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Project E-Ignite

Anne K Horak, PhD & Beverly D. Shaklee, EdD
GEORGE MASON UNIVERSITY

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Project ExCEL (Experiences Cultivating Exceptional Learning) - Ignite (E-Ignite) is a program devoted to the discovery of underrepresented populations of Gifted and Talented (GT) middle school students. It has a significant role to play in changing the ecological culture of schools and the understandings of the teachers and administrators who serve in that school. Understanding the broader implications or theory of change (TOC) that undergirds E-Ignite is important.

At the Brown Center on Education Policy, researchers (Hansen & Quintero) examined the issue of teacher diversity in America (2019). The demographics of teacher representation are still primarily white (80.1%) and female (76.6%). While there have been some gains in some systems to attract and retain a diverse teaching pool, Hansen and Quintero write "the public teaching profession is growing disproportionally white over time." Considering NCES data last reported in 2015-16, approximately 20% of teachers were non-white while over 51% of all children are non-white, the diversity gap between teachers and students continues to grow. Further, there is a growing body of research on the impact having only white teachers on non-white students (Figlio, 2017). There are indications that non-white students who have at least one non-white teacher have higher test scores, higher aspirations, better attendance, and are less likely to be suspended or to drop-out (Figlio, 2017).

Clearly, no single project can change the nature and diversity of the teaching force in America today. Considering this, we must broaden the perspective and ability of the current teaching force to identify the gifts and talents among our children who are non-white, disabled, or live in poverty. Through the systematic, deliberative, and focused research model we have created, E-Ignite is a vehicle to promote long term change in beliefs, pedagogy, and in the lives of students.

Response to Priorities

The primary aim of E-Ignite is to meet the Jacob K. Javits funding program *Priority 1- Identification of, and Provision of Services to, Gifted and Talented Students* by serving underrepresented populations including Black, Latinx, and English Learners, as well as economically disadvantaged and children with disabilities through its ExCEL Problem-Based Learning Initiative Model (ExCEL Model). Additionally, E-Ignite is designed to meet the Jacob K. Javits funding program *Priority 3-to promote effective instruction in classrooms in high-poverty schools* with an innovative curriculum-aligned professional learning program for teachers. The secondary aim of E-Ignite is to meet the Jacob K. Javits funding program *Priority 2- promoting Science, Technology, Engineering, or Mathematics (STEM) Education, with an emphasis on Computer Science* using nationally reviewed award-winning Problem-Based Learning (PBL) curriculum.

Priority 1: Identification of, and Provision of Services to, Gifted and Talented Students

E-Ignite will meet Priority 1 with implementation of the ExCEL Problem-Based Learning Initiative Program Model (ExCEL Model). The ExCEL Model uses PBL curriculum as a dynamic performance assessment for universal screening. Research results show the ExCEL Model increases equitable representation of underserved students in GT classes, increases student engagement, and increases student achievement, specifically for students who are Black, Latinx, and English Learners, those who are economically disadvantaged and children with disabilities. These results are discussed further in the *exceptional approach* section. The performance measures for E-Ignite include the number and percentage of students newly identified and served by the program and are discussed in the *Quality of the Project Design* section.

Priority 3: Promoting Effective Instruction in Classrooms and *High-Poverty* Schools

E-Ignite will meet Priority 3 by providing deep learning of PBL components by engaging teachers in recursive learning-teaching-learning sessions characterized by modeling, collaboration, and video analysis for reflective practice. The professional learning component of this project is aligned to existing PBL curriculum and designed to (a) increase knowledge of the pedagogy of PBL, (b) impact effective PBL instructional practice, (c) transform beliefs about students from underrepresented populations and (d) change the overall ecosystem of a school. The professional learning program and these outcomes are described in the *exceptional approach section*. The performance measures for E-Ignite includes the number of teachers and other educators who will receive professional learning services and will be discussed in the *Quality of the Project Design section.*

Priority 2: Promoting STEM Education with a Focus on Computer Science

E-Ignite will meet Priority 2 with a focus on implementation of PBL STEM curriculum. The E-Ignite PBL curriculum is data rich and embedded with computational thinking, interdisciplinary problem-solving, creative communication, and global collaboration across disciplines to equip students with skills and abilities necessary to apply computation in our digital world. Curriculum will focus on topics from STEM disciplines such as combating the global clean water crises and cleaning up the oceans. Existing ExCEL Model curriculum demonstrates positive increases in student achievement and these results are discussed in the *exceptional approach* section. The performance measures for E-Ignite includes data on State assessments in English Language Arts (ELA), science, and mathematics and will be discussed in the *Quality of the Project Design* section.

(A) Quality of Project Design

E-Ignite will use PBL STEM curriculum in middle school ELA classes as a universal screening that embeds a dynamic performance assessment to identify underrepresented populations. To accomplish this, a curriculum-aligned professional learning program that engages teachers in deep recursive learning-teaching-learning sessions will be implemented.

(1) The goals, objectives, and outcomes are clearly specified and measurable

Priority 1 Goal: *Identify* and *serve* Gifted and Talented students from underrepresented populations including Black, Latinx, and English Learners, as well as those who are economically disadvantaged and children with disabilities.

- Objective 1.1: Expand the use of PBL curriculum as a universal screening that embeds a dynamic performance assessment in 6th grade in 9 middle schools in 3 school districts in 3 states.
  - *Performance Measure Outcome 1.1.a:* Refine teacher observations of student performance to identify gifted behaviors as a pattern over time while implementing PBL curriculum in repeated cycles.
  - *Performance Measure Outcome 1.1.c:* Decrease the gap from the baseline year to meet or exceed the Ford's (2014) Equity Index (EI) for students recommended and scheduled for 7th grade GT classes each year.
- Objective 1.2: Implement PBL curriculum to serve GT students 2 or more times per year in 7th and 8th grade in 9 middle schools in 3 school districts in 3 states.
  - *Performance Measure Outcome 1.2.a:* Improve demonstration of student achievement in content knowledge on annual state tests and benchmarked assessments in ELA, mathematics, and science based on being PBL-identified.

- *Performance Measure Outcome 1.2.b:* Improve demonstration of student cognitive skills on embedded measures based on being PBL-identified.
- *Performance Measure Outcome 1.2.c:* Improve the number of 7th and 8th grade students earning an annual unweighted GPA of 2.5 or higher based on being PBL-identified.
- *Performance Measure Outcome 1.2.d:* Decrease the gap from the baseline year to meet or exceed the Ford's (2014) Equity Index (EI) for students annually scheduled for advanced mathematics, science, and/or English courses in high school.
- *Performance Measure Outcome 1.2.e:* Improve demonstration of student motivation per unit from the baseline to post PBL implementation on the School Engagement Measure (SEM) combined with the Agentic Engagement Scales (AES).
- *Performance Measure Outcome 1.2.f:* Improve demonstration of student engagement per unit from the baseline to post PBL implementation on the Agentic Engagement Scales (AES) and through semi-structured interviews.

Priority 3 Goal: Promote effective instruction in classrooms in high-poverty schools.

- Objective 3.1: Plan the ExCEL Model curriculum-aligned professional learning program to meet the needs of each LEA, each year of the project expanding to 9 middle schools in 3 school districts in 3 states. (*Plan)*
  - *Performance Measure Outcome 3.1.a:* Revise and plan the professional learning sessions annually and before and during delivery for rapid response based on the evidence of goals for each LEA, school, and individual teacher growth plans.
  - *Performance Measure Outcome 3.1.b:* Revise and plan the delivery of the professional learning program annually based on evidence of students and teachers.

- *Performance Measure Outcome 3.1.c:* Update the professional learning program annually to reflect current trends for adult professional learning.

❖ Objective 3.2: Deliver the ExCEL Model curriculum-aligned professional learning program in each LEA, each year, expanding to 9 middle schools in 3 school districts in 3 states. (*Act*)

- *Performance Measure Outcome 3.2.a:* Evaluate growth of teacher knowledge and preparation to engage in reflective coaching structures.
- *Performance Measure Outcome 3.2.b:* Evaluate growth of teacher knowledge and preparation to implement PBL instruction.
- *Performance Measure Outcome 3.2.c:* Evaluate growth of teacher knowledge and preparation to observe student performances of gifted behaviors.
- *Performance Measure Outcome 3.2.d:* Evaluate growth of teacher knowledge and preparation to use PBL curriculum as a universal screening that embeds a student performance assessment.
- *Performance Measure Outcome 3.2.e:* Expand teacher perceptions of students who are from underrepresented groups.

❖ Objective 3.3: Check effectiveness of PBL instruction by implementing the continuous improvement cycle in 9 middle schools in 3 school districts in 3 states. (*Check)*

- *Performance Measure Outcome 3.3.a:* Expand teacher demonstration of implementation practices to meet or exceed individual goals for growth.
- *Performance Measure Outcome 3.3.b:* Cultivate teacher engagement in professional learning sessions that include reflective coaching structures.

❖ Objective 3.4: Expand delivery of the ExCEL Model curriculum-aligned professional

learning program to 313 teachers of ELA, Science, Math, ESOL, and SPED for 3 grades in 9 schools in 3 districts in 3 states. (*Do*)

- *Performance Measure Outcome 3.4.a:* Increase the number of grade levels that receive the introduction professional learning program annually.
- *Performance Measure Outcome 3.4.b:* Increase the number of grade levels that receive the advanced professional learning program annually.
- *Performance Measure Outcome 3.4.c:* Maintain the number of teachers trained in each grade level annually by providing introduction professional learning sessions to new teachers due to turnover.

Priority 2 Goal: To *promote Science, Technology, Engineering, or Mathematics (STEM) Education, with emphasis on Computer Science* with nationally reviewed award-winning Problem-Based Learning (PBL) curriculum.

- *Objective 2.1:* Project experts develop, distribute, and disseminate 1 new open-license PBL unit and 2 expanded units with a computer science and STEM focus and alignment to rigorous criteria each year.
  - *Performance Measure Outcome 2.1.a:* Collaborate with subject matter experts in gifted, STEM, and computer science twice a year to align potential topics and ideas to current trends, practices, standards, and objectives in those fields.
  - *Performance Measure Outcome 2.1.b:* Draft, pilot, and revise 1 newly developed PBL unit using feedback from district instructional leaders, building administrators, and teachers on topics and ideas that are a) compelling to students, b) aligned with local, state, and national standards, and c) viable to implement given potential local contextual constraints each year by the curriculum team.

- *Performance Measure Outcome 2.1.c:* Engage teachers in the process of drafting, piloting, and revising 1 newly developed PBL curriculum each year.
- *Performance Measure Outcome 2.1.d:* Engage subject matter experts in gifted, STEM, and computer science to externally review newly developed PBL units annually based on rigorous criteria and peer review from NAGC and Next Generation Science Standards (NGSS) on the quality and likely effectiveness of the curriculum.
- *Performance Measure Outcome 2.1.e:* Openly license and actively disseminate and distribute newly developed PBL curriculum annually.

(2) Design of the project addresses the needs of the target population

The design addresses the needs of the target population by providing an alternative pathway to traditional procedures for identification and access to GT classes. This pathway capitalizes on the benefits of promising practices including, *universal screening, dynamic performance assessment,* and *engaging inquiry-based learning with STEM PBL curriculum,* that leverage a systemic approach to work in favor of students for whom traditional identification procedures have typically failed. This pathway can work as a 'value added' approach to traditional identification processes providing multiple criteria, multiple pathways approach that expands the integrity of traditional approaches and reflects a growing trend in studies of STEM education (National Science Board, 2010).

Universal Screening. E-Ignite employs universal screening as teachers implement PBL with all students in the ELA classroom. **Card and Giuliano (2015) demonstrated that universal screening increases identification 180% overall, increases identification 130% for Hispanic students and increases identification 80% for Black students**.

Dynamic Performance Assessment. E-Ignite grounds the universal screening by embedding dynamic curricular performance assessment in PBL implementation using the model

created by Shaklee (1993) for observational assessment of culturally, linguistically diverse, and economically disadvantaged students. Shaklee and Viechnicki (1995) described four categories of gifted learners: Exceptional Learner, Exceptional User, Exceptional Generator, and Exceptional Motivation (Appendix D). Using PBL as a dynamic means of engaging students in challenging curriculum and meaningful learning, provides teachers with a long-term opportunity for observation of potential.

Engaging Students with PBL. E-Ignite draws on the successful track record of producing award winning curriculum to create and modify STEM PBL curriculum e.g., technology's role in closing the gap in access to education or how technology can solve everyday problems for people with disabilities. The E-Ignite PBL curriculum is aligned with NAGC Program Standard 3 for Curriculum and Planning (NAGC, 2010). PBL provides an ideal platform for the target population to demonstrate multiple modes of learning which can be observed as a part of the dynamic performance assessment. Initial findings from Project ExCEL reveal that within the PBL environment, EL students were identified as demonstrating increased leadership, greater motivation, and a higher quality of work.

(3) Exceptional approach

E-Ignite is an exceptional approach because it evolved from and builds on previously funded Javits projects including P-BLISS (Gallagher, 1999) and Project Insights (Gallagher & Gallagher, 2013), as well as Project ExCEL (Shaklee & Horak, 2014). E-Ignite seeks to build on the growing demand and high level of success of the ExCEL Model by scaling the model to districts remote from the university. E-Ignite brings together a universal screening with inquiry based PBL curriculum and curriculum-aligned professional learning. Thus, effectively leveraging promising practices from previously funded Javits research as well as future

directions in professional learning to provide a viable, cost-effective solution addressing an urgent and growing need.

Overview of the Implementation Plan

E-Ignite takes place in a series of well-defined sequences (*Find* and *Serve*). During the *Find* sequence*,* a universal screening takes place in 6th grade in middle school ELA classes. ELA classes were selected to ensure that all students can be reached and because of the versatility of ELA non-fiction standards to address interdisciplinary STEM topics, e.g., food scarcity in urban settings or protecting endangered species. ELA teachers with the support of their interdisciplinary teamed science, mathematics, ESOL and SPED teachers, implement two PBL units and select potentially gifted students based on their performance. To examine the effects over time, implementation continues in 7th and 8th grade with the *Serve* sequence of the project. Identified students are scheduled in GT classes for 7th grade and ELA teachers with the support of their teamed science, mathematics, ESOL and SPED teachers, implement up to three PBL units. Identified students served in 7th grade then rise to GT classes in 8th grade and teachers implement up to three PBL units.

Participating Districts. E-Ignite extends and builds on ExCEL with school districts that have different programs than those previously studied and that are all remote from the university. Miami-Dade County Public Schools (MDCPS) in Florida, Virginia Beach City Public Schools (VBCPS) in Virginia, and Charleston County Public Schools (CCSD) in South Carolina will participate. Letters of support are included in Appendix E. These districts were selected based on demographics, interest in the program, and existing infrastructure to facilitate an efficient expansion of the model in a remote context. Nine middle schools, three from each LEA will participate. Schools will be selected using a school data profile, generated with the help of

district leadership. As shown in Table 1, the demographic data of our districts reflects the target population. Implementing in remote districts provides opportunity to implement successful strategies from Project ExCEL and provide insights into bringing programs like this to large scale implementation successfully.

Table 1
Student Demographic Data for Participating Districts

	English Learners (EL)	Latinx	Black	Free / Reduced Price Meals (FRM)
Charleston County School District	9%	10%	38%	
Miami-Dade County Public Schools	19%	71%	21%	66%
Virginia Beach City Public Schools	3%	11%	24%	38%

Implementation will take place in all 9 schools in 6th grade in the first year. In the second year, the project will be scaled-up by bringing on 7th grade. Implementation will be brought to full scale in the third year and thereafter with 8th grade coming on board. Figure 1 illustrates the sequence of project activities as they will unfold from the district perspective. A detailed description of the activities and milestones for accomplishing the implementation plan is found in the *Quality of the Management Plan* section and *Appendix D*.

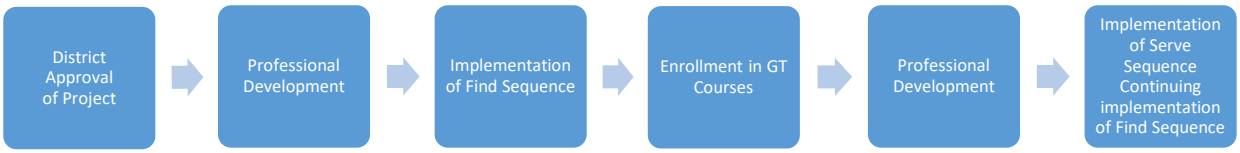

Figure 1. Sequence of project activities from the district perspective.

Outcomes Supporting the Project Design as an Exceptional Approach

Ford (2014) uses a formula called the Equity Index (EI) to determine the minimum percentage of representation that could mathematically be considered due to chance. The EI is calculated with the Relative Differences in Composition Index (RDCI) or percentage of underrepresentation for a given group. Representation percentages falling below the EI show that

these students face systemic institutional hurdles likely due to policies, practices and procedures that limit their ability to access GT classes. Along with this, recent data from the National Center for Research on Gifted Education (NCRGE) indicate that an underrepresented minority language learner on free and reduced meals has a predicted probability of less than 1% chance of being identified for GT classes (NCRGE, 2016). Table 2 shows the severity of the disparities in identification at the national level.

Table 2
National Identification Data for Under-Represented Populations – School Year 2013-2015

	Percentage	**Gifted**	**RDCI**	**EI**
Black	15.9	8.8	45	12
Latinx	23.6	16.9	28	19
FRM	*	-	-	-
EL	9.6	2.7	72	7

*National numbers not available

In all cases, the percentage of ExCEL Model PBL-identified students out-performed the percentages of students found using traditional identification. For FRM and English Learners, the percentage of Project ExCEL PBL-identified students narrowed the gap on Ford's (2014) EI and outperformed the traditional identification process by a large margin.

Table 3
ExCEL Model Identification Data

	Overall Demographics	**Equity Index**	**Traditionally Identified**	**ExCEL Model Identified**
Black	15%	12%	12%	17%
Latinx	27%	22%	18%	19%
English Learners	11%	9%	0%	5%
FRM	47%	38%	18%	29%

Results from Project ExCEL show an increase in achievement for all students. Pre- and

Post- content measures (n=1135) demonstrated a statistically significant difference in the pre-test (M=8.82, SD=3.66) and post-test (M=11.80, SD=3.31); (t(1134)=25.72, p<.001, d=1.080). The effect size (d=1080) suggests large practical significance. Analysis of student interviews indicates that students found PBL more engaging, one student noted "It's not just looking at the board. We got to be in the story…it was better than just taking notes."

Historical research (Kagan, 1992) findings maintain that teacher beliefs are persistent, yet findings from interview data after implementation of the ExCEL Model revealed lasting impact on teachers' beliefs about the importance of PBL. More importantly, qualitative data reveals teachers' growth in recognizing underrepresented students' capacity for GT classes. Teachers noted they identified students they would not have with traditional procedures. Teacher beliefs do change, and the ExCEL Model influenced that change in instrumental ways suggesting that bringing this model to large scale could be pivotal to addressing the identification gap.

(4) The extent to which the proposed project is supported by promising evidence

Support for the project is demonstrated by studies meeting What Works Clearinghouse (WWC) standards and the moderate evidence-driven practices threshold. Studies meeting WWC criteria reveal concrete evidence of the effectiveness of using PBL with economically disadvantaged students (Finkelstein, Hanson, Huang, Hirschman, & Huang, 2011), the importance on motivation and engagement of using PBL in science class (Lin-Siegler, Ahn, Chen, Fang, & Luna-Lucero, 2016), and teaching academic content to ELs (Baker et al., 2014).

Finkelstein, Hanson, Huang, Hirschman and Huang (2011) showed students benefited from support in PBL, teachers engaging in professional learning on PBL, and PBL materials. In this study of over 2,900 students in 106 schools, students exposed to PBL for required economics courses in schools in California and Arizona had positive gains in knowledge

of economics as measured on the Test of Economic Literacy and favored the PBL intervention group (point estimate 2.60; effect size 0.32). Twenty-eight percent of students in the intervention group identified themselves as speaking a language other than English at home. Researchers also found that students in the intervention group also increased problem-solving skills in economics over the control group (point estimate 0.54; effect size 0.27).

Lin-Siegler, Ahn, Chen, Fang and Luna-Lucero (2016) found that exposing low-performing students to stories about struggle led to improved science performance over students exposed to only stories of success. In this experimental study, data analysis for 402 participating 9th and 10th grade students in science classes was conducted for one of three story conditions randomized at the student level. The majority (71%) of the students were eligible for free or reduced meals. Students comprised a diverse population (36.8% Latinx, 31.4% Black, 11.5% Mixed or Biracial) and reported being born outside of the United States (18.4%) and/or speaking English only half the time or less at home (31.8%).

After controlling for science performance, results showed differences between subjects post intervention on science-class grades with students in either of the struggle story conditions outperforming the students in the success story condition at significant levels ($p<.02$, Intellectual Struggle condition; $p<.04$, Life Struggle condition). The effect was more pronounced for low-performing students. These results suggest the use of stories, particularly about struggle, or problems, is a promising instructional approach. In ExCEL PBL curriculum, students are immersed in a story narrative involving a real world problem. In doing so, students function in a way that provides teachers with opportunity to observe capacity they have not seen before, thus shifting teachers' perceptions of culturally and linguistically diverse learners. This shift is one of the critical strengths of the ExCEL model.

PBL integrates oral and written English language instruction into content-area teaching, a research-based recommendation for culturally and linguistically diverse learners that is supported by evidence identified by WWC (Baker et al., 2014). Recommendations in this practice guide support E-Ignite by integrating oral and written English Language instruction into content area teaching through implementation of PBL units and PD conducted with teachers of English Learners. The recommendations of the practice guide overlap with both the population and settings proposed for the project.

Further Hussain, Nafees and Jumani (2009), found PBL was more effective than traditional instruction in increasing achievement of language learners. Azer (2009) also found PBL effective with ELs for engagement, understanding about the topic discussed, collaboration, and self-directed learning, and EL students indicated PBL should be used in future courses (Azman & Shin, 2012).

Long, Conger and Iatarola (2012) found when students take at least one honors course in high school, it increases their likelihood to pass standardized tests, earn a high school diploma, attend a postsecondary institution, and complete that program. The largest effects are for students taking a challenging course in 9th or 10th grade, and the largest gains are for marginalized sub-groups, including economically disadvantaged learners. Related to enrollment in rigorous coursework is grades, or GPA. Burke (2015) found that students with a GPA of at least 2.5 were more likely to graduate. Hanson, Bisht and Motamedi (2016) found that grades for English Learners earned in advanced coursework were similar to students who were never enrolled in ESL classes after prior grades were taken into account.

Not all coursework is equal. PBL activities are interdisciplinary. Knuth, Sutton, Levias, Kuo and Callison (2016) found students who consistently engage in PBL activities also have

increased enrollment and pass rates in rigorous coursework including AP STEM courses.

More broadly, studies about PBL consistently show student increases in content achievement (Tarhan & Acar, 2007; Tarhan, Ayar-Kayali, Urek & Acar, 2008). When PBL curriculum is properly designed and delivered, students acquire as much or more content as students who receive more traditional instruction (Feng, VanTassel-Baska, Quek, Bai, & O'Neill, 2005; Gallagher & Stepien, 1996; Horak & Galluzzo, 2017). Equally important, students who engage in PBL demonstrate longer retention (Diggs, 1997) and demonstrate superior learning gains on measures of conceptual reasoning (Tarhan & Acar-Sesen, 2013). An additional benefit to students of engaging in PBL is the development of data literacy (Swan et al., 2013). These results, taken together, suggest that E-Ignite will have significant effects for students that will positively impact enrollment in GT classes, achievement on state tests and benchmarked assessments, and engagement and motivation to learn.

5. Feedback and continuous improvement are integral to the design of the project

Underlying the success and demand for the ExCEL Model is that it is design-based research (Brown, 1992). Design-based research is distinguished from other approaches because it embeds continuous improvement and responds to real conditions rather than ideal conditions in schools. The ExCEL Model (see Figure 2) takes place in rapid cycles of implementation, professional learning, and curriculum development. The cycles for each of these processes includes planning *(Plan),* implementation *(Act),* reviewing feedback *(Check),* adjustment and implementation again *(Do).*

Implementation Continuous Improvement Cycle

Implementation will be phased in to full scale over the course of five years. *Plan.* Participating 6th grade ELA teachers and their teamed science, mathematics, ESOL, and SPED teachers will participate in professional learning strategically designed to develop knowledge of PBL and gifted learners. Additional teachers are invited to participate given district support for substitute funding. Sixth grade teachers participate in sessions during which they collaborate to plan modifications or extensions to meet students' needs, e.g. how to handle varying reading levels. *Act.* Sixth grade ELA teachers supported by their teamed science, mathematics, ESOL and SPED teachers implement their first PBL unit with all students, administer, and collect student assessments and measures, and record evidence of trends in performance such as anecdotal notes like "Julissa related the problem across disciplines today with the question she asked" or "Gio tried multiple ways to resolve his question independently". *Check.* Student and teacher performance data is analyzed, and a follow-up reflection and planning session is conducted. During this session, teachers set goals for instruction during the second implementation that include goals for individual growth and addressing student needs, e.g. focusing on asking meta-cognitive questions. *Do.* ELA teachers supported by their

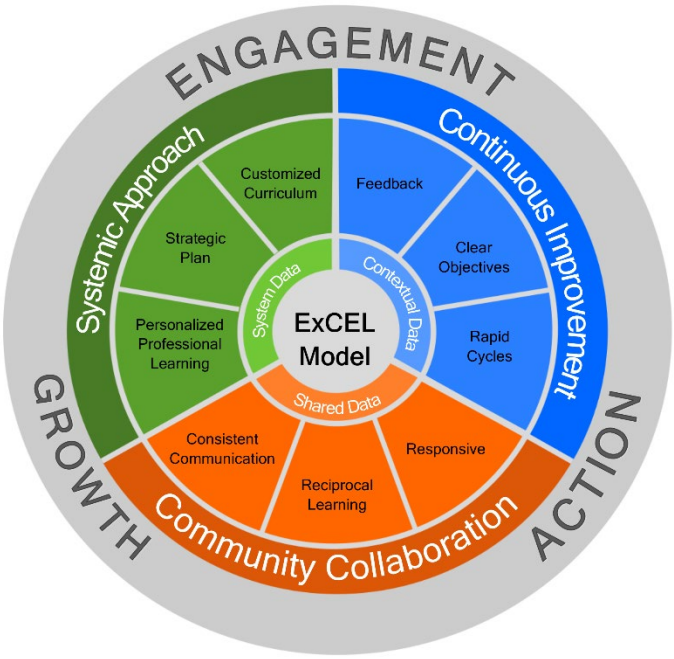

Figure 2: The ExCEL Model.

interdisciplinary team implement the second round of PBL with all students with the adjustments based on data discussed in the reflection and coaching session. Following this implementation, the list of students identified for GT services is collected, scheduling takes place, and as discussed in the *exceptional approach* section, the cycle starts again with professional learning with the 7th grade ELA teachers and their interdisciplinary team followed by the 8th grade ELA teachers and their interdisciplinary team.

Professional Learning Continuous Improvement Cycle

The Professional Learning program is a proven model of teacher support, focusing on differentiated professional learning experiences with personalized ongoing support (Horak, Shaklee & Brusseau, 2019). The Professional Learning program offers progressive sessions with embedded just-in-time coaching. The sessions take place in recursive learning-teaching-learning sessions. A unique part of the design of the Professional Learning program is that it begins by modeling PBL in the context of an ill-structured problem of professional practice, e.g. how do we find and serve underrepresented middle school students who are gifted and talented?

Plan. The professional learning program continuous improvement cycle begins with planning the objectives based on a combination of topics identified to address the project priorities, such as the specifics of meta-cognitive coaching, and the needs and priorities identified from feedback given by teachers and principals, e.g., adjusting lessons to a 90 minute block period. The professional learning is designed to move teachers through an examination of attributes of gifted, implementation of PBL, model lessons and resources, and the delivery of dynamic classroom practices and strategies using technology such Google Apps as a tool for collaborative learning.

Act. The E-Ignite team provides an *Introductory Session*, a *Preparation and Planning*

Session just prior to implementation, followed by a *Self-Analysis and Reflection session* after implementation. The cycle of professional learning then continues with the *Advanced Session, Preparation and Planning*, and *Self-Analysis and Reflection Sessions* for teachers who have already taught PBL.

Check. After each session, feedback is collected from teachers formally by surveys and informally through discussion. After review, adjustments are made based on feedback, e.g. more about classroom management during self-directed learning. The professional learning continuous improvement cycle led to changing the Introductory Session to become a demonstration of a Problem-Based Learning as a problem of practice. This change was met with excitement from the teachers who reported feeling better prepared to teach PBL with the modification.

Do. As we collect feedback, adjust, and refine our professional learning, the sessions are designed to invest in teachers' growth progressively. As teachers demonstrate increasing interest, the program provides increasing opportunities for growth, i.e. learning about curriculum writing and coaching others in PBL instruction.

Curriculum Development Continuous Improvement Cycle

The PBL framework for E-Ignite was adapted for K-12 education by Stepien and Pyke (1997). This model provides teachers with tools to align the interdisciplinary PBL units to single subject standards, develop conceptual reasoning, computational thinking, and problem-solving/finding skills. *Plan.* E-Ignite leverages the expertise of the previous ExCEL team in collaboration with expert faculty at George Mason University (Mason) to adapt current and develop new units centered on data-rich, computer science and STEM-based, real-world problems. *Act.* The curriculum team drafts several viable problem narratives drawn from teacher and student suggestions and real-world STEM problems, for example, chemical pesticides and

their potential reactions with the environment or biometrics and the implications for data mining and privacy. *Check.* The list of curriculum topics is narrowed based on teacher feedback to the problems that are viable to be developed fully. *Do.* Units are piloted, feedback is collected, and the continuous improvement process begins again with revisions.

(B) Quality of the project personnel

E-Ignite's leaders have demonstrated successful project management for a large, evolving, and complex local and remote projects. Appendix B includes curriculum vitae of the key personnel.

(1) Qualifications of the project director/principal investigator

Co-PI/Director of Project Design and Management; Anne Horak, PhD. Dr. Horak has served as Assistant Research Professor and Project Director of Project ExCEL. Dr. Horak has also led middle school gifted programs. She will be responsible for ensuring all elements of the project design and content development represent an exceptional approach, have been reviewed externally by the appropriate content experts, and are developed using feedback and a process of continuous improvement.

Co-PI/Director of Project Services; Beverly Shaklee, EdD. Dr. Shaklee has successfully directed the Division of Advanced Professional Teacher Development and International Education, Co-Directs the *Center for International Education* as well as directed previous Javits grants and served as a scholar in the field with distinction. She will be responsible for ensuring the project objectives are delivered on time and within budget.

(2) Qualifications of key personnel

Expert, Science Education & Instructional Methods; Andrew Gilbert, PhD. Dr. Gilbert has over 25 years of experience across K-12 and science teacher education including

teaching experience at the middle and high school levels. He is an associate professor and serves as the Associate Director of the *Center for Social Equity through Science Education* at George Mason University. He will use these experiences to meet the content needs of teachers and curriculum designers to best serve diverse students in project classrooms.

Expert, Evaluation, Continuous Improvement & Measure Development; Lori Bland, PhD. Dr. Bland has successfully served as on multiple large federal grants, will be responsible for monitoring the quality and sufficiency of the project services for ensuring equal access, evaluating the impact of the services and monitoring feedback and continuous improvement processes. She is currently a clinical associate professor of curriculum development and research and director of curriculum for the Center of Gifted Education at the College of William & Mary.

Project Coordinator; Kimberley Daly, PhD. Dr. Daly will serve as Project Coordinator, responsible for ensuring the activities of the project are operating smoothly on a day-to-day basis. She worked as the grant manager on Project ExCEL and has experience managing program implementation, associated staff, and creating a data repository. Her research has focused on advanced academic programs and teacher education. Previously, Dr. Daly spent 15 years in the classroom teaching English, including Advanced Placement and International Baccalaureate coursework. She is also a Virginia licensed ESL teacher.

(C) Quality of the Management Plan

George Mason University (Mason) is a recognized Research I institution with over 140 million research dollars. The College of Education and Human Development (CEHD) successfully manages a portfolio of some $15 million in external funding. The project will have full access to the CEHD budget and resource personnel in the Office of Research. Further, the

Division in which it is housed has five dedicated staff members who are experienced with externally funded projects of this magnitude and familiar with remote location delivery. Finally, the E-Ignite team has capably managed $2.5 million in federal funds since 2014 and is familiar with federal reporting and accountability standards. The E-Ignite team has successfully received full continuation funding every year of the project because of their record of on track implementation and budget management. Building on this success, the E-Ignite team has structured the management plan to ensure it delivers project objectives on time and within budget, consistent with our previous demonstrated capacity and success with large-scale funding.

(1) The adequacy of the management plan to achieve objectives on time and within budget

The project will begin in October 2019 and conclude in October 2024. Table 4 is a time line of key responsibilities and milestones with detailed alignment of E-Ignite objectives, outcomes, and tasks for the course of the project.

Table 4
Key Activities and Milestones to Achieve Project Objectives

Key Activities and Milestones	Persons Responsible	19-20	20-21	21-22	22-23	23-24
Priority 1 Goal: Identify and serve Gifted and Talented students from underrepresented populations including Black, Latinx, and English Learners, as well as those who are economically disadvantaged and children with disabilities.						
Objective 1.1: Expand the use of PBL curriculum as a universal screening that embeds a dynamic performance assessment in 6th grade in 9 middle schools in 3 school districts in 3 states.						
Agree upon annual participation and performance goals for 6th grade ELA, science, mathematics, ESOL and SPED teachers	Implementation Team	Nov	May	May	May	May
Expand teacher knowledge of observations of student performance during PL program at least 3 times per year and support	Professional Learning and Implementation Teams	Jan - May	Aug – May	Aug – May	Aug – May	Aug – May
Implement PBL curriculum to identify 6th grade students 2 times per year	Teachers	Feb - May	Oct – May	Oct – May	Oct – May	Oct – May

Objective 1.2: Implement PBL curriculum to serve Gifted and Talented students 2 or more times per year in 7th and 8th grade in 9 middle schools in 3 school districts in 3 states.						
Expand teacher knowledge of PBL instruction during PL program at least 3 times per year and ongoing support	Professional Learning and Implementation Teams	Jan - May	Aug – May	Aug – May	Aug – May	Aug – May
Implement PBL curriculum to serve 7th grade students at least 2 units per year	Teachers and Implementation Team	N/A	Sept – May	Sept – May	Sept – May	Sept – May
Implement PBL curriculum to serve 8th grade students at least 2 units per year	Teachers and Implementation Team	N/A	N/A	Sept – May	Sept – May	Sept – May
Objective 1.3: Increase achievement in Gifted and Talented classes of 7th and 8th grade PBL-identified students who are from underrepresented populations in 9 middle schools in 3 school districts in 3 states.						
Collect data on student growth and achievement in content, cognitive skills, and student engagement and motivation	Teachers and Implementation Team	Feb – May	Sept – May	Sept – May	Sept – May	Sept – May
Collect data on student achievement on annual state tests	Project Coordinator	July	July	July	July	July
Provide teachers timely formative feedback on implementation and student performance	Implementation Team	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing
Communicate revisions and potential impacts	PC and PL Consultant	Oct – Jan	Jun & Sept	Jun & Sept	Jun & Sept	Jun & Sept
Reflect on and revise PL program based on summative data and feedback	Implementation Team	Jun	Dec & Jun	Dec & Jun	Dec & Jun	Dec & Jun
Priority 3 Goal: Promote effective instruction in classrooms in high-poverty schools.						
Objective 3.1: Plan the curriculum-aligned professional learning program to meet the needs of each LEA, each year of the project expanding to 9 middle schools in 3 school districts in 3 states. (Plan)						
Make updates and changes as documented to program to reflect feedback from key stakeholders, partners, and participants	Leadership Team	Jun	Dec & Jun	Dec & Jun	Dec & Jun	Dec & Jun
Identify coaches for teachers	Implementation Team	Nov	May	May	May	May
Refine professional learning program including sessions based on formative data and feedback from key stakeholders	PL and Implementation Teams	Oct – Jan	June – Sept	June – Sept	June – Sept	June – Sept
Objective 3.2: Deliver the curriculum-aligned professional learning program in each LEA, each year of the project, expanding to 9 middle schools in 3 school districts in 3 states. (Act)						

Teachers attend professional learning sessions	PI-PD, PC, Implementation Team	Jan	Aug – Sept	Aug – Sept	Aug – Sept	Aug – Sept
Conduct follow-up training for additional teachers as needed	PL Team and school-based liaisons	Feb	Oct	Oct	Oct	Oct
Provide ongoing, timely support for teachers	Implementation Team and PL Consultant	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing
Personalize PL based on stakeholder feedback and goals in timely and ongoing manner	Implementation Team and PL Consultant	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing
Objective 3.3: Check effectiveness of PBL instruction by implementing the continuous improvement expanding to 313 teachers in 9 middle schools in 3 school districts in 3 states. (Check)						
Engage teachers in recursive learning-teaching-learning sessions	Teachers and PL and Implementation Teams	Jan – May	Aug – May	Aug – May	Aug – May	Aug – May
Teachers identify and recommend students for GT services	Teachers	Mar – May	Mar – May	Mar – May	Mar – May	Mar – May
Students scheduled in GT services for upcoming year	Directors of Student Services and PC	Mar – June	Apr – June	Apr – June	Apr – June	Apr – June
Collect annual feedback from students, teachers, administrators, and staff to inform continuous improvement	Implementation Team	May	May	May	May	May
Communicate revisions and potential impacts	PC and PL Consultant	Oct & Jan	Jun & Sept	Jun & Sept	Jun & Sept	Jun & Sept
Reflect on and revise PL program based on summative data and feedback from key stakeholders	Implementation Team	Jun	Dec & Jun	Dec & Jun	Dec & Jun	Dec & Jun
Objective 3.4: Expand the delivery of the curriculum-aligned professional learning program for teachers of ELA, Science, Math, ESOL and Special Education in 1 grade level to 3 grade levels in 9 schools in 3 districts in 3 states. (Do)						
Assist participating schools in identifying teacher participants	PC	Nov	Apr	Apr	Apr	Apr
Train GRAs for PL delivery as needed	PL Team	Dec	Aug – Oct	Aug – Oct	Aug – Oct	Aug – Oct
Conduct follow-on training for additional teachers as needed	PL Team and school-based liaisons	Feb	Oct	Oct	Oct	Oct

Priority 2 Goal: To promote Science, Technology, Engineering, or Mathematics (STEM) Education, with a particular focus on Computer Science with nationally reviewed award-winning Problem-Based Learning (PBL) curriculum.						
Objective 2.1: Project experts develop, distribute, and disseminate 1 new open-license PBL units and 2 expanded units with a computer science and STEM focus and alignment to rigorous criteria each year.						
Solicit input on STEM curriculum focus from stakeholders	Curriculum Team	Oct – Nov	April – May	April – May	April – May	April – May
Select and write problem scenario	Curriculum Team	Jan – Mar	June – Oct	June – Oct	June – Oct	June – Oct
Select and revise existing units	Curriculum Team	Mar – Aug	Oct – Aug	Oct – Aug	Oct – Aug	Oct – Aug
Recruit teachers for curriculum development	Curriculum Team	May	May	May	May	May
Develop and pilot PBL curriculum unit	Curriculum Team	N/A	Oct – Aug	Oct – Aug	Oct – Aug	Oct – Aug
Revise and refine based on teacher and student feedback	Curriculum Team	N/A	Apr – May	Apr – May	Apr – May	Apr – May

Key: Co-PIs – Co-Principal Investigators: Drs. Beverly Shaklee and Anne Horak
PC: Project Coordinator: Dr. Kimberley Daly
Evaluator: Dr. Lori Bland
Professional Learning (PL) Consultant: Jessica McHie
Curriculum Writing Consultant: Dana Plowden
Leadership Team: Co-PIs and PC
Implementation Team: PC, Doctoral GRAs and OSCAR research assistants, and Site Coordinators
Curriculum Team: Dana Plowden, Dr. Andrew Gilbert, and Jessica McHie
Professional Learning Team: Jessica McHie, Dana Plowden, Anne Horak, and Kimberley Daly

(2) The adequacy of procedures for ensuring feedback and continuous improvement

The key activities and milestones reflect the procedures for ensuring formative assessment is collected at appropriate intervals for feedback to enable continuous improvement. The E-Ignite team will make use of formative assessment practices developed and tested during Project ExCEL and in other Mason research projects to engage teachers in collaborative problem identification and problem solving throughout the professional learning program with session and PBL implementation processes. Members of the research team will be in constant communication with district and school personnel during PBL implementation, and measures

developed and tested in previous projects (e.g. Cognitive Apprenticeship Rubric, Embedded Measures Rubric) will be used to facilitate teacher discussion and reflection. Video and video-conferencing allows the research team to collaboratively consult with teachers and district representatives regarding individual teacher implementation of PBL and data collection.

(D) Quality of the Project Services to Ensure Equal Access, Treatment and Likely Impact

Evaluation data from E-Ignite can provide insight into a deeply rooted problem in education, uncovering conditions that are drivers of change in the effort to systematize identification of students from underrepresented groups. Significant findings from research in Project ExCEL are used to scaffold and project outcomes of this proposal.

(1) Ensuring equal access for traditionally underrepresented groups

We hypothesize that: 1) cultivating teacher leaders as a driver for instructional change via 2) implementing PBL curriculum will 3) act as a structured focal point for rapid cycles of data analysis, data-driven decision making, and strategic action to 4) provide data depth which 5) will create a more robust picture of a) *teachers' perceptions of giftedness, b) their recommendations for GT classes* c) *students' motivation for learning, and d) student achievement*.

For the evaluation, we will construct a database of all student, teacher, and program variables. For students, we will include identification data from the universal screening that includes content pre- and post-test scores, and performance-based process ratings. We will include measures of motivation and engagement to understand the interactions and how they support teachers' perceptions of students and their depth of understanding students' capabilities. As examples of data use, continuous improvement data, such as student assessment scores, will be used to provide formative feedback to teachers and program officers; student gain scores will be used for summative evaluation. Teacher variables will include assessment of their PBL

instruction from class observations and interviews that will be used to examine fidelity of implementation (FOI) and other measures, such as self-efficacy in teaching PBL. Thus, the evaluation plan for E-Ignite focuses on four broad areas: (1) identification outcomes, such as the recommendations made by teachers; (2) student outcomes, such as student performance on the Embedded Measures; (3) teacher outcomes, such as teacher metacognitive coaching skills on the Cognitive Apprenticeship Rubric; and (4) program outcomes, such as FOI and success in scaling the program. Alignment of research objectives and measures are shown in Table 5 below.

Identification Outcomes. The first component of the research focuses on the identification process, including the way teachers perceive observations of student behavior in relation to recommendations for GT classes, how they assess student performance during PBL, and how their experiences teaching PBL might shift their beliefs about their students' abilities. Thus, the evaluation will examine the interactions of student performance and teachers' perceptions during PBL, as one example of an identification outcome. The most important identification outcome is the change in identified students.

Objective I1: Application of PBL as a Universal Screening Method for Dynamic Performance Assessment. Teachers will use the PBL units to identify students who demonstrate 'gifted behavior' as they work through the learning models and measures embedded within the PBL units. Teachers will also record their observations of student behaviors during PBL activities using a newly constructed observation scale. Data from the observations of dynamic classroom performance, class grades, and scores on the Embedded Measures Rubric (EMR) (Bland & Horak, 2018, unpublished measure, Appendix F) which are measures of the different stages of problem-solving as students' progress through the units (Sample Embedded Measure prompt, Appendix F) will be used as evidence in universal screening.

To test the validity of teacher recommendations, a random sample of the students with complete data from the standardized assignments embedded within the 6th grade PBL units, classroom grades, and observational data will be sent to the Project Evaluation team for independent assessment. Evaluator's scores will be used to determine if the students identified by the PBL dynamic performance assessment are, in fact, superior to the comparison group of students not identified. These data will also be compared to other extant data, such as end-of-year assessments, student grades, and other student work to show how the measures show talent not otherwise identified, among other validity studies that will be conducted.

Embedded Measures Rubric. Select assignments completed during the PBL units will be gathered for independent assessment by the evaluation team using the Embedded Measures Rubric (EMR - Appendix F). The EMR gathers information on the: 1) extent to which the student understands different perspectives related to the problem and solution, 2) cognitive level of the analysis of the problem and solution, and 3) degree of capacity the student has to reflect on their thinking in relation to the identified step in the problem-solving process. The EMR assesses the cognitive level at which the student is working and the depth of thinking at which the student is working to add to the students' performances on the unit tests. This information will be used to validate teachers' recommendations of students and as a measure of student achievement for the identified students within GT PBL classrooms. Two trained scorers from the research team will score a random sample of student responses to collect reliability data for each of the embedded measures. Then, training sessions will be held with teachers to use the EMR. Two teachers will score each of the measures in the training session. Reliability data for the teacher scores will also be collected. Feedback will be given to teachers during training in order to address any issues related to reliability, so that the measure can continue to be used and scored. In addition, a

training and scoring manual will be developed with open-access to support continued use of the Embedded Measures as part of the universal screening process.

Student Outcomes. A foundational element of the research is student content knowledge. Data related to two student outcomes will be gathered: (1) increasing student content knowledge in ELA, science, and mathematics and (2) increasing student engagement and motivation. Hierarchical linear modeling will be used for an examination of nested effects. Because we will have repeated measures from the students, we will be able to analyze growth curves.

Objective S1: Increase student content knowledge in ELA, Science, and Mathematics. The PBL unit tests will be administered to each student in a pre-post design that will allow us to examine gains. This is based on the approach of Horak & Galluzzo (2017). Before each unit, the students will take the first *unit test as a pre-test* in order to gain a sense of their prior knowledge. After the unit is completed, students will take the *unit test again as a post-test*. Together, these will yield a unit-specific gain score and potential explanatory variables. These data will be analyzed to determine if there are significant differences between the PBL identified students and the comparison group of traditionally identified students.

PBL Unit Tests. In conjunction with curriculum development, we will develop test items that address the interdisciplinary objectives of the PBL units. Tests of approximately 25 items will be identified for each unit, and they will be vetted for consistency by conducting a content analysis. We will work until we reach consensus that the items measure the STEM content taught in the units, ELA standards, and match the format for annual student testing in each site.

Cognitive performance during PBL. Select assignments will be gathered for independent assessment by the E-Ignite evaluation team using the EMR and compared to performance on the PBL unit tests (Bland & Horak, 2018).

Objective S2: Increase student motivation and engagement. Student motivation and engagement will be measured quantitatively and qualitatively.

School Engagement Measure (SEM). Four key dimensions of students' engagement in school have been identified in the literature; cognitive, affective, behavioral and agentic (Reeve & Lee, 2013). In order to assess these forms of engagement, we plan to use the School Engagement Measure (SEM; Wang, Willet, & Eccles, 2011) which consists of items that measure behavioral (e.g., "How often do you have trouble paying attention in classes?"), emotional (e.g., "I feel happy and safe in this school.") and cognitive engagement (e.g., "How often do you try to figure out problems and planning how to solve them?") (Appendix F).

Agentic Engagement Scale (AES). We also plan to assess agentic engagement using the Agentic Engagement Scale (AES; Reeve, 2013). The AES is an instrument (Appendix F) and includes the sample item "During class, I ask questions to help me learn". The internal consistency of both instruments is acceptable (e.g., ranging from $\alpha = .70$-$.88$).

The SEM and AES will be given in a pre-post design as a means of gaining insight on the students' motivations for learning and monitoring possible development of student motivation to learn. Equally important, we will have sub-factor variables to assess as possible correlates of student achievement via simple correlations and more complex regression equations. These data, as well, will be analyzed to determine if there are significant differences across the comparison groups, e.g. general ed, PBL Identified, Traditionally Identified. Because we will have repeated measures from the students, we will be able to assess these for change over time.

Semi-structured interviews. To assess student engagement, we will use a semi-structured interview protocol. The questionnaire will focus on students' engagement, their views of participation in GT classes, and their perceptions of PBL (Appendix F).

Teacher Outcomes. There are three teacher outcomes: (1) improve teacher perceptions of students who are from underrepresented groups; (2) understand the use of PBL curriculum as a means to support universal screening; and (3) increase knowledge and preparation to teach PBL.

Objective T1: Improve teacher perceptions of students who are from underrepresented groups. We will use a semi-structured interview protocol to examine the participating teachers' perceptions of students. We will interview each teacher at the end of each PBL implementation. Given the semi-structured nature of the interview protocol, we will use open and axial coding to build theory (Maxwell, 2013) about how teaching the PBL units to potentially GT students changed their perspectives on these students. These data will allow us to understand the components of teachers' judgments and decision-making about whom to recommend for gifted programs. Equally important, these data will allow us to see whether PBL can alter teachers' conceptions of the nature of performance that can be used to recommend students for gifted services. Deep interviews of the teachers will uncover new variables to support understanding of recommendations of students from underrepresented groups.

Semi-Structured Interview **(Appendix F)**. To assess teachers' perceptions of giftedness we will adapt an interview protocol (Szymanski & Shaff, 2013). The 18-item questionnaire focuses on teachers' conceptions of giftedness, their views of underrepresented groups in gifted programs, and the degree to which personal and social factors affect their views.

Objectives T2 and T3: Understand PBL Instruction and its use for a Universal Screening. Our assessment of teachers' understanding of PBL will come in two forms. First, their knowledge of PBL instruction will be self-assessed using the Cognitive Apprenticeship Rubric (CAR) (Bland, Horak, & Xu, 2018). Two times during specific lessons of PBL instruction, teachers will video record themselves. Teachers will then watch these videos with

the coaching experts on our Professional Learning team and use the CAR to assess their peers in the video, and then self-assess. Results from this self-assessment will be used for goal setting and growth plans. Teachers may also choose to observe each other and use the CAR as a peer feedback mechanism. The research team will analyze the growth plans and the pre and post videos, as well as teacher interview and survey data to determine the degree to which the CAR assisted teachers' growth. The evaluation team will also sample the teacher videos to determine the extent to which PBL is implemented with a high degree of fidelity using the CAR.

Cognitive Apprenticeship Rubric. One of the main issues in implementing projects like E-Ignite is ensuring that the teachers are delivering instruction effectively and consistent with the model being tested. To demonstrate that teachers are practicing PBL effectively, we will use the Cognitive Apprenticeship Rubric (Bland, Horak & Xu, 2018) currently under development and based on evidence-based best practices of PBL teaching. Ratings on the rubric report the degree to which teachers taught PBL effectively, and hence the strength of the units for student learning.

Training sessions will be held with teachers to use the CAR. Two teachers will score a sample of videos in the training session (with teacher permission). Reliability data for use of the CAR as a self/peer teacher evaluation tool will be collected. Feedback will be given to teachers during training in order to address any issues related to reliability of the self/peer-assessment tool. Two scorers from the research team will score a random sample of teacher responses to the CAR and compare their scores to the teacher scores in order to collect additional reliability data for the CAR as a measure of implementation fidelity. In addition, a training and scoring manual will be developed with open-access to support continued use of the CAR as a teacher tool for self-evaluation and as a measure of fidelity of implementation.

Program Outcome. A focus of E-Ignite is successful replication across remote sites.

Objective P1: Successful replication across sites. This final objective is to understand the influence of the program design across the three sites over the five years. By having three distinct sites, each with its own context, we will be able to study the effects nested within and across these sites. We hope this approach uncovers the degree to which contexts matter in effective implementation, changes in school ecosystems, as well as whether related issues are context-free or context-specific. Hierarchical linear modeling will help us reveal answers to this question.

Table 5
Alignment of Research Objectives and Measurements; Administration Schedule

Area of Evaluation/ Research	Research Objective	Measures	Administered
Identification	**I1**: PBL as a universal screening embedding dynamic performance assessment	Embedded Measures Rubric (EMR)	Twice per year
		Teacher Observations	During PBL units
Achievement	**S1**: Increase student content knowledge	PBL Unit Tests	Pre- and Post- PBL Units
		Embedded Measures	Three times per unit
	S2: Increase student motivation and engagement	Agentic Engagement Scale (AES); School Engagement Measure (SEM)	Pre- and Post- PBL Units
Teachers	**T1**: Expand perceptions of underrepresented students	Semi-structured interview	Post-unit
	T2: Expand knowledge of PBL and units	Semi-structured interview	Post-unit
	T3: Improve effectiveness of PBL instruction	Cognitive Apprenticeship Rubric (CAR); Video analysis	In between 1st and 2nd unit
Program	**P1**: Successful replication across sites	Analysis of variation across contexts and sites; Semi-structured administrator interview	End of school year

(2) Impact on intended recipients

The short-term impact is to change classroom practice, improve curriculum, engage underrepresented populations and identify students of talent so that over time, students can perform in higher level courses, graduate, and be admitted into college. The long-term impact is to work systematically to change teachers' belief systems and instructional practice. Studies of the longitudinal effects of systematic, professional learning have indicated increases in the use of the model of instruction and increased effect of the professional learning program. Here, teachers can be followed over the five years to determine the degree to which their practice and beliefs about identification has shifted, as well as if there is transfer to the district overall. The logic model (Figure 3) shows the relationship between the theory of change, objectives, outcomes and their impact. It reflects the significance of this research and its potential contribution to the field.

In three school systems (MDCPS, VBCPS, and CCSD), a combined total of approximately 313 ELA, science, mathematics, ESOL and SPED teachers across grades 6 – 8 will attend professional learning sessions over the course of five years. Using class size estimates for ELA teachers of 32 students, roughly 28,800 students will be considered for GT classes through the universal screening and receive PBL instruction in the ELA classes over the course of five years. With the students reached by the ESOL and SPED teachers, the number of students impacted increases to 31,950. Given the 24% mobility rate of the districts identified in this proposal, the reach of the universal screening and PBL instruction stretches to a possible total of 39,618 students impacted by the project. The total project budget of $2,971,501 represents an investment of $9,500 per teacher and about $75 per student. These costs, when compared with previously funded Javits grants, are competitive in terms of being efficient and scalable.

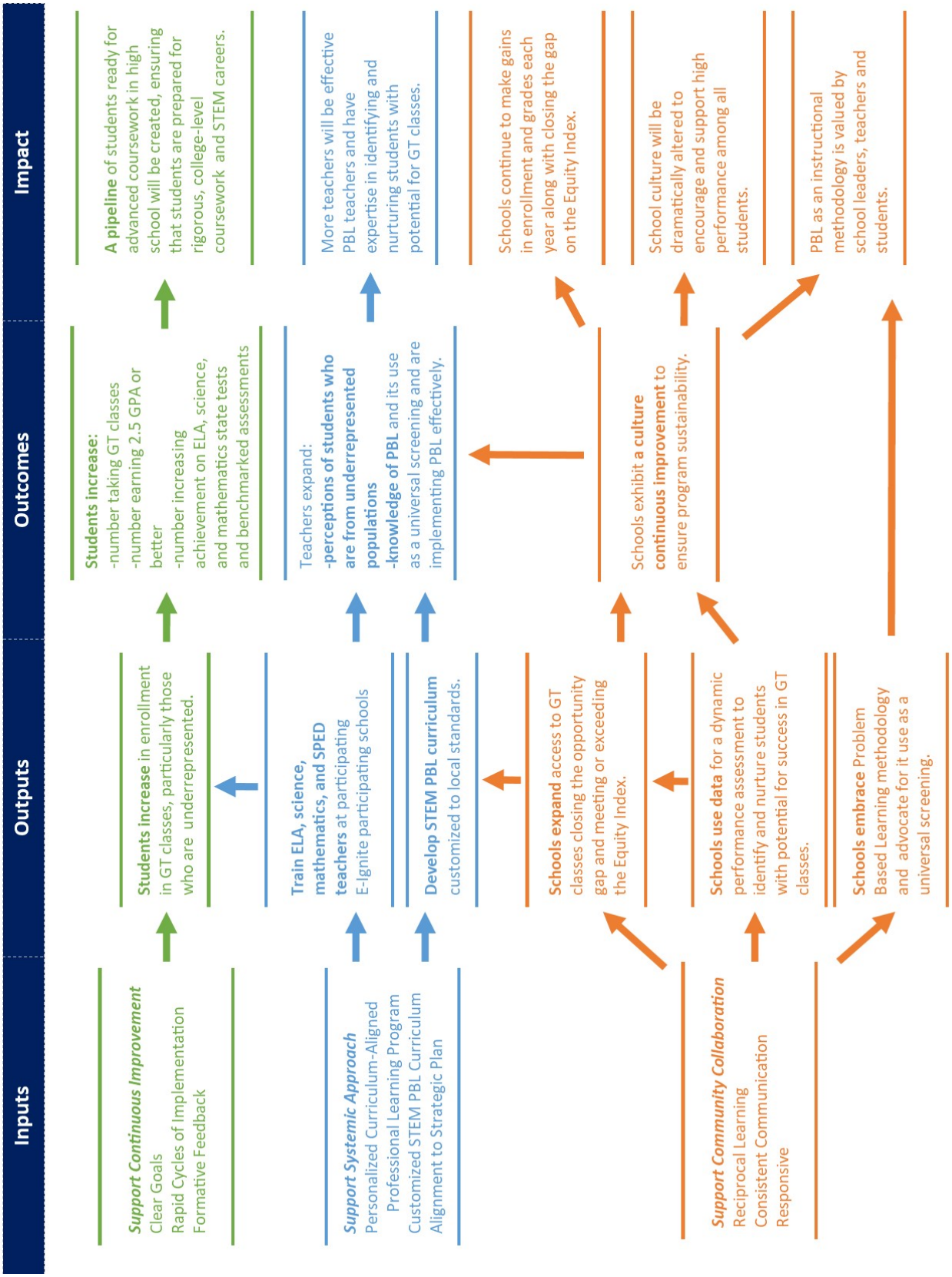

Figure 3: The E-Ignite Logic Model