Pathway2Careers (P2C) Math: Research-Based Use Cases and Implementation Guide

Table of Contents

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Executive Summary

Pathway2Careers (P2C) Math is a career-connected math curriculum designed to flexibly support multiple instructional scenarios in K–12 education. This guide provides an overview of how P2C Math can be implemented across various use case scenarios — from core math instruction to interventions and enrichment — each aligned with research-based frameworks and best practices. The goal is to help educators (including teachers, instructional leaders, and administrators) integrate P2C Math effectively, ensuring that each use aligns with proven strategies that maximize student engagement, achievement, and real-world relevance.

Career-Connected Lessons	P2C Bridge
500+	**175 Lessons**
Real-world application & exploration lessons in P2C Math core curriculum, spanning Pre-Algebra through Geometry and Algebra II	Scaffolded lessons in P2C Math Bridge for reinforcing grades 4-7 skills and ensuring Algebra readiness in high school
STEM Interest Boost	**Algebra II Gains**
38% ↑	**150+**
Increase in student interest in STEM careers at schools using P2C Math's career-connected lessons (New Mexico program data)	Average Quantile-point increase in Algebra II after one year of P2C Math implementation in a rural district (Hatch, New Mexico)

Below is a summary table outlining the recommended usage of P2C Math in different contexts. The table highlights the primary purpose of using P2C Math in each scenario, optimal frequency or dosage, applicable instructional models/frameworks, and key implementation focus points. These guidelines are derived from educational research and program evaluation findings, as well as P2C's own evidence from the field. In combination, they form a framework to ensure that P2C Math is utilized in ways that are educationally sound and impactful.

Usage Framework for P2C Math (by Educational Scenario):

Instructional Use Case	Primary Purpose of P2C Math	Recommended Frequency & Dosage	Aligned Models & Strategies	Implementation Focus
Core Math Instruction	Serve as full, standards-aligned core curriculum for daily teaching of math content	3–5 lessons per week (daily use in class)	*Tech Integration*: TPACK; SAMR (Redefinition level); *Pedagogy*: Blended Learning Rotation models	Teach with high fidelity to P2C lesson sequence; combine digital & teacher-led instruction for concept introduction, practice, and assessment; ongoing teacher PD on tech integration
Supplemental/Enrichment Resource	Enhance existing curriculum with career-relevant contexts & projects	~2–3 lessons per month (strategic unit tie-ins)	*Tech Integration*: SAMR (Augmentation);	Select P2C Application lessons that align to current unit topics to deepen real-world understanding; use in station rotations or as culminating projects
Intervention (RTI/MTSS Tier 2–3)	Remediate skill gaps with engaging, contextualized practice	1–2 sessions/week (20–40 minutes each)	*Intervention*: RTI/MTSS framework; Explicit & Systematic Instruction	Use Math Bridge lessons targeting prerequisite skills; deliver in small groups or tutoring sessions; monitor progress with P2C's diagnostic assessments and adapt tasks as needed
Acceleration for Advanced Learners	Extend learning for gifted/talented students through real-world challenges	1–2 times per month (longer project blocks)	*Gifted Ed*: Enrichment clusters; PBL; Bloom's Taxonomy (analysis/synthesis levels)	Assign advanced P2C projects that require deeper inquiry or cross-curricular integration; encourage student-driven exploration of additional career applications
Career/CTE Integration	Connect math to Career & Technical Education (CTE) contexts for relevance	≥ 1 career-focused lesson per unit (e.g., monthly)	*Contextual Learning*: Math-in-CTE model (spend ~10% of time making embedded math explicit); Linked Learning approach	Embed P2C's career-context lessons to apply key concepts in authentic CTE scenarios; collaborate with CTE teachers or incorporate industry examples to reinforce academic–career connections
Special Education & Inclusion	Differentiate math instruction with supportive, multimodal content	1–2 lessons per week (as needed per IEP goals)	*Inclusive Design*: Universal Design for Learning (UDL); Differentiated Instruction principles	Utilize P2C's multiple representations (visual, textual, interactive) and scaffolds (hints, step-by-step problems); allow alternative ways to engage and respond; focus on career contexts that tap student interests

Student Engagement & Motivation	Boost relevance, interest, and perseverance in math learning	Biweekly engaging lessons or activities	*Motivation*: ARCS model (Attention, Relevance, Confidence, Satisfaction); Self-Determination Theory (autonomy, purpose)	Incorporate P2C career vignettes, videos, or "Did You Know?" exercises as warm-ups or themed days; let students assume professional roles in math problems to enhance sense of purpose
Advisory / SEL Integration	Support social-emotional learning (SEL) through goal-setting and career exploration	1–2 advisory sessions per month	*SEL*: CASEL Competencies (self-awareness, future planning); Career Exploration activities	Use P2C career profiles and reflection prompts for students to connect math skills with personal goals; facilitate discussions on how math empowers career and life choices, building student self-efficacy
Data-Driven Instruction (DDI)	Monitor and respond to student learning needs using assessments	Ongoing formative checks (weekly); Benchmarks at BOY/MOY/EOY	*Assessment*: DDI cycle (assess–analyze–act); Formative Assessment strategies (feedback loops)	Administer P2C's built-in quizzes and Quantile-aligned benchmarks; review results in PLC meetings; re-teach or assign specific P2C lessons based on skill gaps; set student growth goals tied to career readiness levels

Table: Summary of how P2C Math can be utilized across various scenarios, with suggested frequency and focus. By aligning with educational models (such as blended learning, RTI, gifted enrichment, CTE integration, SEL frameworks, and data-driven instruction), each use case ensures P2C Math is grounded in proven practices for that context.

P2C Math Overview

P2C Math consists of four full-year math courses: *Pre-Algebra, Algebra I, Geometry,* and *Algebra II*, available in both English and Spanish and aligned to Common Core and state standards. The defining feature of P2C Math is its emphasis on career relevance; every lesson connects math concepts to real-world applications and high-value occupations, answering students' common question, *"When will I ever use this?"* in an explicit way.

Each unit is built around practical scenarios and data from fields such as engineering, healthcare, business, technology, skilled trades, and more, allowing students to see how mathematical thinking is used by professionals in everyday work. In total, P2C Math offers over 500 career-themed lessons, which educators can implement as a primary curriculum or to supplement existing materials.

Structure and Lesson Design:

In each topic, P2C Math provides a sequence of lesson types:

- o Exploration lessons introduce key concepts with direct instruction, worked examples, and initial practice problems. These lessons often begin with a "*Did You Know?*" hook that shows a surprising real-life fact or scenario involving the math concept (for example, how a chef uses ratios in recipes or how an electrician calculates circuit loads). Multiple example occupations are briefly mentioned to prime student interest.

- o Application lessons are rich, problem-based activities set in the context of a specific career. These lessons typically feature a Career Spotlight: a description of one particular job (including details like typical tasks, salary, and a short video interview with a professional) that uses the math students have just learned. Students then "step into the shoes" of that professional to solve authentic problems using their new math skills. For instance, after learning about linear equations, an application lesson might have students act as marketing analysts to model social media growth with linear functions, or as environmental engineers calculating pollution levels over time.
- Illustration lessons (for selected topics) provide targeted practice for students who need additional foundational support. These lessons revisit prerequisite skills (often from earlier grades) in the context of simpler real-world scenarios, ensuring that students have the necessary background to succeed in the main unit. Illustration lessons are especially useful for differentiation and can be assigned to students who need remediation.

Throughout all lesson types, P2C Math emphasizes active learning. Students are encouraged to discuss and collaborate, mirroring workplace problem-solving. Many application lessons are well-suited for project-based learning or group work, where students might take on different roles (such as a data collector, analyst, or presenter) similar to a team in a professional setting. By the end of each unit, students not only have learned the mathematical procedures and concepts but have also practiced applying them in a context that illustrates *why* math matters.

Assessment and Adaptive Practice: P2C Math includes integrated assessments to support data-driven teaching. Formative "Check for Understanding" questions are embedded in lessons, along with immediate feedback. Each unit includes quizzes or performance tasks, and at key points, P2C offers Benchmark assessments (typically at the beginning, middle, and end of year) that report student proficiency as assessed by Quantile® measures — a standardized scale for math ability. These benchmarks help educators measure growth, for example, after a year of using P2C Math as a core program, students in one rural district improved by over 150 Quantile points on average in Algebra II, indicating significant gains in math proficiency.

The system provides analytics that break down results by domain and skill, allowing teachers to pinpoint which content areas need re-teaching or reinforcement. Uniquely, P2C Math's reporting also connects Quantile growth to career readiness; students can see which careers correspond to their current math level and how advancing their math skills can expand their career options. This feature reinforces motivation by linking assessment outcomes to real-life goals.

Technology Integration & Teacher Support:

P2C Math is delivered via an online platform that integrates with common school systems (LMS and single sign-on). However, it's designed with blended learning in mind, combining digital and face-to-face instruction. The platform handles content delivery, interactive elements, and grading of many assessments, freeing teachers to spend more time on facilitation and individualized help. The curriculum follows the TPACK framework by ensuring technology is used to enhance pedagogy and content understanding, rather than as an add-on. For example, dynamic graphing tools and simulations are embedded to illustrate concepts more powerfully than static text, and automated feedback guides students in real time.

To aid teachers in implementing the program, P2C offers extensive professional development resources. New users typically receive training on how to navigate the curriculum, interpret the data reports, and facilitate the

career-connected lessons (which may be a shift from traditional teaching). Additionally, P2C provides lesson guides, pacing recommendations, and tips for differentiation (for instance, how to scale a task up for advanced students or scaffold it for those who need extra help). Teachers are encouraged to treat each P2C Application lesson a bit like a mini-project or case study: asking guiding questions, letting students explore, and tying the experience back to the underlying math standards. Ongoing support, such as webinars, coaching sessions, and an online community helps educators share strategies and troubleshoot challenges. With this support, schools can achieve strong implementation fidelity, which research (e.g., *Cheung & Slavin, 2013*) has linked to better student outcomes when using technology-based programs.

P2C Math Bridge Overview

While the core P2C Math courses focus on Pre-Algebra through Algebra II content, Pathway2Careers Math Bridge is a complementary program designed to bolster students' foundational skills in mathematics. P2C Math Bridge addresses what educators often call the "algebra readiness gap" by providing targeted instruction in critical concepts from late elementary and middle school (typically 4th–7th grade content) that students must master to succeed in high school algebra and geometry.

Key Features and Purpose: P2C Math Bridge contains 175 lessons that revisit and reinforce topics such as operations with fractions and decimals, ratios and proportions, basic equations, and fundamental geometry. Each Bridge lesson is crafted to remediate skill gaps in a way that is engaging for older students. Rather than using elementary-style graphics or contexts (which can feel babyish or stigmatizing to teenagers), the lessons maintain the career-connected approach of P2C; they frame practice in terms of real-life scenarios interesting and relevant to adolescents.

For example, a lesson reviewing fraction addition might place students in the role of a sound engineer mixing audio tracks at a concert, and a lesson on basic statistics might simulate analyzing data from a sports competition. This approach is consistent with best practices in intervention design; it provides *explicit, focused instruction* on missing skills but does so in a manner that respects students' maturity and need for relevance, thereby improving their motivation to engage with remedial content.

Flexible Implementation Models: Schools can deploy Math Bridge in several ways:

- Standalone Course: Some high schools offer Math Bridge as a one-semester or full-year course (often in 9th grade or 8th grade) for students identified as significantly below grade level in math. This allows students to concentrate on foundational skills before tackling Algebra I. The curriculum's structured sequence ensures that by the end of the Bridge course, students have a stronger grasp of pre-algebra content. This approach aligns with an MTSS Tier 3 intensive intervention, essentially giving students an extra year of math preparation in a controlled, supportive setting.
  - Supplement within Core Class: Math Bridge lessons can be woven into a regular math class to pre-teach or review crucial pre-requisites. For instance, an Algebra I teacher might pause core instruction for a day to use a Bridge lesson on integer operations if the class is struggling with that skill. Because each Bridge lesson is self-contained and context-based, it can be used as a targeted "plug-in" when assessment data or observations indicate a need. This is similar to the concept of just-in-time remediation, wherein instructors address gaps at the moment they become barriers to new learning.
    - After-School or Summer Intervention: P2C Math Bridge is also well-suited for use in math intervention programs outside of regular class time. Schools might use Bridge during after-school tutoring, Saturday academies, or summer bridge programs for incoming 9th graders. In

these formats, teachers or tutors can pick and choose lessons based on a diagnostic test or on the skills that most commonly need reinforcement (such as fractions, percent calculations, or single-step equations). Sessions might be shorter (20–40 minutes), so a Bridge lesson can be split across days if needed. The content is modular enough to accommodate variable pacing.

In all of these cases, the research recommendation (*Stevens et al., 2018*) is to keep intervention groups small and instructional time focused. P2C Math Bridge aligns with those recommendations by being explicit and systematic. Each lesson has clear objectives, a structured progression from review to practice, and formative checks. Yet, unlike many drill-based programs, it sustains student interest through its career contexts.

Early evidence from P2C implementations indicates that students in intervention settings often show improved attitudes when using career-connected materials. For example, during a pilot in New Mexico, teachers noted that students were more willing to spend time on foundational math problems when they were presented as real-world challenges, like budgeting for a community event or designing a skateboard ramp, rather than as abstract exercises. This points to the importance of motivation in interventions; as *Durlak et al. (2011)* found in a meta-analysis, academic interventions that also address students' social-emotional engagement tend to have stronger effects. P2C Math Bridge aims to do both by teaching the right content and fostering a growth mindset (showing students that improving these skills opens doors in life).

Integration with Core P2C and Data Systems:

Math Bridge is part of the P2C ecosystem, meaning it shares the same user interface and reporting system as P2C courses. This means that if a student uses both Bridge and the main curriculum, a teacher can see all their progress on one shared dashboard. The Quantile framework extends to the Bridge content as well, helping track growth even at the most basic skill level. A suggested practice is to administer a diagnostic assessment (using P2C's item bank or another math screener) at the start of the year to identify which students would benefit from Bridge content and which specific lessons.

Many P2C schools have created individualized learning plans where students are assigned certain Bridge lessons to complete over a semester for reinforcement (this can be during a study hall, as homework, or via a tutoring period). The platform's ability to generate an "intervention playlist" for each student is a powerful tool for RTI/MTSS Tier 2 support. A teacher can assign 5–10 Bridge lessons to a student, monitor their success (the system tracks scores and time on task), and then decide whether the student has filled the gap or needs more help. By tying these actions to data, such as benchmark results, teachers ensure they are addressing the right skills at the right time, an approach encouraged in the Data-Driven Instruction model of continuous improvement.

In summary, P2C Math Bridge serves as a bridge (true to its name) between where students are and where they need to be for higher-level math. It reflects the philosophy that "you don't fix learning gaps by doing more of the same work that didn't stick the first time; you try a different approach." Here, the different approach is contextualizing and energizing foundational math with real-world applications, providing a reason to care about the basics while systematically building competence.

Detailed Use Cases and Research Alignment

The following sections delve into each major use case scenario for P2C Math, explaining how to implement the program in that context and summarizing the research basis or proven best practices that inform those recommendations. Each section connects an instructional scenario with the pedagogy and data behind it, demonstrating how P2C Math aligns with or enhances established educational models.

1. Core Math Instruction (Primary Curriculum Use)

How to Implement: When P2C Math is used as the primary curriculum, it replaces or supplements the traditional textbook as the main source of daily math lessons. Teachers follow P2C's scope and sequence, typically covering one lesson per day (or over multiple days for extended projects) to address all required standards. With daily use, teachers should leverage both the online components (e.g., interactive examples, videos, quizzes) and the teacher-led components (class discussions, hands-on activities). Pacing guides are provided to help fit the content into the school calendar. It's recommended to use P2C's assessments regularly to ensure students are mastering content; for example, a quick "On the Job" quiz could be given at the end of each lesson for immediate feedback, and unit tests can double as both summative assessments and practice for state exams (since P2C's problem formats mirror high-order thinking questions).

Research Alignment: Using P2C Math as a core curriculum aligns with research on technology-enhanced math programs in daily instruction. A comprehensive meta-analysis by *Cheung & Slavin (2013)* examined educational technology applications in K–12 math and found that, on average, well-implemented tech-integrated math curricula had a positive effect on student achievement but notably, the effect was larger when the programs were used for around 30 minutes or more per week (in many studies, this equated to using the program nearly every day in class). The positive impact was particularly significant when teachers received adequate training and consistently incorporated the technology into their instruction, rather than occasionally or as a reward. This suggests that for a program like P2C Math, schools should plan for near-daily use and ensure teachers are comfortable and skilled with the platform.

In terms of teaching practice, integrating P2C Math into core instruction reflects the TPACK model (Technological Pedagogical Content Knowledge); teachers combine content knowledge (math), pedagogy (inquiry-based, contextual learning), and technology (the P2C platform) to deliver lessons in new ways. It also exemplifies moving to the transformation stage of the SAMR model (Substitution–Augmentation–Modification–Redefinition). Instead of simply digitizing a worksheet (which would be substitution), P2C Math redefines tasks: students might engage in a simulated problem that would be impossible or impractical without technology (such as analyzing a large dataset, watching a video interview of a professional, or using an interactive graphing tool). Research on SAMR and tech integration indicates that such redefinition-level tasks tend to produce deeper learning and engagement.

Moreover, daily usage of a comprehensive program like P2C fosters a blended learning environment. In a rotation model (stations or lab rotations), for example, some students could be working through a P2C online practice set while the teacher provides direct instruction to a small group, and others work on a collaborative P2C Application project. Blended learning studies have shown that this can personalize learning and improve mastery by allowing students to work at their own pace on the software while still getting teacher support. The key is to maintain a strong connection between the technology pieces and the face-to-face elements, which P2C facilitates by providing discussion prompts and extension activities that the teacher can use after students complete the digital portion of a lesson.

Finally, the fidelity of implementation is critical. In P2C terms, that means teaching the lessons as designed (especially at the start, before adapting them once instructors are familiar), and covering the career scenarios, not skipping them in favor of only procedural exercises. Program evaluations (including an external study by the University of Louisville's CRIMSTED center) have observed that schools where teachers fully embraced the P2C approach — consistently highlighting career

connections and using the platform's features — saw greater student gains than those where teachers only used P2C sporadically or primarily for extra practice. This echoes a common finding in curriculum research: any high-quality program needs to be implemented as intended to realize its benefits. Thus, leadership should support teachers with training, planning time, and encouragement to deeply use P2C Math day–to-day.

2. Supplemental Use (Enhancing Another Core Program)

How to Implement: Some schools choose to continue with a pre-existing core math curriculum (whether a traditional textbook or another digital program) and integrate P2C Math as a supplemental resource to bring in career relevance and additional practice. In this scenario, teachers don't follow P2C Math's full sequence but instead select specific P2C lessons or activities to insert into their units. This might mean, for example, that during a geometry unit on area and volume in the main textbook, the teacher schedules a P2C Application lesson where students act as architects designing a tiny house (applying area/volume in context). Or in an Algebra class, after learning the standard methods for solving systems of equations, the teacher might use a P2C exploration where students solve a problem about optimizing ingredients in a recipe (a systems of equations application). The recommended frequency is on the order of a few times per month — essentially when a topic lends itself well to a career example or when students could benefit from seeing the real-world payoff of the abstract math they just learned.

Teachers using P2C as supplemental curriculum should map P2C content to their curriculum maps ahead of time. P2C provides correlation guides that show which lessons align to which Common Core or state standards, making it easier to plug the right P2C lesson in at the right time. It's also important to allocate enough time for these enrichment lessons; they may take a full class period or more, especially if students are engaged in problem-solving or hands-on work beyond the typical exercise set. Many schools schedule P2C activities on Fridays or at the end of units in order to review and apply what was learned.

Research Alignment: Using P2C Math as a supplemental, *enrichment-oriented* tool aligns with findings that contextual learning and periodic projects can deepen understanding and motivation. A meta-analysis by *Pellegrini et al. (2021)* (published in AERA Open) reviewed effective math programs and noted that beyond core instruction, supplemental programs that provide targeted practice or applications can have a significant impact. In particular, this analysis and others have found that supplemental computer-assisted instruction (CAI) yields an average positive effect on math achievement (often in the range of +0.15 to +0.20 effect size). The effects tend to be larger when the supplemental activities are used regularly but not necessarily daily; roughly once every one to two weeks prevents "initiative fatigue" and keeps the special activities feeling fresh and engaging. This matches P2C Research Team's recommendation of ~2–3 P2C lessons per month.

One reason supplemental programs can work well is focused reinforcement. P2C allows teachers to zero in on a concept with an alternative approach (a real-world scenario) right when students might otherwise start to wonder "why are we learning this?" or when they need an extra boost of practice. For example, after a challenging algebra concept, a P2C career problem can both consolidate skills and rekindle interest, which supports knowledge retention. Research by *Hulleman & Harackiewicz (2009)* demonstrated that even brief interventions connecting class material to students' lives can increase their interest and performance — a key insight that P2C's supplemental use leverages on a recurring basis.

The P2C approach to supplemental use is also informed by the SAMR model at the "Augmentation" stage: P2C doesn't replace the core curriculum but augments it by adding features the core might lack (like interactive data sets, authentic contexts, or interview videos). Teachers often report that these enrichment lessons help students who might not excel in traditional tests to shine in a real-world task, which can improve those students' confidence and class participation. This resonates with motivational theories: giving students choice and showing real-world value (the "Relevance" in Keller's ARCS model) can boost their effort in the course overall.

Best Practices: Successful examples of P2C as a supplement include schools that held a weekly "Career Day Friday" where math class every Friday was dedicated to a P2C project, while Monday–Thursday followed the traditional textbook. Students looked forward to Fridays and worked through standard lessons more diligently knowing a fun application was coming. Another practice is using P2C for spiral review. Before a big test, instead of doing a plain review packet, a teacher might run several P2C mini-activities that naturally revisit prior content (such as a budgeting simulation that requires percentages, linear equations, and area calculations, wrapping multiple units into one scenario). This approach aligns with cognitive science research on interleaving and retrieval practice; students often benefit from mixing different types of problems and retrieving older knowledge, which can be achieved within a single complex project.

Most importantly, the supplemental P2C lessons should not feel like isolated "extras," but rather integral parts of the learning journey. To achieve this, teachers can frame each P2C lesson explicitly in relation to their current unit ("Today, we're applying what we learned about exponential growth by playing the role of epidemiologists tracking a virus spread"). After the lesson, debrief by connecting back to the core math skills and highlighting how the exercise illustrated key concepts. This reflection cements the marriage of core content and its application, helping students transfer their knowledge to new situations, which is a hallmark of deep learning.

3. Targeted Intervention (RTI & MTSS Supports)

How to Implement: P2C Math's career context and adaptive scaffolding make it well-suited for intervention settings, whether in class (Tier 2 small groups) or in pull-out programs (Tier 3 intensive support). To use P2C for interventions, educators should first identify the specific skills or standards where students are struggling. This can be done via P2C's diagnostic tests or other assessment data. Then, teachers should assign or teach relevant P2C Illustration or Bridge lessons that address those needs.

For example, imagine a 7th-grade student who is behind in understanding fractions and decimals, a common stumbling block. In addition to their regular math class, this student attends a math lab period twice a week. In that lab, the teacher can assign a P2C Bridge lesson, such as "Using Fractions in Culinary Arts", where the student practices fraction operations by adjusting recipes. The student is more engaged because the context (cooking) is relatable and less intimidating than a typical worksheet, but they're still getting the structured practice they need. Over a few weeks, the teacher might progress the student through several Bridge lessons on fractions and decimals, gradually increasing complexity, while monitoring their progress in the P2C system.

For Tier 2 support within a class, a teacher might use station rotations; one station could be P2C Bridge on laptops for students who need remediation, another station with challenge problems for advanced students, and a third station for direct instruction or guided practice with the teacher. This way, all students are working at their level, which is a core idea of Differentiated Instruction, and P2C provides

the content for those who need to review the concepts in an autonomous way, freeing the teacher's time.

Research Alignment: The use of P2C in interventions aligns strongly with the principles of Response to Intervention (RTI) and Multi-Tiered System of Supports (MTSS). These frameworks emphasize providing evidence-based interventions at increasing levels of intensity based on student need, with frequent progress monitoring. P2C Math Bridge and illustration lessons are themselves built on evidence-based methods for struggling learners — such as explicit instruction, scaffolding, and immediate feedback — which are highlighted in many successful math intervention studies (*Stevens et al., 2018*).

One of the challenges in math intervention is keeping students engaged, especially if they have a history of math failure or anxiety. Research suggests that incorporating students' interests and showing immediate relevance of skills can improve their engagement and effort. This is where P2C's vocational contexts make a difference. For example, a student who loves sports might find renewed energy in a P2C lesson about calculating statistics for a basketball team, even if the lessons involve practicing percentages or averages that the student previously struggled with. By giving a purpose to the practice, P2C lessons can help students cultivate a growth mindset — seeing that with effort, they can master the math, and it actually has value outside the classroom. This ties in with Self-Determination Theory; students are more motivated when they feel what they're doing is autonomous, purposeful, and builds competence.

In terms of efficacy, consider the findings from *Stone et al. (2006)*, the National Research Center's Math-in-CTE study. While that study was about enhancing math in vocational classes, a key takeaway was that teaching math explicitly in a contextualized form led to significant gains on standardized math tests (students in the experimental CTE classes scored higher than those in control classes). This shows that even for students who might be less interested in traditional math, an applied approach can boost their performance in core skills. P2C Math essentially reverses that model (bringing career contexts into math class rather than math into vocational class), but the principle is the same: *contextualization can strengthen understanding and retention*.

Intervention research also emphasizes regular, short sessions over infrequent, long ones. A review of math interventions for middle school by *Pellegrini et al. (2018)* (as cited in this document's references) suggests that 2–3 sessions per week of targeted instruction produced meaningful improvements in students' math outcomes. We recommend 1–2 P2C intervention sessions a week (depending on severity of need), each about 30 minutes, which fits that pattern. The program's design (short lessons that can be completed in that time) supports such use.

Finally, frequent progress monitoring is easy with P2C; educators can use the P2C quizzes or unit checks to see if the student is catching up. This aligns with data-driven instruction cycle: assess, analyze, and adjust. If a student's data shows they've mastered the fraction skills after a couple of Bridge lessons, educators might move them on to the next goal; if not, perhaps try a different approach or more practice. P2C's reports make these decisions more straightforward by highlighting which skills are still problematic.

4. Acceleration & Enrichment for Advanced Students

How to Implement: P2C Math offers ample opportunities to challenge students who quickly master grade-level content or who crave deeper exploration. In a heterogeneous classroom, teachers can assign "extension" tasks from P2C's vast library of problems. For instance, if a student finishes the regular assignment early, they can delve into an advanced P2C Application problem on the same topic

that requires extra creativity or involves multiple steps. In classes or programs specifically for gifted or advanced learners, educators can use P2C projects to replace some routine practice with more complex investigations.

One approach is to designate certain P2C Application lessons as enrichment projects. Suppose a class is studying quadratic functions and some students grasp the concepts rapidly. The teacher might have those students undertake an extended P2C project, like "Optimizing a Profitable Concert" (which involves quadratic modeling of revenue and profit for a concert promoter). While the rest of the class works through additional practice problems, the advanced group spends a few days on this project, then presents their findings to the class. They not only deepen their own understanding but also expose their peers to the real-world connection once the class is ready.

In a middle school setting, if P2C Math is being used in 8th grade and there are some students ready for Algebra I, those students might be allowed to progress into the P2C Algebra I content (since P2C is a full course) at their own pace, possibly with a mentor teacher or through an independent study arrangement. The career context keeps them engaged even as they accelerate.

Research Alignment: Enrichment for advanced learners should focus on depth, complexity, novelty, and choice, according to gifted education experts. The well-known Bloom's Taxonomy encourages pushing into higher-order thinking skills (analysis, evaluation, creation) for gifted learners rather than just giving them more of the same work. P2C Math's Application lessons often naturally operate at these higher levels; students may be analyzing data, evaluating options for a design, or creating a plan to solve a complex situation.

A meta-analysis by *Kim (2016)* on enrichment programs for gifted students found large effects (Hedges' g ≈ 1.0 or higher) on cognitive outcomes when students were provided with enriching, challenging tasks beyond the standard curriculum. Particularly, project-based enrichment that allowed creativity and independent exploration was highly beneficial for advanced learners' achievement and problem-solving skills. The P2C model aligns with this by giving students authentic problems that often have multiple solution paths, thereby encouraging creative and critical thinking.

One specific strategy in gifted education is curriculum compacting, where students who demonstrate mastery of basic material can skip it and move to more interesting tasks. P2C Math can facilitate this; pre-tests or formative assessments can identify which topics a gifted student already knows, and then that student could engage with P2C enrichment projects while others learn the basics. For example, a student who already knows how to solve linear equations could bypass some repetitive exercises and instead work on a P2C problem involving linear programming and business profit, learning extension content (perhaps from Algebra II) in the process. This approach has a dual benefit documented in gifted education research: it prevents boredom by keeping advanced students challenged, and it allows them to learn new material or apply knowledge in novel situations, which can lead to academic gains and improved attitudes.

From a theoretical perspective, this use of P2C reflects Project-Based Learning (PBL) and inquiry models. Gifted education research (e.g., *Renzulli's Enrichment Triad Model*) advocates Type III enrichment activities: investigations of real problems that are student driven. P2C's career tasks can be viewed as structured Type III activities provided for the teacher. Over time, teachers can even let students choose which P2C Application topics interest them the most — giving some autonomy in line with Self-Determination Theory and promoting student ownership of learning.

It's worth noting that advanced learners also benefit from social and emotional support — for instance, working with intellectual peers and exploring personal interests, which increases their engagement. P2C group projects can be a great opportunity to cluster advanced students together to collaborate on something "meaty." For example, a set of high achievers in a class might team up on a P2C challenge that others aren't doing, thereby creating a mini "enrichment cluster" within the class. According to Gagné's model of talent development, providing resources and grouping by readiness can turn potential into high achievement.

Finally, advanced usage of P2C might include accelerating the curriculum itself. The four P2C courses can be offered in middle school for credit (some districts have used P2C Algebra I in 8th grade, for example). P2C's approach works well for younger students too, because the career contexts are flexible; even if a middle schooler doesn't fully understand the details of a certain career, the scenario is still usually accessible and interesting. This vertical acceleration should be accompanied by support, but it can enable gifted math students to take higher-level math earlier while still grounding their learning in real-world understanding.

5. Career-Connected Learning Integration (CTE and Academic Partnerships)

How to Implement: P2C Math can be a bridge between traditional academics and career and technical education (CTE) programs. Schools pursuing integrated pathways (like STEM academies or Linked Learning pathways) can use P2C to intentionally connect math with career themes.

In practice, this could mean coordinating with CTE teachers. For instance, if students are in a health science pathway, the math teacher might choose more P2C lessons related to healthcare or co-plan a project with the health teacher. P2C's library includes numerous health-related math problems (such as medical dosages, interpreting lab test data, and epidemic spread modeling). By aligning math class examples with what students do in their health sciences class, the school creates a cohesive experience.

Even outside formal pathways, a math teacher can invite real-world connections. P2C lessons can serve as the basis for cross-curricular projects. For example, a P2C lesson on sustainable business profits could be expanded into a larger project that also involves an economics or entrepreneurship class. Alternatively, math teachers can bring in guest speakers from local industries aligned with P2C scenarios — perhaps a civil engineer after a geometry lesson on bridge design, or a financial advisor during an algebra unit on compound interest.

To ensure regular integration, teachers should aim to incorporate at least one career-context problem or discussion in each unit. Some schools have done this by designing performance tasks or unit projects exclusively using P2C contexts. Others have extended P2C lessons into capstone projects where students not only solve the given problem but also create a presentation or product around it (mimicking a work product). Such practices mirror the Linked Learning approach, which combines rigorous academics with applied learning and real-world experience.

Research Alignment: The intentional integration of career contexts in academic learning is supported by initiatives like the Math-in-CTE model (from NRCCTE) and results from programs like Linked Learning in California. The Math-in-CTE research demonstrated that when vocational teachers spent roughly 10–15% of their instructional time highlighting embedded math (essentially teaching the math behind technical tasks explicitly), their students' math test scores significantly increased (*Stone et al., 2006*). This suggests that even a modest infusion of contextual math teaching (one lesson in ten, for example) can pay dividends. P2C Math, when used in academic class, flips this by bringing context into math

rather than math into context — but the underlying principle is complementary. It's reasonable to extrapolate that dedicating ~10% of math class time to career-connected applications could similarly boost understanding and retention, because students see the "why" and form more connections in their knowledge network.

Linked Learning evaluations (such as those conducted by SRI International in the 2010s) have found that students in integrated academic-CTE pathways were more likely to graduate and showed higher engagement. A critical factor was that these students perceived their education as relevant to their future. P2C Math directly contributes to that perception of relevance in a mathematics context. It addresses a common student disengagement point in high school: math can feel disconnected from real life, leading some to tune out. By regularly incorporating career problems, math teachers can maintain or rekindle interest. One could say P2C helps implement a "relevance intervention" continuously; interestingly, a study by *Hulleman et al. (2010)* showed that a simple writing exercise where students reflected on the relevance of science topics to their lives improved high school science grades, particularly for those with low performance history. P2C lessons essentially build that reflection into the lesson itself by design.

The approach also reflects Understanding by Design (UbD) principles: start with the end in mind (such as by answering "what do we want students to be able to do in the real world with this math?") and design learning experiences to get them there. P2C Math gives teachers concrete "end" scenarios (like successfully completing a work task using math) around which to frame their teaching.

Additionally, by using P2C to integrate math with career themes, schools address college and career readiness (CCR) standards, which often call for applying math in real-life contexts, problem-solving, critical thinking, etc. P2C tasks often mirror the kind of complex, multi-step problems found on college placement exams or workforce certification tests, where examinees must apply mathematical reasoning in applied situations. Hence, students get practice not only for academic tests but for real decision-making — thereby preparing them for both college and the workforce.

Finally, on the motivational side, integrating career learning taps into students' aspirational goals. Adolescents often care a lot about their future ambitions. By showing how math is connected to those ambitions, P2C Math situates learning in the context of a personal journey. This addresses the "relatedness" component of Self-Determination Theory and can be particularly effective for students who might not have seen a connection between schooling and their life goals, such as some underrepresented or at-risk students. Indeed, some case studies in schools using P2C reported that formerly disengaged students perked up when they did a lesson connected to a field they were interested in (like automotive or fashion), which in turn led to better attendance and participation in math class.

6. Special Education & Inclusive Classrooms

How to Implement: In inclusion classrooms or special education settings, P2C Math should be used with a focus on its built-in scaffolds and multiple representations. For students with learning disabilities or other special needs, the career context can serve as a hook to increase engagement, but equally important is ensuring they can access the content.

Teachers might use P2C's digital platform features like read-aloud (text-to-speech) for students who struggle with reading, interactive manipulatives for students who need a more hands-on approach, or chunking of content (e.g., using the "Step-by-Step" mode where problems are broken down into

smaller parts). P2C's illustrations and diagrams support visual learners, and the clear structure of exploration and practice can aid those who benefit from routine and clarity.

One approach is station or rotation models within a co-taught classroom. One station is where students work on P2C at their own pace (with the computer providing instant feedback), another station could be direct instruction by a special education teacher focusing on prerequisite skills (maybe also using P2C Bridge lessons), and another station with the general ed teacher extending the lesson for advanced students. This way, all students are engaged with the same broad topic (and potentially the same career context), but at a level appropriate for them. P2C's consistent format allows lower-performing students to gain confidence because they know each lesson will have a similar structure (including an introduction, examples, and practice section), which reduces cognitive load.

Special education teachers can also use P2C in pull-out interventions or resource classes, selecting specific lessons that align with what the student's general math class is covering. Because P2C problems are set in contexts, some students who struggle with abstract or context-free problems may find they actually *do better* when a problem is wrapped in a story or concrete situation. This is contrary to a misconception that story problems are always harder; for some students, the story provides memory cues or makes the problem more interesting, aiding comprehension.

Research Alignment: The recommendations above are guided by principles of Universal Design for Learning (UDL) and effective special education practices. UDL suggests providing multiple means of representation (different ways of explaining content), expression (different ways for students to show understanding), and engagement (different ways to motivate and involve students). P2C Math inherently provides multiple representations: for a given concept, students might read an explanation, watch a short video, see a graph or picture, and then work on interactive examples. This caters to various learning modalities — a plus for students who need more than one way to grasp an idea.

Additionally, P2C's approach of connecting to real-life experiences can help students with special needs by tapping into their background knowledge and interests. For example, if a student has difficulty with purely symbolic math but loves cars, a P2C problem about car speeds or fuel efficiency might give them a familiar context to latch onto, thereby improving comprehension. This resonates with the idea in special education that high-interest materials can increase time on task and persistence for students who might otherwise disengage due to frustration.

The structure of P2C lessons also reflects explicit, systematic instruction, which is a hallmark of effective special ed teaching (*Gersten et al., 2009* guidelines, for instance). Lessons clearly state the goal, provide models, and include guided practice before independent practice. The career context adds a narrative that can help memory. Memory research shows that information tied to a story or concrete example is easier to recall than isolated facts, which can be particularly beneficial for students with memory deficits or executive functioning issues.

Differentiated instruction strategies are supported as well. P2C allows for adjusting difficulty, as the teacher can assign simpler Illustration lessons to some students and advanced Application problems to others on the same concept. Everyone might be learning about slope in Algebra, but one student is exploring it through a simple story of walking pace (basic proportional reasoning), while another is tackling a challenging project on business profit margins (involving slope among other things). Both see a connection to the real world but at their own level.

Finally, consider social-emotional effects. Students in special education often struggle with low self-esteem in math. The use of P2C's career lens can help them develop a sense of purpose and see that

math skills could be part of a successful future, potentially combating feelings of "I'm not a math person." One special education teacher using P2C reported that a student with ADHD became the class "expert" on a P2C lesson about graphic design and math, because he was passionate about design and had some prior knowledge. That student's engagement and confidence soared when he saw that his interests were valued and connected to math class. This exemplifies how inclusive practices benefit from honoring student strengths and interests — something P2C makes easier by covering a wide gamut of careers where different students might find their "hook."

7. Increasing Student Engagement & Motivation in Math

How to Implement: P2C Math can be infused into the curriculum specifically to address student engagement issues. Teachers can plan periodic activities that are pure engagement boosters; for example, using a P2C career problem as a "hook" at the start of a unit to spark interest, or as a special event when energy is low (like before a holiday break or after testing). These might not always align perfectly with the day's lesson objective, but they remind students that math is fun, relevant, and interactive.

One concrete strategy is the thematic approach: dedicate certain days as "Math in the Real World" days. For instance, every other Wednesday, instructors might run a short (20-minute) P2C mini-lesson or discussion at the beginning of class about a cool career fact or scenario involving math. Maybe teachers show a Career Spotlight video from P2C and have a class discussion on how that professional uses math, then do one or two example problems from that context as a warm-up. This approach can get students talking and curious. It connects to *Keller's ARCS model* — capturing student *Attention* with a novel situation, emphasizing *Relevance* to something beyond school, which can lead to increased *Confidence* and *Satisfaction* as they see themselves succeeding in that context.

Another approach: incorporate gamification elements with P2C. While P2C itself isn't a gamified system in the way some math apps are, teachers can create games around the problems. For example, turn a P2C Application problem into a team challenge or competition: which team can come up with a solution and presentation for the "client" (the scenario) that's both mathematically sound and creatively presented? Offer badges or small prizes for accomplishments like "most innovative approach" or "best teamwork". Such strategies align with motivation research that finds that recognition and a sense of healthy competition can increase student engagement.

Research Alignment: The engagement challenge in mathematics is well-documented, especially in middle and high school, when many students start to lose interest. Studies like the Gallup Student Poll consistently show a decline in engagement from elementary to high school. Underlying factors include a lack of perceived relevance and autonomy. Strategies to improve engagement often draw on theories like Self-Determination Theory (SDT), which emphasizes the need for autonomy (choice, student voice), competence (appropriate challenge and success), and relatedness (connecting to students' lives and aspirations).

P2C Math provides multiple levers for these. Teachers can give students *choices* (such as Pick which of these three P2C problems interests you most, and do that one", satisfying autonomy), P2C's adaptive practice and scaffolded support helps students experience *competence* by enabling them to eventually solve problems that initially seem complex, and the whole premise of P2C is *relatedness/purpose* (math relates to real life and potential careers).

One specific piece of research, *Hulleman & Harackiewicz (2009)*, showed that having high school students periodically reflect on how coursework is relevant to their lives significantly increased their

RR.03.16.2026.01 | Page 16

interest and performance in science class. P2C automates a similar process by inherently asking students to engage with math in a life context. A similar benefit can be inferred in math class; in fact, internal data from P2C implementations showed a notable increase in student interest in STEM careers after exposure to P2C math lessons. For example, in a pilot program involving several high schools, student surveys indicated that the proportion of students who said they were considering a STEM-related career went up by 38% over the course of the year. This suggests that P2C not only helps students learn math but also can inspire them to envision themselves in future roles that use math — a strong motivator for engagement with the subject.

Another relevant concept is Carol Dweck's Growth Mindset research. When students see that they can solve real-world problems with the math they're learning, it reinforces the idea that ability grows with effort and application. Instead of viewing math as a static set of rules to memorize (which can be discouraging if they don't "get it" immediately), they see it as a tool they are learning to use for interesting tasks. This shift in perspective — from pure performance orientation to mastery and purpose orientation — is linked to greater resilience and willingness to tackle challenges (as per mindset research).

Tips: To maximize engagement with P2C, teachers should be enthusiastic facilitators. The story aspect of the lessons can be played up. Some teachers even decorate their classrooms or bring props related to the scenario. For example, if the math lesson is about space travel, the teacher might wear a NASA t-shirt that day or start class with a short NASA video. Building a little drama or context before diving into numbers can hook students in. Also, consider the power of collaborative learning; letting students work in pairs or teams on P2C problems taps into the social aspect of learning, which can be motivating. Educators often see students get excited and debate different solution strategies, which is an ideal type of cognitive engagement. Finally, it's important to debrief after an activity. Ask students reflective questions like "Did this activity change how you see math or this topic?", "Could you imagine using math in this job?", and "How was this different from what we usually do in math class?" These reflections tie the experience back to their identity as math learners and future professionals, integrating the academic and the personal, which is also a subtle form of social-emotional learning.

8. Advisory Periods and Social-Emotional Learning (SEL)

How to Implement: Many secondary schools have an advisory or homeroom period aimed at mentoring students, building community, and addressing non-academic topics like goal setting, study skills, or social-emotional development. P2C's resources can provide meaningful content for these sessions, connecting students' academic experiences with their future selves.

One practical idea is a monthly "Career & Goal-Setting Workshop" during advisory. In this session, an advisor (teacher or counselor) might guide students through exploring a P2C *Career Profile* (from the P2C Career Database or labor market navigator (if applicable) that accompanies the math curriculum). For example, one month they might look at the career profile of a civil engineer. Students would learn about what civil engineers do, the education required, the median salaries, and specifically note the math skills that civil engineers use. Then, the advisor could facilitate a conversation or reflection on questions like "What skills are you learning now that would help you in a career like this?", "What additional skills or steps would you need if you were interested in this field?", and "What aspects of this job interest you (or not)?"

Another set of advisory topics could revolve around the nine core employability skills that U.S Department of Education outlines in its Employability Skills Framework: applied academic skills, critical

thinking skills, interpersonal skills, personal qualities, resource management skills, information use, communication skills, systems thinking skills, and technology use skills. These are also skills that Pathway2Careers is intentionally designed to support, with features and activities that help students build and practice them in real-world contexts. Students could journal or discuss how working through a complex math project is similar to tackling a real-life challenge and what personal strategies (like self-management, seeking help, organization) they used. This helps them practice self-awareness and self-management, two core competencies in the CASEL SEL framework.

For younger students (middle school), P2C's engaging contexts can be used to illustrate concepts like growth mindset ("Remember that welding lesson we did? None of us knew how to start, but you figured it out step by step, which shows you can do hard things by persisting."). For older students, P2C's realistic scenarios can prompt discussions about responsible decision-making; for example, a lesson about credit card interest could launch a conversation on financial responsibility and planning.

Research Alignment: The integration of career exploration with social-emotional learning is supported by the idea that helping students develop a sense of purpose can boost motivation and resilience. The SEL competency of *self-awareness* includes identifying one's interests and values; exploring careers in advisory helps students articulate what they care about and how school connects to those interests. This is backed by research in motivation science. For example, *Yeager et al. (2014)* found that when students link school to their future goals (a "purpose for learning" intervention), they show greater perseverance on tedious tasks and improved academic outcomes.

Additionally, goal-setting exercises have long been a staple of advisory programs and have been shown to increase student locus of control and academic achievement, especially when goals are connected to concrete steps and when students revisit and reflect on them regularly. P2C can supply the concrete context. Instead of vague goals, like "get good grades to have a good future," a student might set a goal like "I want to become a nurse, which requires college-level math. This semester I will improve my algebra skills by 100 Quantile points so I'm on track for that." This is more tangible and inspiring.

From the SEL research perspective, *Durlak et al. (2011)* conducted a meta-analysis of school-based SEL programs and found that programs integrating SEL into regular school activities (not just stand-alone programs) resulted in improved student attitudes, behavior, and an 11-percentile-point gain in academic performance on average. By leveraging part of the school day (advisory) to tie together academics, career, and personal growth, schools can create a more cohesive support system for students. P2C's role in this is providing the material and structure for those conversations without requiring counselors or teachers to create them from scratch.

Also, using career exploration tools in advisory is akin to the model of comprehensive counseling programs (like the ASCA National Model), which advocate for regular career and college readiness activities for all students. P2C's career database and math connection adds an extra layer: students not only identify careers of interest, they also talk about how their current learning is relevant to those careers, which reinforces the importance of their schoolwork.

Implementation Tip: Engage students in a portfolio or "future plan" project. Over the course of the year, each student can maintain a simple journal or digital portfolio of career-connected reflections, perhaps initiated by P2C lessons: "What careers did I find interesting? What skills do they require? What math did I learn that relates to them? What are steps I can take now (like course choices or skill practice) to move toward my goals?" This turns sporadic advisory activities into a coherent narrative for each student, culminating in, say, a personal education and career plan by year's end. Research by

Savitz-Romer & Bouffard (2012) on college readiness supports the idea that when students have a clear vision of their future and understand how to achieve it, they are more likely to persist through challenges in high school.

9. Data-Driven Instruction and Continuous Improvement

How to Implement: P2C Math's rich assessment data should be used to guide instructional decisions at the classroom and school level. At the classroom level, teachers should make it a routine to examine results from P2C's quizzes and tests. For example, after a P2C lesson, the teacher checks the dashboard: if 80% of the class missed question 5 (say, a particular application of the Pythagorean Theorem), the teacher knows to review that concept the next day. Conversely, if a subset of students is acing everything quickly, the teacher might decide they're ready for enrichment or more challenging problems, as the data indicates they need greater challenge (this ties back into differentiation and acceleration).

On a broader level, schools can use P2C's Beginning-of-Year (BOY), Middle-of-Year (MOY), and End-of-Year (EOY) benchmark assessments to measure growth. In professional learning community (PLC) meetings, math teachers and instructional coaches can analyze these results to identify trends. For example, they might say, "It looks like across the board, our students struggled with interpreting linear functions in context. Maybe we need to adjust how we teach that or spend more time on it; P2C said it's used a lot in the Marketing Analyst and Urban Planner lessons, did we cover those thoroughly?" The data can highlight strengths too — perhaps showing that students did exceptionally well in statistics standards after a particular set of P2C projects, reinforcing the effectiveness of those programs.

Another component is using data to inform student grouping and personalization. Within P2C, the adaptive engine can suggest what each student is ready to learn next. Teachers can use this to form flexible groups; students who have similar learning gaps can work together on a P2C Bridge lesson addressing that gap, while other students move ahead. Over a quarter or semester, student groupings might change as some catch up and others show new needs — exactly what MTSS envisions with fluid, needs-based grouping.

Research Alignment: The practice of using frequent assessment to drive instruction is supported by decades of research on formative assessment and data-driven instruction (DDI). Black and Wiliam's seminal (1998) review on formative assessment found that when teachers regularly gathered evidence of learning and modified their teaching accordingly, student achievement improved significantly – often with effect sizes ranging from 0.4 to 0.7 (considered substantial). The key is that feedback and adjustments must be timely and targeted.

P2C's immediate feedback on assignments (students and teachers both get results right away) enables this timely adjustment. For example, a teacher using P2C can know *today* whether the class understood the lesson and can intervene *tomorrow*, rather than waiting for a chapter test weeks later when it's too late.

In the broader DDI cycle (assess -> analyze -> act), P2C provides the assess part (benchmarks, quizzes) and the analyze (reports) in an easily digestible form (e.g., which standards are most problematic). It's then up to the teacher to act – but P2C even assists with that by linking each standard to specific lessons or practice items. So if a report shows "Many students struggled with standard 7.EE.B.4 (solving equations)", a teacher can quickly find P2C content tagged to that standard and reteach or assign extra practice.

Bambrick-Santoyo (2010) emphasizes in his DDI framework the importance of action planning after each assessment: teachers should plan re-teaching for topics where less than, say, 80% of students mastered the objective. P2C can simplify that by providing ready-made re-teaching lessons (Bridge or review lessons) that the teacher can pull out.

From an evaluation perspective, having concrete data is also valuable for program monitoring. If a school is piloting P2C, they might use the benchmark growth data to evaluate success. For example, an internal analysis by P2C (in partnership with New Mexico's FIPSE grant project) found that schools using P2C saw significantly higher growth on the Quantile scale over a year than similar schools not using P2C. That kind of data can justify the program's continuation or expansion.

It's also aligned with PLC best practices where teachers collaboratively analyze student work and outcomes to improve teaching. Using common P2C assessments across classes or schools allows educators to have a shared language and set of data to discuss. They might discover, for instance, that one teacher's class excelled in a topic whereas another's struggled; by digging into how they respectively taught it (perhaps one used the P2C career context more fully), teachers learn from each other and refine their practices.

Finally, using data can personalize student goal setting. Teachers can conference with students using their P2C reports: "Look, you've grown 50 points in your Quantile score; that's great progress. Here are some careers that are now within your reach at this level. Let's set a goal for what to work on next." This sort of practice ties together SEL (goal-setting, self-efficacy) with academics, and was noted as a promising approach in a case study by the University of Louisville's CRIMSTED evaluation of P2C Math. Students became more invested when they saw a direct measure of their growth and its implications.

Conclusion

The Pathway2Careers Math program offers a versatile platform that can significantly enhance mathematics education by making it more relevant, engaging, and effective across a variety of settings. The executive summary table provides a quick reference for how often and in what manner to use P2C Math in scenarios like core instruction, interventions, enrichment, and others. Key themes across these recommendations include maintaining a balance of rigor and real-world relevance, using data to inform decisions, and ensuring teachers are well-supported through professional development.

Core Instruction: When P2C Math is used as the main curriculum, daily integration of career contexts can transform students' perception of math from abstract to applicable. Research indicates that technology-based math curricula yield the best results when used with consistency and supported by teacher training (Cheung & Slavin, 2013). By following P2C's structure and fully utilizing its resources, teachers can cover required standards while also improving student outcomes and interest.

Supplemental & Enrichment Use: For schools not replacing their entire curriculum, P2C Math still adds value through periodic enrichment lessons and projects. These provide students with meaningful contexts to apply what they learn, reinforcing knowledge, and boosting engagement. Studies show that thoughtfully implemented supplemental programs can raise achievement (Pellegrini et al., 2021) and that linking learning to personal interests increases motivation (Hulleman & Harackiewicz, 2009).

Intervention: To help students who are behind, P2C's Math Bridge and scaffolded lessons offer a proven method for remediation that doesn't bore or stigmatize learners. The combination of systematic skill practice and high-interest contexts aligns with effective RTI strategies and has been associated with significant learning

gains. Small-group and individualized interventions using P2C can be powerful, especially when driven by data and delivered with fidelity.

Advanced Learners: P2C Math also serves advanced students by providing depth and complexity. Enrichment projects from P2C challenge students to think like professionals, addressing the need for higher-order thinking tasks for gifted learners. Research (Kim, 2016) supports that such enrichment can yield substantial benefits. By compacting curriculum and substituting advanced P2C tasks, teachers can keep high-achievers engaged and growing.

Career Integration: Making mathematics a part of career and technical education experiences – or simply illustrating the career relevance of math – benefits all students. It brings to life the notion that math is a tool for solving real problems. The Math-in-CTE study (Stone et al., 2006) and Linked Learning outcomes have shown improved achievement and engagement when this integration is done right. P2C Math provides a practical avenue to do so, whether or not a school has formal CTE programs, by consistently highlighting how math skills translate into real work.

Inclusion & Equity: By design, P2C Math aims to engage a wide range of learners; it shows diverse careers and individuals, catering to different cultural and personal interests (from agriculture to technology to public service). This can be particularly empowering for students who historically haven't seen themselves in certain fields. For example, a student from a rural background might connect with an agriculture or construction context, whereas another might be inspired by a computer science scenario. This breadth can make math more inclusive and show every student that math is for *them*. Coupled with the UDL features and differentiation options, P2C is a tool for equity. As one teacher put it during a program evaluation, *"P2C Math gives every student a chance to find something in math class they excel at or are interested in. It levels the playing field in a way I haven't seen before."*

Student Motivation: Across virtually all use cases, an underlying theme is that P2C Math can increase motivation. It addresses the perennial student questions "Why do I need to learn this?" and "When will I use this?", not with a theoretical answer but with concrete examples. This sense of purpose has been linked in research to greater engagement, better behavior, and even improved performance (Yeager et al., 2014). This is evident in P2C usage as well: classrooms that implemented P2C reported higher student attendance on P2C lesson days and anecdotal reductions in off-task behavior, as students were drawn into debates about how to solve the problems. When motivation goes up, so does time on task, and ultimately achievement.

Continuous Improvement: The combination of engaging content and robust data means that teachers can become more effective instructors. P2C's detailed analytics provide an "x-ray" of student understanding, allowing teachers to be more responsive. When teachers gather in PLCs to discuss P2C data and strategies, they're engaging in evidence-based improvement of their practice — a habit of effective schools (DuFour, 2004).

Professional Capacity: By investing in teacher training and coaching, schools ensure that their usage of P2C Math isn't just an off-the-shelf product, but a fully integrated part of their math instruction culture. This aligns with the finding that strong implementation and teacher buy-in are often what make or break a program's success (Knight, 2007). In fact, the University of Louisville CRIMSTED evaluation of P2C highlighted that schools with principal support and regular teacher collaboration around P2C saw the greatest student gains.

In conclusion, Pathway2Careers Math is more than a set of lessons; it is an approach that can infuse meaning into math education. By following the guidelines for each use case, educators can tailor P2C's use to meet their specific goals, whether that's raising test scores, closing gaps, igniting a passion for STEM, or all of the above.

The evidence is clear that when students understand the relevance of what they are learning, receive support that meets them at their level, and are challenged to think critically, they achieve more and are better prepared for the future. P2C Math is a vehicle to deliver those conditions in the math classroom. With thoughtful implementation, P2C Math can help create a generation of students who not only master mathematics, but also appreciate its power and possibilities in their lives and careers.

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6. **American Institutes for Research (2019).** *Early College, Continued Success: Longer-Term Impact of Early College High Schools.* Washington, DC: AIR. – *Follow-up study on ECHS showing that benefits extend beyond high school, including higher rates of college degree attainment for ECHS participants up to six*

years post-high school. Also discussed cost-benefit aspects, noting the long-term economic advantage of the early college model for students.

7. **Kim, M. (2016).** A meta-analysis of the effects of enrichment programs on gifted students. *Gifted Child Quarterly, 60*(2), 102–116. – *Synthesis of studies on academic and socioemotional outcomes of various enrichment interventions for gifted/talented learners. Found that well-structured enrichment programs yield large positive effects on gifted students' academic achievement (overall effect sizes approaching 1.0 or higher) and moderate positive effects on their social-emotional development. Highlights the importance of providing depth, challenge, and interest-based learning for advanced students.*

8. **Hulleman, C. S., & Harackiewicz, J. M. (2009).** Promoting interest and performance in high school science classes. *Science, 326(5958),* 1410–1412. – *Field experiment where high school science students wrote about the relevance of course material to their lives. The intervention significantly increased students' interest in science and improved course grades, especially for those with low success expectations. Demonstrates the power of connecting academic content to students' personal interests and goals.*

9. **University of Louisville CRIMSTED (2019).** *External Evaluation of Pathway2Careers Math Program.* (Unpublished evaluation report). – *An external evaluation conducted by the Center for Research in Math and STEM Teaching (CRIMSTED) at UofL, examining the implementation of P2C Math in selected schools. Reported positive correlations between high-fidelity implementation of P2C Math and student gains in math performance and engagement. Emphasized the role of leadership support and teacher collaboration in successful program outcomes.*

10. **NS4ed & New Mexico Public Education Dept. (2018).** *Career-Connected Math Learning (Pathway2Careers) – FIPSE Grant Outcome Report.* (Internal data summary). – *Report summarizing outcomes from a federally funded demonstration project in New Mexico using P2C Math. Noted improvements such as increased student interest in STEM careers (student survey results indicating a 38% rise) and significant student growth on Quantile measures in participating schools compared to state averages. Provided insights for scaling career-connected math initiatives statewide.*

11. **Pathway2Careers (NS4ed) Internal Data (2020).** *Student Engagement and Performance Metrics.* – *Internal analysis of usage data, student feedback, and assessment results from schools implementing P2C Math. Highlighted case studies where specific P2C lessons or strategies led to notable improvements (e.g., a dramatic increase in class participation during career-focused projects, or substantial score gains after targeted Bridge lesson interventions). Used to inform ongoing refinements to the curriculum and teacher support materials.*

Educational Frameworks and Models:

- **Technological Pedagogical Content Knowledge (TPACK)** – *Framework by Mishra & Koehler (2006) emphasizing the integrated knowledge teachers need to effectively teach with technology (content, pedagogy, and technology knowledge all intersect). P2C Math's design and PD encourage teachers to develop TPACK by blending math content, career-focused pedagogy, and an online platform.*
- **SAMR Model (Substitution, Augmentation, Modification, Redefinition)** – *A model by Dr. Ruben Puentedura (c. 2010) describing levels of technology integration. P2C Math enables "Modification" and*

"Redefinition" by allowing tasks that transform learning (e.g., real-time data analysis, virtual career scenarios) beyond what traditional methods could achieve.

- **Blended Learning (Rotation Model)** – *An instructional strategy that combines online digital media with traditional classroom methods. P2C Math supports station rotations or flipped classroom approaches by providing online content that students can engage with independently, freeing teachers for small-group instruction.*

- **Response to Intervention (RTI) / Multi-Tiered System of Supports (MTSS)** – *A framework for providing targeted support to struggling students. P2C Math aligns with RTI/MTSS by offering Tier 1 whole-class instruction with embedded supports, Tier 2 small-group intervention lessons (Math Bridge for common gaps), and Tier 3 intensive, individualized practice. Frequent progress monitoring is facilitated through P2C's assessments.*

- **Project-Based Learning (PBL)** – *An approach where students learn by actively engaging in real-world and personally meaningful projects. P2C's Application lessons and extended career projects naturally fit the PBL model, as students often must solve complex, authentic problems and sometimes create presentations or reports of their findings.*

- **Bloom's Taxonomy** – *A classification of different objectives and skills that educators set for students (Bloom et al., 1956; revised by Anderson & Krathwohl, 2001). P2C Math promotes higher-order thinking (analysis, evaluation, creation) by asking students to tackle open-ended problems, analyze data, make decisions, and justify solutions in a career context.*

- **Math-in-CTE Model** – *An instructional approach from the NRCCTE that involves enhancing math instruction in career/tech classes by explicitly teaching the math concepts embedded in CTE curricula. The success of this model (Stone et al., 2006) informs P2C's strategy of integrating career context into math class, effectively the "reverse" application of the same idea of contextualized learning.*

- **Linked Learning Approach** – *A high school reform model that integrates rigorous academics, career-technical education, work-based learning, and comprehensive support services. P2C Math supports Linked Learning by providing academically rigorous math content delivered through career and real-world lenses, helping to connect academic learning with industry themes.*

- **College and Career Readiness (CCR) Frameworks** – *Standards and guidelines (such as those by David Conley, or state-defined CCR standards) that outline the skills and knowledge students need for success after high school. P2C Math addresses key CCR elements: problem-solving, critical thinking, quantitative reasoning, and the ability to apply academic skills in real-world contexts.*

- **Universal Design for Learning (UDL)** – *An educational framework from CAST (e.g., Meyer & Rose, 2002; CAST UDL Guidelines, 2018) that calls for flexible curricular materials and methods to accommodate all learners. P2C Math embodies UDL by offering content in multiple formats (text, audio, visual, interactive) and multiple means of engagement (career stories, real-world problems, gamified elements) to reach diverse learners.*

- **Differentiated Instruction** – *An approach (championed by Carol Ann Tomlinson, 1999) where teachers adapt content, process, and product based on student readiness, interest, and learning profile. P2C Math facilitates differentiation by providing varying levels of lesson difficulty (Exploration vs. Application vs. Bridge), as well as optional challenges and supports that teachers can use to tailor learning for each student.*

- **ARCS Model of Motivation** – *John Keller's (1987) model focusing on motivating learners through Attention, Relevance, Confidence, Satisfaction. P2C Math captures Attention with real-world hooks, establishes Relevance by connecting math to careers, builds Confidence through scaffolded learning and feedback, and yields Satisfaction as students successfully solve meaningful problems.*

- **Self-Determination Theory (SDT)** – *A theory of motivation (Deci & Ryan, 2000) positing that autonomy, competence, and relatedness are key to intrinsic motivation. P2C Math addresses these by giving students some autonomy (e.g., choosing different problem paths or roles in projects), developing competence (through supported practice and mastery of challenges), and fostering relatedness (connecting learning to students' personal goals and potential societal contributions).*

- **CASEL's SEL Framework** – *The Collaborative for Academic, Social, and Emotional Learning (CASEL) identifies five core competencies: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. P2C Math can integrate with SEL by prompting self-reflection (e.g., students recognize their interests/strengths in certain career tasks), requiring responsible decision-making in problem contexts, and encouraging collaboration (relationship skills) during group projects.*

- **Data-Driven Instruction (DDI) Cycle** – *An approach to teaching where data from assessments are regularly analyzed to inform and improve instruction (Bambrick-Santoyo, 2010). P2C Math aligns with DDI by providing frequent checks for understanding, robust data reports, and the ability to quickly assign targeted interventions based on that data, enabling a responsive teaching cycle.*

- **Professional Learning Communities (PLCs)** – *A model of ongoing, collaborative teacher development (DuFour et al., 2004) where educators work in teams to focus on student learning data and effective practices. Implementing P2C Math provides a common platform and set of data that PLC teams can explore together to share strategies, plan re-teaching, and celebrate successes.*

- **Instructional Coaching Models** – *Approaches to teacher professional development where experienced coaches support teachers in implementing new practices (e.g., Knight's partnership coaching model, 2007). P2C Math's rollout can be enhanced by coaching that helps teachers integrate technology and contextual learning strategies, providing observation and feedback cycles to refine practice.*

- **Understanding by Design (UbD)** – *Curricular planning framework by Wiggins & McTighe (2005) that starts with desired end goals and designs learning experiences backward from them. P2C Math supports UbD by providing real-world end goals (the career applications) and structuring lessons to build student understanding toward those performance tasks, ensuring that daily learning is aligned with ultimate transfer goals.*

Each of these frameworks and models has informed the P2C Math program design or its recommended use in some way. By aligning P2C Math implementation with these established principles, educators can ensure they are using the program not only innovatively, but also effectively and in harmony with what research shows works best for student learning.