by a counselor, gifted students can start earning high school credits early.

Connections Academy provides students with a prescribed schedule, which requires a minimum of 30 hours per week, or as mandated by school and/or state requirements. Students work with teachers as needed to create their individual schedules. About 50–75% of the school day for middle schoolers is centered on interactive online courses. Connections Academy middle school students begin working directly with subject-specific teachers and a homeroom or advisory teacher, who monitors and assists with all subjects. A school counselor is also available. The role of the Learning Coach changes as the student becomes more independent and takes increased ownership of his or her learning. Connections recommends that the Learning Coach spends about two to three hours a day overseeing learning. Activities may include: supporting the transition to more independent learning, assisting with some lessons, monitoring student comprehension and grades, and communicating with teachers and referring the student to the teacher as needed.

High school

High school encourages students to set goals and reach them. The 9th–12th grade education features a core curriculum including math, science, English, and social studies. Electives in varied topics such as digital photography, marine science, game design, and world languages encourage students to explore subjects of interest to them, and grow to become well-rounded individuals. Honors and Advanced Placement courses provide the challenge needed for college preparation. In some states, early college credit is available. Students can also prepare for the future by joining college and career clubs.

Students maintain their prescribed schedule, spending a minimum of 30 hours a week learning, or as mandated by school and/or state requirements. Students may work with teachers to create modified schedules. About 80–90% of the high school day is centered on interactive online courses. Students are guided by subject-specific teachers and school counselors. All students meet with an advisory teacher, who continues to monitor advancement and helps to develop a personalized learning plan that will prepare them for success in their chosen path. The Learning Coach role changes as the student transitions into high school and more independent learning. Connections recommends that the Learning Coach base his or her time commitment on the student's progress. The typical Learning Coach spends about 30 minutes per day overseeing learning. Activities may include: encouraging and supporting a student's growing independence, verifying that lessons and assessments are completed, communicating with teachers and referring the student to the teacher as needed, and attending regular teacher conferences.

Intended outcomes

The intended outcomes for Connections Academy students have been consistent since Connections Academy was founded. They are based on the mission of Connections Academy, internal goals, research, and customer expectations. Our efficacy impact evaluation work aims to build a body of research year on year to evidence the impact of Connections Academy on these outcomes.

Mission and long-term intended outcomes

The mission of Connections Academy is to **help each student maximize his or her potential and meet the highest performance standards through an individualized learning program.** Connections Academy has identified three long-term intended outcomes for Connections Academy schools that directly reflect this mission:

1. Student academic growth
2. Student academic achievement
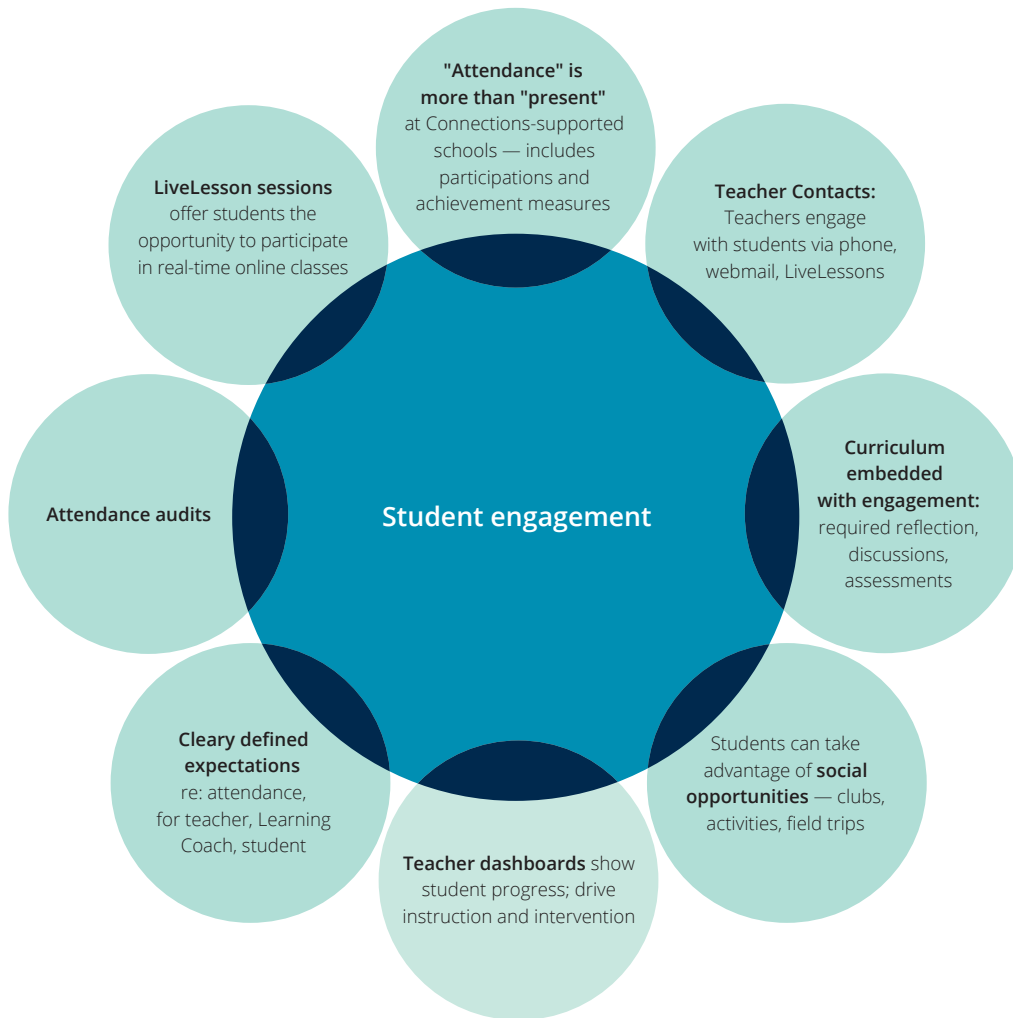3. Graduation and post-secondary plans

These long-term outcomes are supported by the short- and medium-term intended outcomes listed in the appendix.

Building an environment of support

The key to reaching the long-term intended outcomes is building and providing an environment of support for students to be engaged in their education in a way that positions them to succeed. This environment is encouraged with a collection of foundational tasks and attributes (Connections Academy's short-term intended outcomes) that promote student engagement and learning. This supportive environment aims to provide students with:

— Current, standards-aligned curriculum and instructional delivery that supports varied learning preferences and/or needs
— Multiple opportunities to practice and learn without fear of negative consequences
— Guidance from supportive, qualified teachers
— Ability to monitor their own learning and learn at a pace that matches their needs
— Frameworks for setting personal and academic goals
— Feedback that is timely, actionable, and specific, intended to support students in becoming engaged, self-directed learners

Figure 3: Student engagement

"Attendance" is more than "present" at Connections-supported schools — includes participations and achievement measures

LiveLesson sessions offer students the opportunity to participate in real-time online classes

Teacher Contacts: Teachers engage with students via phone, webmail, LiveLessons

Attendance audits

Student engagement

Curriculum embedded with engagement: required reflection, discussions, assessments

Cleary defined expectations re: attendance, for teacher, Learning Coach, student

Students can take advantage of **social opportunities** — clubs, activities, field trips

Teacher dashboards show student progress; drive instruction and intervention

Ensuring student satisfaction

Two of Connections Academy's medium-term intended outcomes relate directly to student satisfaction. Connections therefore conducts annual student satisfaction surveys, measuring students' satisfaction with:

— The overall Connections Academy experience — the curriculum; the academic, physical, and emotional learning climate

— Their ability to learn at their own pace and monitor their own learning

Progression towards long-term outcomes

Access to a Connections Academy virtual school, its supportive and high-quality online learning environment, resulting satisfaction, and ability to master course material, comprise a student's progression towards Connections Academy's long-term intended outcomes of academic achievement, academic growth, and graduation and post-secondary plans. The timing of this progression varies based on the individual student.

Research-based program design

Connections Academy has always reviewed relevant research when designing and developing the many products and services that make up the Connections Academy school program. Typically, each department focuses on research topics specifically related to their areas of responsibility (e.g., curriculum content, instructional design, technology, teacher effectiveness, parental involvement, etc).

In 2014, to strengthen cross-departmental collaboration focused on improving student outcomes, and to ensure that ongoing improvements to Connections Academy's products and services reflected findings from the most current, relevant research, the Connections Academy Chief Academic Officer brought together a group of department leaders to engage in a close study and discussion of learning sciences (e.g., Dweck, 2006; Hess & Saxberg, 2014; ASCD, 2010, 2011, 2012a, 2012b, 2013a, 2013b, 2013c; Bransford, Brown, & Cocking, 1999; Shechtman, DeBarger, Dornsife, Rosier, Yarnall, 2013; iNACOL, 2015). Along with a formal review of relevant literature and research, the group brought many decades of experience, and more than a decade of accumulated data, to the discussions.

Through this exercise, the team of experts responsible for the Connections Academy program crystallized a set of beliefs about four major program elements that have been shown through research to have a significant impact on student learning. Connections Academy regularly refers to these four elements, along with additional research and feedback from users, to guide ongoing improvements to the Connections Academy school program. Those four elements are:

1. Practice
Studies comparing novices and experts show that one characteristic of experts is relatively effortless or automatic retrieval of relevant knowledge, as well as easy recognition of problem types (Bransford et al., 1999). This ability to recognize problems so that appropriate solutions can be applied, as well as the ability to easily retrieve knowledge, comes primarily from practice. However, not all practice produces equivalent learning outcomes. Research suggests that practice should be: relevant (Eccles, 1983), deliberate (Ericsson, Krampe, & Tesch-Romer, 1993), and ongoing (Cepeda et al., 2009), and give students multiple opportunities to learn and demonstrate learning without negative consequences.

2. Feedback
In online educational settings, feedback is generally regarded as a key component of knowledge and skill acquisition (Azevedo & Bernard, 1995). However, both the content and timing of feedback can influence its effectiveness (Shute, 2008). A review of the literature suggests that feedback should:

— Focus on the task, not the learner
— Elaborate with information about the what, how, and why in a given problem, not just the correctness of the answer
— Be specific and clear
— Be objective
— Promote a focus on growth, improvement, and learning (Shute, 2008)

3. Student engagement and motivation
Educational research has identified a number of "non-cognitive" factors that impact student success (e.g., Richardson, Abraham, & Bond, 2012), with motivation playing a critical role. Many aspects of motivation have been researched, such as different beliefs, attitudes, goals, and interests. For example, when a student is feeling motivated, it may be because she or he feels interest in a topic, is feeling challenging or confident, wants to improve his or her career prospects, or wants to outperform his or her peers, among many other reasons. From this rich research base, various theories and frameworks have been developed for understanding this wide array of motivations and how they affect important learner outcomes. Some of these have proven quite powerful in helping researchers understand how motivation impacts student success.

Mindset and goals

One non-cognitive factor that research has found to have a large impact on learning is students' "mindset." Research has shown that people tend to gravitate towards one of two mindsets when it comes to learning in a given domain.

One of these is a "fixed" (or "entity") mindset, where a person believes that how good one is in the domain is largely innate, and not much can be done to change that. For example, someone who believes that they are just not good at math and never could be has a "fixed" mindset.

The other is a "growth" (or "incremental") mindset, where a person believes that ability in the domain comes through practice and effort. Someone who feels like they can improve with enough effort exemplifies a "growth" mindset.

A growing body of research has found that there are benefits associated with adopting a growth mindset. Students with a growth mindset are more likely to adopt more learning-oriented goals, to persist longer (Diener & Dweck, 1978), to use better learning strategies and, ultimately, to achieve better grades (Yeager & Dweck, 2012).

In addition, research has begun to document different interventions that have been shown to move students to adopt this more beneficial growth mindset. For example, programs that provide training on learning strategies, paired with neuroscience information about how the brain changes with learning, have been shown to lead to greater adoption of growth mindset (Blackwell, Trzesniewski, & Dweck, 2007). In addition, tutoring by respected peers on growth mindset has been found to be effective (Good, Aronson, & Inzlicht, 2003), particularly for students from traditionally disadvantaged populations. More subtle approaches, including providing encouraging messages that focus on the development of skill, have also been found to be successful (Williams, Paunesku, Haley, & Sohl-Dickstein, 2013).

Personal relevance

Students tend to work harder, spend more time, and have more positive motivational experiences when they find the content they are learning to be *personally relevant*. However, attempts to add interesting elements meant to engage students can actually be detrimental to learning, and students who are already interested may find those features distracting (Durik & Harackiewicz, 2007).

A more promising approach is, rather than attempting to design a universally interesting experience, to get students to reflect on why the content they are covering in class may be useful to them. For example, Hulleman & Harackiewicz (2009) prompted students to write about how they would apply the class content to their lives (or the lives of their friends or family), or how it fits in with their future plans, and found semester-long benefits for interest and achievement, particularly among students with low expectations of success. Approaches to help make clear the possible utility of the content for the student can have an impact on students' interest and achievement.

Framing

Another element that is important to acknowledge has to do with the "epistemological framing" of the learning environment. This refers to the different ways in which students can think about the knowledge they are learning in class. Specifically, research has identified particular ways in which learning environments can promote a sense for students that the information they are learning is likely to be used in broad ways, outside of the particular context in which it is learned (Engle, Nguyen, & Mendelson, 2011). Some approaches to help students frame things in a more "expansive" way include:

— Connecting material explicitly across time (i.e., how what they learned earlier connects to what they are learning now; or how what they are learning now will connect to what they will learn in the future)
— Being connected to more people, such as other groups of students in the course, students in other courses, or even outside participants in the endeavor, such as scientists or other related groups
— Making clear that the student is involved in generating their own explanations and ideas, rather than simply being a (passive) recipient of canonical information

4. Intervention

Research shows that targeted interventions to struggling students help those students significantly improve (Burns, Appleton, & Stehouwer, 2005; Tran, Sanchez, Arellano, & Swanson, 2011). The key components of intervention are identifying students at risk, delivering targeted, effective interventions, and monitoring progress (Shinn, 2010). Effective interventions explicitly teach specific skills students need (Fuchs, Fuchs, & Compton, 2012).

Beginning in 2016, Connections began working with the Efficacy and Research team and third party researchers to design and implement additional research studies to measure the efficacy of Connections Academy schools. These studies are detailed in the following section.

Research studies

Overview of research

Given the alignment of the Connections Academy school program with the research and learning principles discussed in the Research-based program design section above, we hypothesized that students choose to enroll in Connections Academy virtual schools for a variety of reasons, including improving their academic outcomes. This is potentially as a result of the virtual school having helped to resolve issues that may have prevented them from achieving their full academic potential in a brick and mortar school. If Connections Academy schools meet these students' needs, then the students should report satisfaction with their Connections Academy experience. In addition, Connections Academy should achieve intended outcomes related to student achievement and progression; specifically, Connections Academy students should show similar or superior levels of achievement compared to students in carefully matched traditional brick-and-mortar or other virtual schools.

Exisiting research

In 2018, Pearson researchers completed a systematic search and review of research articles published since 2012 that assessed the impact of Connections Academy schools on learner outcomes. Our criteria for the review and inclusion of existing published research on our products were designed based on US Department for Education What Works Clearinghouse guidance. Based on these guidelines, in order for research to be included in this Efficacy Report on Connections Academy schools it needed to meet a number of criteria, including that the study was published in the past five years, examined at least one intended learner outcome category, and reported results in enough detail that the research could be properly evaluated. For more information on this see the Pearson Efficacy Reporting Framework dated April 3 2018.

In our initial screening, we discovered no studies that were completed in the last five years that explored the impact of Connections Academy on learner outcomes. For the initial screening list see the Pearson Efficacy Reporting Framework dated April 3 2018.

Research studies

There are two studies (one of which has two phases) that form the basis of the Efficacy Research Report for the Connections Academy school program. The research questions and findings are set out in detail below, including the efficacy statements generated by those studies.

With an eye toward students who enrolled in Connections Academy schools in order to stay on track or get back on track for high school graduation, researchers evaluated whether GradPoint credit recovery courses offered in Connections Academy schools helped students to effectively make up lost credits, thereby helping them stay on, or get back on, track for high school graduation.

In the second study, researchers first set out to determine the characteristics of students who choose to enroll in Connections Academy schools. These findings, were then used to design a research study to investigate how Connections Academy students performed on state assessments compared to students in "matched" traditional brick and mortar schools in the same state, after adjusting for those student characteristics. Researchers also compared Connections Academy schools' state assessment results to virtual schools in the same state to investigate whether the Connections Academy model may be more effectively meeting student needs and/or achieving student outcomes than other virtual school programs.

Study 1

Study citation	Weatherholtz, K. and Guido Gatti (March 2018). Quasi-experimental study of Connections GradPoint: how taking a credit recovery course in GradPoint leads to better learner outcomes than repeating a failed original credit course
Research study contributors	Kodi Weatherholtz, Florin Bocaneala, Carmen Arroyo, Kacper Lodzikowski. Guido Gatti

Research questions	The overarching goal of this study was to assess whether taking a Pearson Online and Blended Learning GradPoint online credit recovery course was more effective than repeating a failed foundation course as a means for students to recover course credit. We assessed impact in terms of both course pass rates and students' acquisition of knowledge. We asked the following questions:
	
	1. Does taking a credit recovery course in GradPoint lead to better academic achievement than repeating a failed original credit course, after controlling for a wide range of student achievement-related factors, including student prior achievement, demographics, and enrollment factors? We addressed this question in terms of two learner outcomes:
	
	    a. Impact on course pass rates: Are GradPoint students more likely than a matched comparison group of original credit course repeaters to pass their credit recovery course and thereby recover lost credits?
	
	    b. Impact on students; objective knowledge of subject area content: Do students taking GradPoint courses tend to have similar state test performance as students repeating original credit courses in the subject area (Math, English) for which credit recovery is sought?
	
	For the complete list of questions addressed in this research study, including those without related efficacy statements, see the Technical Report.

Related intended outcomes categories	— Student achievement or level of competence — Learner progression

Study design	*Part 1:* quasi-experimental (course pass rates)
	This study used a quasi-experimental design to assess whether students enrolled in GradPoint courses were more likely to earn a passing grade than students who repeated a failed original credit course, after controlling for student-level factors that affect academic achievement, including prior achievement, demographic background and course enrollment.
	
	Specifically, propensity score matching was used to identify a similar sample of students who opted to repeat a failed original credit course. The following nine dimensions were used to select similar students:
	— Prior achievement
	    1. Students' cumulative grade point average (GPA) prior to completing the target course
	
	— Student demographic characteristics
	    1. Race
	    2. Gender
	    3. ELL status (English Language Learner or not)
	
	— Enrollment factors
	    1. Course
	    2. Location / Virtual school
	    3. Enrollment time (on time vs. late enrollment)
	    4. Enrollment status (new vs. returning student)
	    5. IEP status (on an individualized education plan during 2015–2016 or not).

Study design	The study groups were adequately matched according to What Works Clearinghouse standards for baseline equivalence, on prior GPA, Gender, ELL, Race (with the sole exception of African American[1]), enrollment time, enrollment status, and IEP. In addition to the one ethnic group, it was not possible to match 1:1 GradPoint course repetitions always on the same courses within each Connections Academy. This issue was addressed in the statistical analyses.
	Part 2: retrospective cohort design
	This study also used a retrospective cohort design to assess whether students enrolled in GradPoint courses tended to have similar state test performance as students repeating original credit courses. Possible confounding factors were controlled for with their addition to the statistical model as covariates. These factors were students' prior cumulative GPA, course content (i.e., math or English), and course level (i.e., English 1 to 4, Pre-Algebra, Algebra 1 and 2, Geometry).
Metrics studied	— Course pass rates
	— Proficiency levels on state English and mathematics assessment
Description of sample	*Part 1: Participants*
	Connections Academy began offering GradPoint as a credit recovery option during the 2015–2016 academic year. Therefore, participants in this study were limited to GradPoint students and a matched sample of students enrolled in Connections during 2015–2016. The propensity score matching analysis yielded an analytic sample of 4,876 Connections Academy enrollments from the 2015–2016 academic year: a treatment group of 2,438 GradPoint enrollments (from 1,390 unique students), and a comparison group of 2,438 repeated original credit course enrollments (from 2,013 unique students).
	Part 2: Participants
	There were 296 (159 GradPoint, 137 original credit course) cases in 2015–2016 where an English or math course was repeated, completed and passed, and the student was subsequently state tested. It should be noted that more GradPoint students repeated English, while math was more often repeated with an original credit course.
Sample size	After propensity score matching, the final analytic sample comprised a total of 4,876 Connections Academy student enrollments: 2,438 GradPoint enrollments (from 1,390 unique students) —the full set of completed GradPoint enrollments for which all matching variables were available—and a matched comparison group of 2,438 repeated original credit course enrollments (from 2,013 unique students).

[1] African American: This is not to say that students of any ethnic group were excluded; rather that the best matching pairs (according to propensity scores) were not always of the same ethnicity. The difference between the GradPoint and matched comparison group in African American students was 3%.

Analysis

Part 1 *analysis*

To compare learner outcomes between GradPoint courses and original credit course repetitions, course outcomes (pass vs. fail) were analyzed using a hierarchical logistic regression model, with course type (GradPoint vs. original credit course repetition) as the predictor of interest. The nine propensity score matching variables were additionally included in this analysis to statistically control for any systematic variability between the GradPoint and original credit course comparison samples that remained. Specifically, course and school/location were each included as random effects (intercepts), thereby statistically controlling for the fact that some courses have lower pass rates on average than others (e.g., math vs. geography) and that pass rates vary across schools. Additionally, covariates were specified for students' prior GPA, race, gender, ELL status, IEP status, whether students were on-time vs. late enrollers, and whether students were new vs. returning.

Part 2 *analysis*

To compare state test achievement between GradPoint courses and original credit course repetitions, state test performance levels (e.g., proficient, partially proficient) were analyzed using probit (latent) ordinal regression. Variables indicating the subject area, course level, and prior GPA were included in this analysis to statistically control for difference in these factors between the groups. Prior GPA was missing for 41.6% of the sample. Multiple imputation was used to create 100 imputed data sets using subject area, course level, course score, and state test performance category to predict missing prior GPAs.

Results

Course pass rates were nearly two (1.89) times higher for GradPoint enrollments compared to the sample of original credit course repetitions. Specifically, after adjusting for achievement-related student characteristics and enrollment factors, the average adjusted pass rate for GradPoint enrollments was 85% — significantly higher than the average pass rate of 45% for original credit course repetitions (see Figure 4).

**Figure 4: Marginal effect of credit recovery type on course pass rates. Error bars denote 95% prediction intervals**
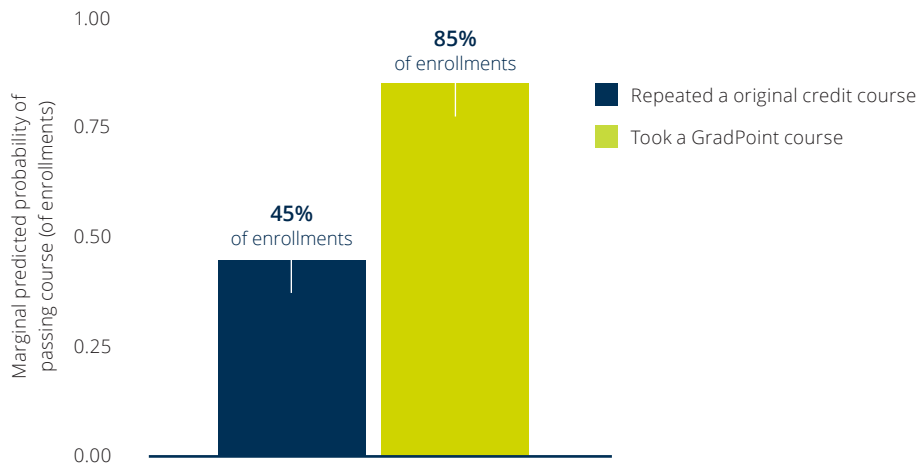
Results

Figure 5 provides a more nuanced view of the "GradPoint advantage" by showing the adjusted probability of students passing a credit recovery course based on their cumulative GPA at the time of enrollment. Several aspects of this graph are worthy of note. First, and most obviously, pass rates increased for both GradPoint courses and original credit course repetitions as the students' prior GPA increased, with a comparable rate increase among both course types (i.e., the lack of a significant interaction between students' GPA and students' choice of credit recovery option). In other words, higher achieving students were, unsurprisingly, more likely to earn a passing grade.

Second, while the average pass rate for GradPoint courses was 85%, the adjusted pass rate for original credit course repetitions only reached that level among original credit course repeaters with a prior GPA of 3.4 or higher (see Figure 5, and note where the solid blue line intersects the dashed yellow line). That is, in terms of course pass rates, the average GradPoint student, who had a GPA of ~1.7, outperformed original credit course repeaters with considerably higher prior achievement.

Third, while the average pass rate for original credit course repetitions was 45%, nearly all GradPoint enrollments had an adjusted pass rate higher than that. In particular, historically lower achieving students with a GPA of ~1.0 who sought credit recovery via GradPoint had an adjusted course pass rate of ~71%, with pass rates increasing to 90% or higher among GradPoint students with at least a 2.0 GPA (see Figure 5).

Figure 5: Adjusted course pass rates by course type and students' cumulative GPA. Ribbons denote 95% prediction intervals
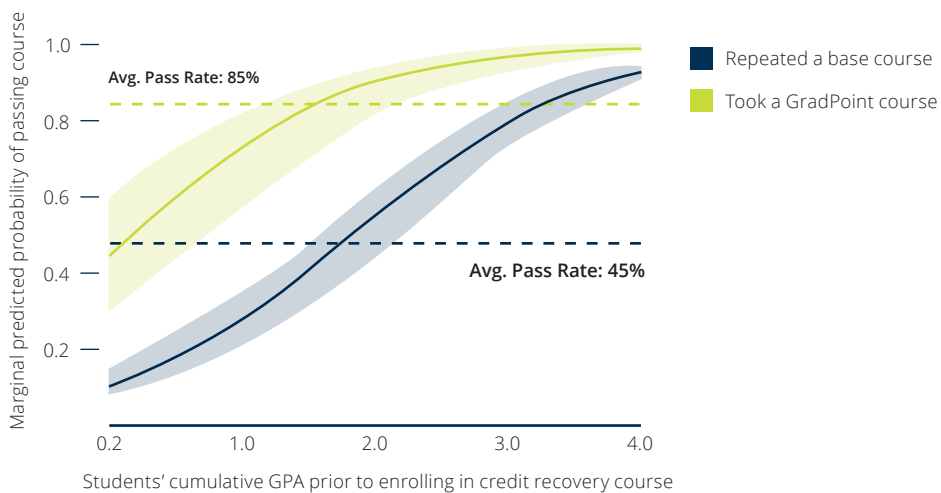
In addition to seeing higher pass rates, GradPoint students also tended to have similar objective knowledge as measured by their subsequent performance on English and math state tests. After controlling for prior GPA, subject area, and course level, there was no statistically significant difference in English or math achievement between those students who passed GradPoint and those who passed the repeated Connections Academy course offering in English or math.

In conclusion, completing a GradPoint online credit recovery course is associated with higher pass rates than repeating a failed original credit course. GradPoint pass rates are nearly two (1.89) times higher on average. Further, GradPoint students tend to have similar objective knowledge, as assessed on state tests, as original credit course repeaters. Taken together, results suggest that Connections Academy offers successful intervention solutions for recovering credits to struggling students.

Efficacy statements	In the context of this study of Connections Academy schools for students enrolled in the GradPoint credit recovery courses during 2015–2016, Pearson is able to make the following comparative, relational (correlational, not predictive) and descriptive statements about the efficacy of the Connections Academy — GradPoint course:

Comparative
— Connections Academy students taking GradPoint credit recovery online courses, after failing a course, were almost twice as likely to pass the course than similar students (matched on prior GPA and after adjusting for demographic and enrollment factors) who repeated with a Connections Academy course offering

Relational (correlational, not predictive)
— After controlling for prior GPA, subject area, and course level, students who passed GradPoint credit recovery online courses tended to perform as well as students who passed the repeated Connection Academy course offering on math and reading state assessments, as there was no statistically significant difference in performance.

Descriptive
— Connections Academy offers successful intervention solutions for recovering credits to struggling students as evidenced by its high success rate of 85% for GradPoint online credit recovery course completion. |

Limitations and generalizability	*Design of the study:*
Part 1 was a quasi-experimental design, which means we compared the expected pass rates of students completing GradPoint courses to similar students who simply retook the failed original credit course. Students in the two groups were matched in terms of prior achievement. However, the two groups showed differences in other factors that are related to passing rates (such as the course taken, location, students' race/ethnicity, gender, ELL status, IEP status, and other enrollment factors). Although we statistically adjusted for these variables in the analyses, we cannot rule out the possibility that the differences in the expected passing rates we observed are due to other factors. Thus, the study cannot support causal conclusions.

A limitation of Part 2 was that cumulative GPA was missing for around 42% of the sample. However, we addressed missing data by applying multiple imputation.

Generalizability of the results:
study results for Part 1 should generalize to similar types of Connections Academy students who complete future GradPoint offerings in the types of courses studied here. The sample size used for Part 2 was relatively small, thus results may not generalize to other Connections Academy students or to subjects other than English and math. Additional studies with larger samples are needed. |

Future research	Future research could attempt to validate the impact of taking a GradPoint course on students' knowledge of subject area content. For the current study, we only had reliable student achievement data for two subjects - math and reading. While the preliminary results from Part 2 were suggestive, it is unclear whether these results are robust (due to a limited sample size) and whether these findings would generalize to subject areas other than math and English. Thus, further research is needed to understand the impact of GradPoint on student learning across the range of credit recovery course offerings.

Given the current data, we were able to identify schools and courses that showed a larger or smaller GradPoint advantage than average. However, we were not able to assess what caused this variability. Future research could investigate the combination of contextual, implementation-level and/or school-specific factors that affect the size of the GradPoint advantage across schools and courses in order to understand the conditions that maximize the impact of taking a GradPoint course on learner outcomes. |

Read about this research in more detail in our Technical Report

Study 2 — *Phase 1*

Study citation	Gatti, G. (March 2018). A comparison study of Connections Academy Schools to matched brick and mortar and virtual schools, examining the types of students who attend K–12 virtual school and the effects on performance of a highly mobile student body.
Research study contributors	Guido Gatti, Julie Miller, Marcy Baughman, Alyssa Walters
Research questions	1. What are key characteristics of students who enroll at Connections Academy schools, and in what patterns do we see certain characteristics or profiles "cluster" together?
Related intended outcomes category	Learner access and experience
Study design	Student Profile Analysis (Exploratory, Descriptive) The purpose of this research effort was to gain a deeper, clearer understanding of the types of students attending Connections Academy schools, and the reasons students and families choose a virtual school. This improved understanding will greatly enhance Connections Academy leadership's ability to effectively refine, re-design, and/or add to the Connections Academy instructional model to best meet each student's individual needs.
Metrics studied	— Student characteristics (e.g., achievement scores, reasons for choosing to attending a Connections virtual school, enrollment/attendance, student demographic and family background information)
Description of sample	The sample was comprised of Connections Academy students that were enrolled at any time during the 2015–2016 academic year.
Sample size	77,541 students
Analysis	Multiple 2015–2016 data files were merged into one comprehensive database that included student demographic information, information collected via the Connections Academy Student and Family Information Forms (SIF and FIF), grading and attendance information, student mobility, and state test data. Then, a careful examination of this data was conducted using a two-step cluster analysis in SPSS, a statistical analysis software package.
Results	Examination of the data revealed seven distinct profiles for students choosing a Connections Academy virtual school. Below are the predominant characteristic(s) for each of these clusters: 1. Academically advanced students 2. Academically struggling students 3. Students experiencing health problems 4. New students experiencing bullying 5. Returning students who originally enrolled with numerous challenges, including those captured in the previous clusters 6 & 7. Students new to Connections Academy schools or returning, both of which were seeking flexibility and choice

Results	This phase of the study aims to describe those student populations seeking alternatives to their current local school system and detail their complex needs. Information from this study will allow Connections Academy to serve its students more effectively by better meeting individual students' needs.
	The resulting seven student profiles illustrate that Connections Academy schools serve highly mobile students with complex needs known to impact academic performance. These students' needs include, among others, health concerns, bullying and safety, looking to be challenged, trying to catch up, and flexible scheduling. These characteristics create a unique student population that differs from traditional brick and mortar schools.
	Further, it is our belief that the resulting student profiles reflect the wider virtual school population. This information should help not only Connections Academy, but also other virtual schools, to serve their student population more effectively.
Efficacy statements	This initial phase of the study was to explore the distinct profiles of students choosing a Connections Academy virtual school. The resulting profiles outlined above were used to inform the second phase of this study. Therefore, no efficacy statements resulted from this phase of the research.
Limitations and generalizability	*The generalizability of the results:* Given the sample size for the analysis, this research is relatively generalizable to other students attending Connections Academy Schools, and may also describe characteristics of students attending other virtual schools. In any given Connections Academy, the distribution of students across the seven profiles could vary.
Future research	To follow up on this study, future research could survey the research literature to identify the types of interventions and learning strategies that are most effective in promoting the achievement of students who fit these various profiles. In addition, future research should investigate the extent to which Connections Academy students within the different profiles are actually participating in programs and interventions and using resources that are designed to target their specific needs. Future Research could also evaluate the impact of these programs, interventions and resources.

Study citation	Gatti, G. (2017). A comparison study of Connections Academy Schools to matched brick and mortar and virtual schools, examining the types of students who attend K–12 virtual school and the effects on performance of a highly mobile student body.
Research study contributors	Guido Gatti, Julie Miller, Marcy Baughman, Alyssa Walters
Research questions	2.1. How do Connections Academy schools perform compared to matched non-charter brick and mortar schools on math and reading state assessments?
	2.2. How do Connections Academy schools perform compared to matched virtual schools on math and reading state assessments?
Related intended outcomes category	Standard of achievement or level of competence
Study design	Quasi-experimental matched comparison study
	Student cohorts (i.e., each grade level for math and reading separately) were all matched on data from either 2014 or 2015, the first year for available data. The cohorts were then compared on achievement for the subsequent years. This eliminates any possibility of a confound for time in making the comparisons.
	The research team collected school and district state achievement data (defined as the percentage of students scoring proficient or above on state tests) from 19 states' Departments of Education, at 3rd–8th grades, for 2014, 2015 and 2016. States were included if they had a Connections Academy school that had operated for three or more years. District-level student mobility data was also collected from each state along with school and district demographic data from the National Center for Education Statistics (NCES).
	The research team used sophisticated formulas to make sure the Connections Academy schools were matched and compared to schools with similar student populations.
	Given the significance of mobility in the Connections Academy student population, and the importance of academic achievement in evaluating any educational program's success, mobility rate (i.e., only matched at district level) and prior student achievement were the primary factors in finding a "matching" brick and mortar school for each Connections Academy school. Mobility rate was not included as a matching variable for virtual schools because both groups come from the wider virtual school population that serves this highly mobile population.
	The two-tier nearest neighbor matching process may best be explained as a two step process.
	Step 1 (matching by district): Within each state, the research team first identified the three closest-matching districts to the Connections Academy at each grade level for math. This process was repeated for language arts. It is important to note that the matching process was done for each grade and each content area separately (i.e., 6 grades by 2 content areas = 12 student cohorts).
	Step 2 (matching by school): For each of these 12 cohorts, the Connections Academy school was matched to the single best-matching school within the three districts identified in Step 1.
	In the matching process, variables were weighted according to how they distinguish Connections Academy student populations (e.g., mobility, meal status) as well as other critical variables (i.e., percent proficient on previous state assessment).

Results	In the matching formula for brick and mortar schools, mobility is weighted the highest due to its prominence among virtual students, and prior year achievement is weighted second due to its importance in predicting subsequent year achievement. Other variables used in the matching formula included: — Students' socioeconomic status — Students' race/ethnicity — Instructional expenditures per student — Percentage of students with Individualized Education programs — Grade-level enrollment
Metrics studied	Percentage of schools' students testing proficient on state math and reading standards in 2015 and 2016.
Description of sample	Researchers compared the state assessment performance of Connections Academy schools with that of: — Non-charter brick and mortar schools in the same state and with similar student populations (non-charter schools were selected due to the wide variability among charter schools in terms of focus and curriculum) — Other virtual schools in the same state and with similar student populations The sample was comprised of Connections Academy schools implementing the core instruction model that were in operation in the 2013–2014 to 2015–2016 school years. This included Connections Academy schools from Arizona, California, Colorado, Florida, Georgia, Iowa, Idaho, Indiana, Kansas, Michigan, Minnesota, New Mexico, Nevada, Ohio, Oklahoma, Oregon, South Carolina, Texas and Utah. All states had one Connections Academy with the exception of California, which hosted three schools (Alpaugh, Capistrano, and Ripon). Across years in 3rd–8th grades in each content area, there were: — 171 possible student cohort pairings between Connections Academy schools and brick and mortar schools — 165 possible student cohort pairings between Connections Academy schools and other virtual schools After omitting pairings with redacted or missing achievement data: — 161 brick and mortar pairings were available for math, and 167 for reading — 142 virtual school pairings were available for math, and 138 for reading
Sample size	All US students taking state tests in 3rd through 8th grade in the 19 states with participating Connections Academy schools were eligible for inclusion in the comparison group and thus the analytic sample.

Analysis

After matching, the groups were statistically equivalent on prior achievement in their matching years. Matched student cohorts were then statistically compared to the Connections Academy student cohorts on 2015 and/or 2016 percent of students proficient on state math and reading tests. Schools that could be matched on 2014 data were compared on both 2015 and 2016 student proficiency. Schools that needed to be matched in 2015 were compared solely on 2016 student proficiency. A fixed effects general linear model with empirical standard errors was used to statistically test group mean differences.

It should be noted, as with any matched comparison study design, the specific details of the matching technique used will select different matched pairs and thus can give different results.

To investigate the sensitivity of the specific matching technique used in this study, all the district specific (i.e., mobility rate, IEP, and instructional expenditure) and school level matching variables were entered into the statistical model as covariates. This model also included state as a fixed factor to adjust for differences in the state assessments. Also, along with mobility rate, the mobility category (see technical report) by mobility rate interaction was also entered as a fixed effect into the statistical model. This was done to account for differences in the way mobility rate was calculated across the states.

After adjusting the group comparisons, the results remained the same, changing negligibly. This result provides additional support that the results are not likely to be an artifact of the weighting for mobility and achievement, nor of non-perfect matching.

Results

Analysis of the data described above showed that:
— Connections Academy schools performed as well (i.e., no statistically significant differences) on reading and math achievement as brick and mortar schools
— Connections Academy students outperform other virtual school students in reading
— Connections Academy students perform as well as other virtual school students in math

This study is an attempt to fill the research gap by comparing the effectiveness of 21 Connections Academy schools from 19 states to matched brick and mortar schools and virtual schools, utilizing prior achievement and student mobility as significant factors in matching schools. The results provide evidence that Connections Academy students can receive the same quality of education as that offered at their local public school, while simultaneously taking advantage of the benefits offered to them by virtual schools; and that students may be better positioned in Connections Academy schools than other virtual schools.

Efficacy statements

In the context of this study of representative Connections Academy Schools for students enrolled during the 2013–2014 to 2015–2016 academic years, Pearson is able to make the following comparative statements about the efficacy of Connections Academy schools:

— There was no statistical difference in percentage scoring proficient in math and reading between student cohorts in Connections Academy schools and cohorts in brick-and-mortar schools that were matched on prior achievement, and after adjusting for district-mean student mobility and school-mean student SES and other demographic factors.

— Student cohorts in Connections Academy schools statistically outperformed (by 7.9 percentage points) cohorts in other virtual schools (matched on prior achievement) in terms of the percentage scoring proficient in reading on state assessments.

— There was no statistical difference in percentage scoring proficient in math between student cohorts in Connections Academy schools and cohorts in other virtual schools that were matched on prior achievement.

Limitations and generalizability

Design of the study: This study used a quasi-experimental design, which means we compared the achievement of Connections Academy students to the achievement of students attending brick and mortar schools and other virtual schools. Cohorts in the two groups were matched in terms of prior achievement. However, the two groups showed differences in other factors that are related to achievement in reading and math (such as students' mobility, socioeconomic status, and race/ethnicity). Although we statistically adjusted for these variables in the analyses, we cannot rule out the possibility that the achievement differences we observed are due to other factors. Thus, the study cannot support causal conclusions. A more rigorous research design would have matched groups at the individual student level rather than the school or district level. However, this data was not available for the analysis.

Generalizability of the results: The study results may generalize to other Connections Academy schools with similar student profiles.

Future research

Future research could attempt to replicate this analysis with matching at the individual student level, rather than the school or district level. This would require seeking permission from states to obtain individual student level data for children attending brick and mortar schools. In addition, in order to better understand how Connections Academy serves its students, future analysis could examine whether stronger fidelity to the Connections Academy core instructional model is associated with better learning outcomes, and which components from the core model are most important for student learning.

Read about this research in more detail in our Technical Report

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Appendix: full list of intended outcomes

Connections Academy Intended Outcomes are grouped into three stages: short, medium, and long-term Outcomes. Intended Outcomes 1–4 are the short-term outcomes, which are "foundational" in that they must be in place for Intended Outcomes 5–9 (medium-term) to come about, which in turn also support Intended Outcomes 10–12, the long-term outcomes.

Outcomes related to learner access and experience

Intended outcome 1
Students have access to the most updated aligned curricular content because the curriculum is continually reviewed, evaluated, and improved.
Connections Academy schools are committed to helping students be academically prepared for wherever they go after Connections Academy, whether that is to another K–12 school or to college, career, military, or whatever path they choose beyond high school. The curriculum is designed to prepare students for longer-term success. Courses are revised on a six-year cycle so they remain current and support intended learning outcomes for students in the 21st century. During this six-year cycle, daily, yearly, and mid-way revisions are implemented based on a multi-level evaluation system that incorporates regular (at least annual) review and analysis of student performance results, user feedback, assessment performance analysis, and alignment to national, state, and district content standards and course requirements.

Intended outcome 2
Students have multiple opportunities to learn, practice, set goals, receive timely feedback, and monitor their own progress.
Connections Academy believes that in order to achieve academically, students must be provided with:

— *Multiple opportunities to learn*, and to demonstrate learning, without negative consequences
— *Practice* that is integral to learning, builds fluency, and supports memory
— *Feedback* that is specific, timely, goal-oriented, and support students taking ownership of their learning by instilling in them the belief that they can learn and achieve at high levels

The aim is that they become engaged students who are able to be self-directed, set goals, and monitor their own progress; are invested in their own learning; and as a result have a growth mindset and perseverance that supports academic success.

Intended outcome 3
Students with varied learning preferences and/or needs are supported by the curriculum design and delivery.
In order to effectively support the diverse group of students who enroll in Connections Academy schools, the curriculum design and delivery must accommodate a wide range of students with varied learning preferences or needs. From advanced to struggling, students must have access to appropriately challenging curriculum, intervention and enrichment programs, teacher-led instruction in both one-on-one and group settings, interactive tools and instructional resources that advance and support their learning.

Intended outcome 4
Students actively participate in the curriculum and learning activities/attend "classes".
Student engagement is a key element in student academic success. Connections Academy schools employ multiple methods and measures to encourage student engagement. The schools also document each student's active participation in the online curriculum, as well as interactive activities such as discussion assessments, LiveLesson attendance, and synchronous and asynchronous contact with their teachers to support students' active engagement in learning and the learning process.

Intended outcome 5

Students express satisfaction with the curriculum and academic environment.

Connections Academy schools serve students who have actively sought out a non-traditional education option for a variety of reasons, including their (and/or their parents') dissatisfaction with the curriculum and/or academic environment at their previous school(s). Hence, student (and parent) satisfaction with those elements of their chosen Connections Academy school are areas of significant focus for Connections Academy schools, as they seek to meet their students' specific academic needs.

Intended outcome 6

Students express satisfaction with the physical, academic, and emotional learning climate.

Connections Academy schools serve students who have actively sought out a non-traditional education option for a variety of reasons, including their (and/or their parents') dissatisfaction with the physical, academic, and/or emotional climate at their previous school(s). Student (and parent) satisfaction with the Connections Academy learning environment is therefore a very important step in ensuring student academic and personal success.

Outcomes related to timeliness and completion

Intended outcome 7

Students are able to learn effectively at their own pace and monitor their own learning.

Connections Academy believe that not all students are well-suited to the defined schedule of a traditional school day. We believe that some students, in order to remain engaged, effective learners, need a more flexible, self-directed learning environment that still supports and guides them as they seek to take ownership of their learning. Connections Academy schools combine the flexibility of a largely self-paced environment with supervision and support from teachers trained in engaging students in the online environment, enabling students to learn effectively and at an appropriate pace.

Outcomes related to standard of achievement or level of competence

We have evidence related to this category of intended outcomes for Connections Academy.
Find it under **Product research**.

Intended outcome 8

Students master the course material and objectives.

To progress academically, students must master the learning outcomes identified in their state academic standards. To support students' mastery of course material and objectives, Connections Academy's curriculum, supplementary support programs, instructional method, and personalized learning, are all designed to work together to give students multiple opportunities to acquire and master the skills and knowledge they need for long-term academic success. The regular one-on-one contact that teachers have with students, along with surveys and questionnaires, provides teachers with the opportunity to understand, and help mitigate, any non-academic issues that students may also be struggling with, so that students can re-focus on learning and successfully master course material.

Intended outcome 9

Students are authentic, self-directed learners with perseverance, demonstrate a growth mindset, and connect learning to ideas and outcomes that are meaningful to them.

Students who demonstrate a growth mindset, engage in productive struggle, and connect learning to ideas and outcomes that are meaningful to them, are more successful academically and personally. Connections Academy's overall educational program includes curriculum design and delivery and extra-curricular activities, such as clubs and field trips. The educational program combines with a robust teacher professional learning program and active Professional Learning Communities (PLCs). This multi-faceted approach to learning aims to create an educational environment that helps students develop a growth mindset and connect learning to their own interests. This is designed to ultimately help them become more successful learners and individuals.

Intended outcome 10
Student academic growth.

Student academic growth — making progress from wherever they are starting from — is an overarching goal for all Connections Academy schools as part of our core belief that all students can achieve at relatively high levels. Connections Academy's short- and medium-term Intended Outcomes work together to create a physically and psychologically safe learning environment in which students, advanced and struggling alike, are given support, guidance, feedback, interventions, and opportunities to believe in their own ability to learn and to achieve. By measuring and celebrating student growth, Connections Academy helps students develop the growth mindset and perseverance that ultimately support academic and personal success.

Outcomes related to learner progression

We have evidence related to this category of intended outcomes for Connections Academy.
Find it under **Product research**.

Intended outcome 11
Student academic achievement.

Student academic achievement is the hallmark of a successful educational program, and is therefore one of the three long-term Intended Outcomes for Connections Academy schools. Students come to Connections Academy for many reasons, and the mission of Connections Academy schools is to help **all** students — whether struggling or advanced, facing chronic or acute health issues, seeking a safe learning environment after experiencing bullying, needing a flexible schedule to pursue a non-academic passion, or other reasons — achieve academically through a personalized education program designed to meet their specific learning needs.

Intended outcome 12
Graduation and post-secondary plans.

The ultimate measure of whether students achieve academic and personal success is if they are prepared for the next stage of life. This may be as simple as transitioning from third to fourth grade, or moving from Connections Academy to another educational option with the skills and knowledge they need to succeed there. It may be as comprehensive as graduating from high school well-prepared to fulfill post-secondary goals such as college, career, military, mission, or other. Connections Academy schools, short- and medium-term Intended Outcomes are designed to support the long-term outcomes of helping each student maximize his or her potential, and meet the highest performance standards through a personalized educational program that ultimately helps prepare them for success in school and beyond.

Independent limited assurance report to the directors of Pearson plc

The directors of Pearson plc ("Pearson") engaged us to provide limited assurance over the efficacy statements clearly identified by the box titled 'Efficacy statements', including reference to the study design type, in the Pearson Connections Academy Efficacy Research Report dated April 3 2018 ("Research Report").

Our conclusion

Based on the procedures we have performed and the evidence we have obtained, nothing has come to our attention that causes us to believe that the efficacy statements set out in the Pearson Connections Academy Research Report have not been prepared and reported, in all material respects, in accordance with the Pearson Efficacy Reporting Framework dated April 3 2018.

This conclusion is to be read in the context of what we say in the remainder of our report.

Efficacy statements

The scope of our work was limited to assurance over the efficacy statements clearly identified by the box titled 'Efficacy statements', including reference to the study design type, in the Connections Academy Research Report. Our assurance does not extend to other information presented in the Research Report.

Professional standards applied and level of assurance

We performed a limited assurance engagement in accordance with International Standard on Assurance Engagements 3000 (Revised) *Assurance Engagements other than Audits and Reviews of Historical Financial Information*, issued by the International Auditing and Assurance Standards board. A limited assurance engagement is substantially less in scope than a reasonable assurance engagement in relation to both the risk assessment procedures, including an understanding of internal controls, and the procedures performed in response to the assessed risks.

Our independence and quality control

We applied the Institute of Chartered Accountants in England and Wales (ICAEW) Code of Ethics, which includes independence and other requirements founded on fundamental principles of integrity, objectivity, professional competence and due care, confidentiality and professional behaviour.

We apply International Standard on Quality Control (UK) 1 and accordingly maintain a comprehensive system of quality control including documented policies and procedures regarding compliance with ethical requirements, professional standards and applicable legal and regulatory requirements.

Our work was carried out by an independent and multi-disciplinary team including educators, statisticians, and experts in reporting and assurance.

Reporting and measurement methodologies

The efficacy statements need to be read and understood together with the Pearson Efficacy Reporting Framework dated April 3 2018 (the "Framework"), available on Pearson's website[i] at https://www.pearson.com/efficacy-reporting-framework. The absence of a fully comprehensive set of generally accepted rules for identifying learner outcomes and defining, assessing and reporting the efficacy of educational products allows for different, but acceptable, ways of measuring product efficacy and reporting findings as efficacy statements. This could affect comparability between Pearson's efficacy reporting and that of other organisations.

Work done

We are required to plan and perform our work in order to consider the risk of material misstatement of the efficacy statements. A material misstatement would be an efficacy statement that does not reflect the study design and quality of underlying research or the omission of key information from a relevant study.

In doing so, we:

• made enquiries of relevant Pearson management;
• evaluated the design of the Framework including key structures, systems, processes and controls for managing, generating and reporting the efficacy statements;
• tested all 19 controls across the 8 stages of the Framework;
• confirmed that all management reviews were performed by at least two members of Pearson's Efficacy & Research team;
• performed substantive testing on a sample basis of the data that underpins the research studies and the resulting efficacy statements, and the controls over the completeness and accuracy of that data (supported by Pearson Internal Audit in those instances where student data was subject to confidentiality restrictions);
• assessed the quality and conclusions of the underlying research studies;
• inspected the statistical analysis to assess whether the efficacy statements are valid, supportable and consistent with the underlying research studies;
• independently re-performed screening of relevant external public research studies and compared to that done by Pearson;
• assessed the efficacy statements and underlying Technical Report(s) for consistency with the Framework; and
• reviewed the product's efficacy web page, Research Report, and Technical Report(s) for alignment of research studies and efficacy statements.

Pearson responsibilities

The directors of Pearson are responsible for:

• designing, implementing and maintaining internal controls over information relevant to the preparation of efficacy statements that are free from material misstatement, whether due to fraud or error;
• establishing an objective framework for preparing and reporting efficacy statements;
• preparing and reporting efficacy statements in accordance with the Framework; and
• the overall content of the Framework and the Research Report.

Our responsibilities

We are responsible for:

- planning and performing the engagement to obtain limited assurance about whether the efficacy statements are free from material misstatement, whether due to fraud or error;
- forming an independent conclusion, based on the procedures we have performed and the evidence we have obtained; and
- reporting our conclusion to the directors of Pearson.

Inherent limitations

Efficacy research, and the resulting efficacy statements, reflect the implementation and use of a product in a particular context. It would not be appropriate to assume a product would always generate similar outcomes in other contexts and/or in the future.

Intended users and purpose

This report, including our conclusions, has been prepared solely for the board of directors of Pearson in accordance with the agreement between us, to assist the directors in reporting Pearson Connections Academy efficacy statements, in accordance with the agreement between us dated 9 August 2017. We permit this report to be disclosed online**i** at https://www.pearson.com/corporate/efficacy-and-research/efficacy-reports in respect of the Connections Academy Research Report to assist the directors in responding to their governance responsibilities by obtaining an independent assurance report in connection with the efficacy statements. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the board of directors and Pearson for our work or this report except where terms are expressly agreed between us in writing.

PricewaterhouseCoopers LLP

PricewaterhouseCoopers LLP
Chartered Accountants
London
3 April 2018

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i *The maintenance and integrity of Pearson's website is the responsibility of the directors; the work carried out by us does not involve consideration of these matters and, accordingly, we accept no responsibility for any changes that may have occurred to the reported efficacy statements or the Framework when presented on Pearson's website.*