

USING PROJECT-BASED LEARNING IN LOW RESOURCE CONTEXTS GLOBALLY: UNDERSTANDING THE CHOICES AND CHALLENGES



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FOREWORD

The onset of the COVID-19 pandemic has seen innumerable alternative approaches to learning evolve in response to colossal global education disruption. The flourish of new and progressive pedagogies during this unprecedented time emphasizes the ever-evolving need for teaching and learning that encompasses all needs, all learners, and all communities. But how can we ensure that these progressive pedagogies are accessible across various learning contexts? This report aims to answer this question of how through the investigation of project-based learning (PBL) cases and to provide recommendations on how PBL can be implemented regardless of resources, capital, and context.

Inspired by Larry Rosenstock, the 2019 WISE Prize Laureate, and his aspirational work at High Tech High, we were enlightened to delve deeper into the world of project-based learning and its relevance in the 'new now' of education. Hoping to contribute to, and narrow the gap in, literature surrounding PBL - particularly in lowresource contexts - and in order to represent those from the global south, this report aims to not only investigate PBL approaches in various contexts, but also to provide recommendations for those that wish to utilize PBL, albeit the learning environment. In looking at the challenges when designing a project-based learning experience, this report addresses the who, what, where, when, how, and why of PBL implementation, in looking at a variety of cases around the world that are inclusive of both high and low resource settings.

In thinking about his ideas on project-based learning, Larry Rosenstock, and his colleague Rob Riordan noted that "when we learn – really learn – we transform the content, the self, and the social relations of teaching and learning". Noting the importance of social capital when it comes to learning, this report echoes and builds on Larry's philosophy in finding that social richness is a significant element of teacher and student learning experiences.

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GLOSSARY OF TERMS, ABBREVIATIONS AND ACRONYMS

COVID-19	The global pandemic caused by COVID-19 beginning at the end of 2019
PBL	Project-Based Learning
SEL	Social Emotional Learning
STEM	Science, Technology, Engineering, Mathematics

EXECUTIVE SUMMARY

A few years ago, WISE administrators, focused on several innovation in education initiatives worldwide, began to notice a trend both in their work and in data collected and shared by multiple sources such as The Canopy Project¹, The Learning Accelerator's study of professional learning at Lindsay Unified School District², and others. The trend was that projectbased learning (PBL) was consistently—but not frequently—being used as an effective instructional model across a range of diverse schools that were innovating on conventional models of learning. Given a growing evidencebase that supported the effectiveness of project-based learning in a variety of learning environments, we wondered why PBL was not more widespread. Further, we wondered whether there were implementation challenges of PBL unique in low resource contexts.

This study set out to explore why projectbased learning is implemented at such low rates overall, and whether the challenges and barriers to its implementation are different in resource-scarce settings across the globe as compared to settings in which resources are more readily available to schools. Broadly, we set out to determine:

- What are the challenges to implementing project-based learning in low resource contexts globally?
 - What decisions do educators in low resource/high need settings most struggle with when implementing or exploring implementation of projectbased learning?
 - What can we learn from their decisions about potential paths forward that either support or inhibit successful, sustained implementation of projectbased learning?

In order to answer these questions, we used an exploratory, descriptive, mixed-methods approach to understand and document educators' lived experiences as they navigated decisions and made design choices around implementing project-based learning in their own schools and classrooms. We conducted a total of 21 interviews (one with two interviewees from a single site), and received nine survey responses. Because both data collection formats were gathering the same information, interview and survey responses were combined into a single sample and data set. These 31 participants had a range of roles, from teachers (sometimes called guides, mentors, or facilitators), in-school heads of content or subject departments, school leaders and administrators, to school designers, and founders of independent schools, to heads of nongovernmental and nonprofit organizations. They discussed 24 distinct cases of PBL implementation in 17 countries from five regions of the world (Africa, Asia and the Middle East, Europe, North America, and South America and the Caribbean). One site provides humanitarian and educational services to a displaced community, and one program was designed for, and is being used by, over 70 countries worldwide.

Findings

We found that 18 of the 24 PBL cases were sustained and currently ongoing, with plans to continue in future years. The remaining six either didn't sustain PBL at their site, or considered but decided not to implement PBL at all. The majority of cases (16 of the 24) were self-described as occurring in low resourced contexts and eight as happening in highresource settings.

¹ <u>https://canopyschools.transcendeducation.org/research</u>

² <u>https://drive.google.com/file/d/1qHWgrU_1BaUBi-8dztj5b60kmi-ubIHz/view</u>

Finding 1: Social capital (networks, relationships, and trust—and the flexibility and autonomy they afford) is a valuable, often overlooked, resource. As we analyzed our interviews and survey responses, it became clear that social capital, or the networks, relationships, and trust a school has, gives more access to flexibility and autonomy in implementation. Such access is a highly valuable, yet often-overlooked contributor to the level of resources in any given implementation context. Participants mentioned that people and relationships were a far greater resource than money could ever be. As one participant said,

"...if you have a group of people, they can help you to draw money, facilities, and many, many other things. So that is the most important thing. If you get a group of trained teachers, you've got everything."

Perhaps it is even the case that social capital may act to fill in the gaps created by the more well-known knowledge, motivation, and organizational well-known knowledge, motivational, and organizational (from the gap analysis framework of Clark & Estes, 2008) challenges challenges to PBL implementation.

Finding 2: COVID-19 had both positive and negative impacts on PBL implementation or adoption in the 2020-21 school year. The uneven impact of COVID-19 on project-based learning from place to place was unanticipated. A handful of participants specifically mentioned the impact of COVID-19, either positively or negatively, on their implementation of PBL. Some stated that the pandemic had a more positive impact in that the PBL model was not competing against other instructional models. Others mentioned discontinuing PBL at least temporarily during the pandemic (whether or not they planned to continue using the model in the longer-term). Residential schools seemed to fare especially well at sustaining or starting PBL implementation during the pandemic. PBL cases that were sustained and unsustained, or in high- or low-resourced contexts, were equally likely to respond to the pandemic by using PBL as an opportunity, or by stopping it to focus on other instructional models.



Finding 3: There were six dimensions along which participants were making decisions, answering "how, where, why, when, what, and who" questions related to project-based learning. These questions focused on:

- 1. Core instructional model vs. supplemental activity: How should we use PBL? Will projects be the primary means for daily instruction or will they be occasional activities that supplement daily instruction?
- 2. Community-driven vs. curriculum-aligned projects: Where should our projects' driving questions come from? Will they come from the needs of our community, or from our need to cover curricular content?
- 3. Student agency vs. broad learning experiences: Why should we implement PBL? Is our goal to advance learner agency, or enhance learner experiences?
- 4. Academic vs. non-academic skills: When in our students' developmental trajectory should PBL be used? Will projects primarily focus on developing their academic skills, or their non-academic skills?
- **5. Standardized vs. individualized:** What will our PBL model be? Will we use or develop a more prescriptive, guided model, or one that requires teachers and students to co-design a more flexible model?
- 6. Concentrated vs. diffuse: Who should we implement PBL with and for? Will PBL primarily support certain teachers and students, or all teachers and students across our school or system?

Distribution of these choices varied within each decision according to two contextual factors: whether the model was currently or was planned to be sustained beyond an initial pilot year or two of implementation; and whether the school or system considered itself to have access to a high or low level of resources for implementing PBL.

Finding 4: Resources like people, time, materials, and the flexibility stemming from governmental, administrative, policy, and community trust and support were universally helpful to implementation. Most noticeably, almost all participants mentioned students themselves, as well as the communities they operated in, and the networks participants had access to, as being key resources for sustained implementation, regardless of their contexts. Unequivocally, participants agreed that funding was not the only, nor a major challenge to implementation, even in contexts where funds were lacking. In addition, as mentioned above, many participants agreed that having "people" capital—whether in the form of relationships, trust, buy-in, or human capacity—outweighed having financial capital when implementing PBL.



Finding 5: Conversely, challenges like preconceived mindsets and cultures about the role and nature of school, inflexible regulations, policies, curricula, standards, and assessments, and a lack of time, technology, and other material resources were universal barriers to implementation. The single most commonly cited challenge by far was motivational: The culture and mindset that school only looks a certain way, or the prevailing perception that a teacher's role is to be a learning director, or the widespread existence of a school culture of "assessment" globally.

Recommendations

Four recommendations and a series of discussion guides stemmed from our findings:

Recommendation 1: Above all else, first consider all the various ways people in the learning environment can serve as resources or challenges, especially above financial resources and challenges. After all, as one of our participants put it, "You don't need a lot of funding to do this, you can do it for totally free, as long as someone, somewhere has the will to do it."

Recommendation 2: Explicitly consider social capital (or relationship) resources along with other available resources. The web of relationships that decision-makers, teachers, and students had was itself a valuable category of resources, in addition to being a resource that could fill gaps in knowledge, motivation, and organizational resources (as defined using the Gap Analysis Framework of Clark & Estes, 2008).

Recommendation 3: Benefits of either choice should be explicitly considered along all six dimensions when considering or designing a PBL model. We found participants making decisions along six familiar dimensions: how, where, why, when, what, and who PBL implementation would be in their school/system. For each of these dimensions, seemingly opposing decisions could be made. However, neither choice is clearly the right choice for all PBL, or for any given context.

Recommendation 4: Consider which of these distinguishing resources and challenges are most applicable to your context when making choices along the six dimensions. We found that some resources, and challenges were described more often when one or the other choice was made. Apparently, these resources and challenges distinguished one choice from the other. Considering the alignment between these and your own context allows for more intentional decision-making, and can help to predict and perhaps even reduce the risk of PBL's failure in your learning environment.

Finally, we encourage the use of the six discussion guides included in this report in conversations about PBL design and implementation, and to act on the final two recommendations. Using these guides will help you to be sure you are reflecting on all of the benefits, distinguishing resources, and challenges relevant to your context and learning environment. Awareness of these benefits, resources, and challenges will enable you to systemically focus your PBL resource allocation and design to maximize your resources and minimize challenges to make the most informed decisions about whether and how to implement PBL for your learners.





CHAPTER ONE

There is a growing base of evidence supporting the effectiveness of project-based learning (Condliffe et al, 2017). However, this instructional model is complex and many foundational barriers to implementation are consistently reported in the literature (cf, Bradley-Levine & Mosier, 2014). It is so complex, in fact, that there isn't firm consensus in the research or practice on the specific definition of project-based learning and its distinction from other similar inquiry-based learning models, like problem-based learning, and designthinking (Waite, 2020). Nonetheless, emerging evidence suggests that project-based learning is implemented at low rates in conventional educational settings, but at similar, higher rates in innovative settings regardless of the socio-economic status of the school that is innovating or the community the school serves (Waite, 2020).

This study sets out to explore why projectbased learning is implemented at such low rates overall, and whether the challenges and barriers to its implementation are different in resource-scarce settings across the globe as compared to settings in which resources are more readily available to schools. Broadly, we aimed to determine:

- What are the challenges to implementing project-based learning in low resource contexts globally?
 - What decisions do educators in low-resource, or high-need settings struggle with the most when implementing or exploring implementation of project-based learning?
 - What can we learn from their decisions about potential paths forward that either support or inhibit successful implementation of project-based learning?

PROJECT-BASED LEARNING (PBL): WHAT IS IT AND WHAT ARE ITS CHALLENGES?

TWO TWO

PROJECT BASED LEARNING (PBL): WHAT IS IT AND WHAT ARE ITS CHALLENGES?

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Projet-based learning can be defined as an active method of learning through project work that encourages learners to construct their own knowledge (de la Torre-Naces et al, 2020; Eickholt et al, 2019). Projet-based learning follows the construct of a model based on student autonomy that takes the form of self-organization, design, problem-solving and critical thinking skills which facilitates deep learning (Randazzo et al, 2021). Some successful examples of PBL can be seen from the exploratory work of students at High Tech High, noteably a twelfth-grade project with interest in the comined discovery of and relationship between physics, engineering and calulus (Kluver & Robin, 2021). Through modeling, experimenting and testing, students facilitated their own understanding of mathematical volumes through the PBL approach.

But what makes using PBL hard?

Our first step was to dig into what is already known about what makes using PBL hard. We found a consistent set of limitations to deploying PBL in classrooms across the world. These aligned well with the Gap Analysis Framework (Clark & Estes, 2008). There were factors that were motivation-related like teacher beliefs and practices driven by pedagogical beliefs about their and students' roles, and their beliefs about how people learn. Some factors were knowledge-related, such as teachers' and administrators' understanding of PBL and their ability to design and use projects in their teaching, along with their capacity to generate and manage meaningful, relevant, community-engaged projects. Some factors were organizational, most commonly the policy and administrative environment of the school and the system in which the school operated (for example, curricula, assessment, and standards requirements). We noted that organizational factors in particular existed on two levels, either internal contexts, or more external or systemic contexts. Based on the existing literature, we somewhat expected to find that schools in lower resourced contexts were unable to overcome the challenges in one, two, or all three of these groups (knowledge, motivation, and organization), and that this was driving the pattern of non-implementation.

Studies from the last ten years that have investigated the efficacy of project-based learning, especially in low-resource settings, have also documented the challenges and barriers to successful PBL implementation in primary and secondary schools around the world. In these studies, challenges and barriers to implementation were mostly documented from teachers' perspectives. A study of three schools by Culclasure, Longest, and Terry (2019), found that while PBL can have positive effects on both academic and socialemotional outcomes, fidelity and sustainability of implementation can vary, based on certain factors. On the fidelity side, they found that "planning for standards-based project-based instruction" and "connecting to an audience" (p. 6) were the least frequently observed aspects of PBL implementation. For schools that did not maintain implementation beyond the first year, the assessment environment, lack of support from their district, and underestimating the complexities of PBL were cited as reasons.

Similarly, Odell, Kennedy, and Stocks (2019) evaluated a state-level school reform approach that included PBL as a model for specialty STEM schools, and found that when the program was implemented with fidelity, it was effective in increasing reading, math, science, and writing scores. The challenges in implementing PBL specifically reportedly included tensions between PBL and teaching philosophy; shifting to a student-centered environment; and misalignment between school or district supports and the intended outcomes of the program.

In a large, randomized control study of PBL, Duke, Halvorsen, Strachan, Kim, and Konstantopoulos (2020) found that teaching four PBL units designed to address social studies and some literacy standards led to higher growth in social studies and informational reading. No similar effects were found for writing nor motivation, however, the consistency of PBL session plans was positively associated with growth in reading, writing, and motivation. Halvorsen, Duke, Brugar, Block, Strachan, Berka, and Brown previously used a design-based approach in 2012 and found that, after implementing intentionally designed project-based units, second grade students in low-SES settings performed as well as their peers in high-SES settings on researcherdeveloped, standards-based assessments of social studies and literacy. Teachers in the low-SES settings modified and extended the project curricula by making connections between project-based approaches and the world outside of school, between lessons within each project and between projects, and between projects and other content.

Finally, a large efficacy study of a PBL approach to teaching an Advanced Placement (AP) unit on government in a US high school (Parker et. al., 2011) found that the project-based approach, used with 208 students, was at least as effective as the typical approach, concurrently taught to 106 students, as measured by performance on the AP exam, a standardized, externally administered test. Interestingly, a challenge of PBL was reported by students in this study—namely, a misalignment between their expectations for how they would learn the content, and the PBL approach.

In addition to efficacy, many studies and syntheses of the evidence on project-based learning published within the last ten years, along with an older synthesis, focused specifically on the challenges and barriers to implementation. Similar to the efficacy studies above, the themes that were reported and/ or emerged could be categorized into a gap analysis framework (Clark & Estes, 2008). These themes, detailed in Table 2.1, centered on:

- Knowledge: definition of the instructional model, and convergence and divergence between definitions of project-based learning, and other similar models (problem-based learning, inquiry learning, and designbased thinking).
 - Definition of the projects as research questions that focus on content, or as cases that focus on complex problems, often coming from real-world situations.
- Motivations: beliefs about classroom roles, both for educators and learners,
 - beliefs about the goal(s) of learning,
 - beliefs about students' capacity for self-directed learning, and
 - beliefs about students' needs from the learning enterprise.
- Organizational factors (internal and external): policy contexts of the school system,
 - standards, curriculum, and assessment requirements,
 - availability of resources to support learning experiences,
 - availability of resources to support teachers, and
 - competing priorities and time management.

Table 2.1

Challenges to implementing PBL reported in the existing literature

Knowledge-related challenges: definition of the instructional model, and how to bring it to life in the classroom				
Difficulties planning and designing projects (Condliffe, Quint, Visher, Bangser, Drohojowska, Saco, & Nelson, 2017; Krajcik, & Blumenfeld, 2006)	 Scoping a project to balance stakeholder needs (Rees Lewis, Gerber, Carlson, and Easterday, 2019³), Developing rigorous and flexible curriculum across projects (Rees Lewis, Gerber, Carlson, and Easterday, 2019). Design challenges around determining project groups (Macmath, Sivia, and Britton, 2017) Managing all aspects of a project including multiple resources, sources, and learning environments (Tamim & Grant, 2013) Balancing the complexity and time required with students for real-world problems vs. created problems with "nice", "round" (p. 182) solutions, (Macmath, Sivia, and Britton, 2017) Balancing more didactic teaching of content with project-based learning (Macmath, Sivia, and Britton, 2017) Misalignment between students' expectations for learning and the timing of projects (Grant, 2011) Coordinating stakeholders (Rees Lewis, Gerber, Carlson, and Easterday, 2019). 			
Difficulties designing authentic assessments (Bradley-Levine, & Mosier, 2014)	 Designing meaningful, formative assessments throughout a project, and not just the final product (Tamim & Grant, 2013) Giving feedback with authentic assessments (Krajcik, & Blumenfeld, 2006) Finding time to assess and give feedback throughout the process (Macmath, Sivia, and Britton, 2017) 			

³ Rees Lewis, Gerber, Carlson, and Easterday, 2019: While this study was conducted in higher education, some of the external experts involved in these projects were sometimes also included in K-12 projects (especially grades nine -12), and the reported challenges were relevant in K-12 as well (perhaps more so, given that there are often more requirements for standards and curriculum in K-12 settings).

Teachers' & students' prior knowledge, (Revelle, K. Z., 2019)

- Shifting practices to a constructivist approach of sharing knowledge and facilitating student inquiry (Condliffe, Quint, Visher, Bangser, Drohojowska, Saco, & Nelson, 2017; Pecore, 2013; Tamim & Grant, 2013)
- Scaffolding student writing of conclusions and explanations (Krajcik, & Blumenfeld, 2006)
- Supporting the creation of discourse communities (Krajcik, & Blumenfeld, 2006)
- Managing classroom behaviors and student disengagement (Condliffe, Quint, Visher, Bangser, Drohojowska, Saco, & Nelson, 2017)
- Assisting students with shifting to a new way of learning and project completion (Rees Lewis, Gerber, Carlson, and Easterday, 2019; Tamim & Grant, 2013).
- Necessary guidance and support for students to use technology effectively in their projects (Kokotsaki, Menzies, & Wiggins, 2016)
- Having to pre-teach some prerequisite skills before launching project-based learning (Macmath, Sivia, and Britton, 2017)
- Additional considerations for students with disabilities and their needs being greater than other students' (Macmath, Sivia, and Britton, 2017)
- Integrating technology into classrooms (Condliffe, Quint, Visher, Bangser, Drohojowska, Saco, & Nelson, 2017) including in ways that keep students on task during project data collection phase (Gao, 2012)

Motivation-related challenges: beliefs about classroom roles, both for educators and learners

Difficulties creating a classroom culture of collaboration & teamwork (Bradley-Levine & Mosier, 2014)

- Desire to cover content standards (Bradley-Levine & Mosier, 2014)
- Culture of lack of teacher autonomy (Gao, 2012)
- Student assessment portfolios relying too much on students' input and completion in environments where students hesitate to document selfevaluations in writing (Gao, 2012)

	 Teachers' hesitance to document reflections in writing (Gao, 2012) Students' attendance and behavior (Revelle, 2019) Prevailing teacher-centered learning school culture (Condliffe, Quint, Visher, Bangser, Drohojowska, Saco, & Nelson, 2017) Leadership lacking culture of learning by doing (Bradley-Levine & Mosier, 2014)
Difficulties shifting to student-centered learning with the teacher negotiating their new role as inquiry facilitator (Bradley-Levine & Mosier, 2014; Condliffe, Quint, Visher, Bangser, Drohojowska, Saco, & Nelson, 2017)	 Balancing student support with independence (Bradley-Levine & Mosier, 2014; Gao, 2012) Incorporating technology as cognitive tool (Bradley-Levine & Mosier, 2014) Beliefs about the teacher's role in the classroom (Condliffe, Quint, Visher, Bangser, Drohojowska, Saco, & Nelson, 2017) Beliefs about students' (lack of) potential (Condliffe, Quint, Visher, Bangser, Drohojowska, Saco, & Nelson, 2017) Stepping outside content area of expertise to support multidisciplinary projects, and project data collection (Gao, 2012) Inequitable agency within groups, often based on socio-economic status, gender, or prior achievement; especially in projects where peer- assessment is used (Kokotsaki, Menzies, & Wiggins, 2016) Misalignment between students' persistence and motivation and the expectations placed on them by projects (Grant, 2011) Students' frustration with having more responsibility in the learning process (Macmath, Sivia, and Britton, 2017)
Difficulty balancing the mismatch between beliefs about learning as knowledge transfer vs. social construction of knowledge (Tamim & Grant, 2013)	 Classroom management, as PBL can feel disorderly (Bradley-Levine & Mosier, 2014) Accepting ambiguity, flexibility, dynamic environments, and multiple answers or outcomes instead of one right answer (Bradley-Levine & Mosier, 2014; Tamim & Grant, 2013) Students not seeing the value of a driving question (Krajcik, & Blumenfeld, 2006)

	 Preexisting beliefs about how certain content can and should be taught (Park Rogers, Cross, Gresalfi, Trauth-Nare, & Buck, 2011) Perception of project-based learning supports (e.g., self-reflection tools), as additional time and effort demands (Gao, 2012) Perception of problem-based learning as a mandate from above and an administrative burden (Gao, 2012) Insufficient staff buy-in (Schwalm & Tylek, 2012) Low levels of student and/or teacher engagement (Revelle, 2019)
Organization-related of external contexts of the	challenges: policy and other internal and e school system
Evaluative culture of the entire school system (Gao, 2012)	 Pressure to improve test scores (Revelle, 2019) Not all driving questions address learning goals from standards (Krajcik, & Blumenfeld, 2006). Poor fit between project-based methods and standardized testing (Waite, 2020) Variation in implementation and tension between standardized administrative requirements and flexible framework in diverse settings (Schwalm & Tylek, 2012) Desire to prove problem-based learning leads to academic achievement (Gao, 2012) High-stakes, standardized assessment used for high

Shortage of curricular and other resources to create real-world, authentic (engaging, interest-driven) experiences (Gao, 2012; Waite, 2020)

Unmet need for school administration and leadership support (Bradley-Levine & Mosier, 2014; Condliffe, Quint, Visher, Bangser, Drohojowska, Saco, & Nelson, 2017)

Misalignment between project-based learning and other academic goals (Schwalm & Tylek, 2012) leading to lack of resources such as time (Revelle, 2019)

- Class size (Revelle, 2019)
- Lack of technology access (Krajcik, & Blumenfeld, 2006)
- Difficulty integrating technology into curriculum (Krajcik, & Blumenfeld, 2006)
- Need for resources for design, principles, and practices; and sufficient developed materials (Krajcik, & Blumenfeld, 2006)
- Shortage of libraries, computers, labs (Gao, 2012)
- Insufficient staff professional development (Schwalm & Tylek, 2012; Macmath, Sivia, & Britton, 2017; Gao, 2012; Waite, 2020)
- Lack of teacher peer-group also implementing PBL (Condliffe, Quint, Visher, Bangser, Drohojowska, Saco, & Nelson, 2017)
- Need for school leadership support through a shared vision and professional development (Bradley-Levine & Mosier, 2014)
- Insufficient collaboration time given by administration (Macmath, Sivia, & Britton, 2017)
- Difficutly scheduling across classes (Macmath, Sivia, & Britton, 2017)
- Inability to modify curriculum materials and/or balance curricular content with projects (Revelle, 2019; Tamim & Grant, 2013)
- Time demand of using technology intentionally (Krajcik & Blumenfeld, 2006)
- Time required for data collection phase (Gao, 2012)
- Time to provide feedback and/or utilize selffeedback activities with students (Condliffe, Quint, Visher, Bangser, Drohojowska, Saco, & Nelson, 2017)
- Time for scaffolding learning and project planning (Bradley-Levine & Mosier, 2014)

These challenges and barriers to implementation, regardless of how they were categorized, appear to hinge on decisions being made about how to allocate resources (broadly defined as time, money, human capacity like roles and responsibilities, student competencies and other skills, community support for decision making, and others) and balance tradeoffs among all the learning responsibilities schools have. Few studies in the literature explicitly examined the relationship between how resources were allocated and the success of PBL implementation. Eickholt, Jogiparthi, Seeling, Hinton, and Johnson (2019) investigated adult students' perceptions of PBL in more expensively resourced college computer labs compared to less expensive ones. They found that there are ways to facilitate PBL without expensive equipment and that students perceived the learning experience just as well in both settings. This supports the hypothesis that project-based learning does not require expensive classrooms nor technology infrastructure to be well-received by students.

RESEARCH METHODOLOGY

THREE

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Research inquiry areas

In order to answer our research questions, we used an exploratory, descriptive, mixedmethods approach to understand and document the lived experiences of educators as they navigated decisions and made design choices about implementing project-based learning in their own schools and classrooms.

We recruited participants from around the world through convenience sampling and snowball sampling via our existing professional networks and through online channels. We initially aimed to primarily engage school designers and leaders, including both administrators and teacher leaders, especially those who were involved in their school design or other similar process of developing and leading implementation of project-based learning at their school. We also included school system leaders (including district, government, and charter management organizations or independent school leaders and founders) and classroom teachers as participants.

Our goal was to include 20 to 100 participants from around the world. After receiving ethics review approval in Qatar, we began recruitment in Bangladesh, Brazil, Canada, China, Ecuador, Greece, India, Malawi, Malaysia, Oman, Pakistan, Qatar, South Africa, Turkey, the United Kingdom, and the United States of America. From these initial efforts, we were eventually referred to individuals from additional countries who participated.

To take part in this study, participants were asked to either:

- Complete an online survey which asked about their experiences in implementing (or exploring whether to implement) project-based learning, or
- 2. Participate in an online interview with the researcher(s) in which they were asked to describe in detail their experiences in implementing (or exploring whether to implement) project-based learning.

The specific measures used in this study were researcher-developed, but based on a series of informal conversations with researchers and educators familiar with project-based learning, along with data from the Canopy Study conducted by the Clayton Christensen Institute⁴ in 2019. We devised a series of interview questions that we also adapted for the online survey to investigate how sustained and unsustained models of PBL were implemented, and what decisions were being made about resources. We wanted to know where school designers and leaders were able to prioritize scarce resources to overcome these challenges, and where they were unable to do so.

The online survey of an anticipated 20 schools or school systems (including, for example, public school districts, charter school systems, private schools systems, and others) gathered demographic, quantitative, and qualitative data about the school(s) where the participant worked. This included the extent to which the participant considered it to be a low-resource setting, if and how project-based learning (or other models that include similar core instructional components, as defined by the participant) was implemented there, and the challenges or barriers they experienced to implementing project-based learning.

Our interview of an expected minimum of eight schools or school systems produced much of the same information as the survey, but qualitatively in a much more openended conversation. We did not record these interviews, but relied on live transcripts automatically generated in real time by Otter.ai software, and the interviewer's notes to capture all of the information to be analysed. After conducting the interviews, we completed "member checks" with our interview participants in which they were asked to review our findings and any quotes that pertained to them and to provide approval before we published them.

⁴ https://www.christenseninstitute.org/wp-content/uploads/2019/09/The_Canopy.pdf

The quantitative and qualitative data were analyzed descriptively, using summary statistics like frequencies of quantitative data, thematic analysis of open-ended responses to document any trends arising from participants' lived experiences, and gap analysis of themes that arose from survey and interview data.

Limitations

As with all studies, there are some limitations to this one as designed. Any convenience or snowball method for recruiting participants to a study can lead to a biased dataset and eventually skewed or one-sided analyses and recommendations. To mitigate this limitation, we tried to anticipate potential sources of bias as we began recruiting, and as we included more participants we noted where potential biases persisted, which we outline here.

As previously mentioned, we expected that the global pandemic would limit participants' ability and desire to participate in online interviews, and lead to more survey responses—which was the opposite of what happened. Similarly, while we anticipated not being able to recruit sufficient participants from low resource contexts, ultimately far fewer of our participants described their contexts as being high resourced. Finally, we talked with at least two participants whose PBL model was being implemented at multiple sites, potentially in multiple ways. All of these together impacted our ability to develop a clear understanding of the similarities and differences of challenges and barriers to implementing project-based learning between schools that were in similar low-resource settings. To mitigate this risk, we implemented a member-checking protocol, in

which participants were asked to review the findings for their PBL case only, and indicate their agreement with how we classified them. Most participants who responded to this member-check said our classification was aligned with their understanding of their model and the frameworks we used. In three cases, participants disagreed with some or many of our classifications, and provided explanations as to why. We changed those classifications when it was clear that they understood the frameworks we were using and their PBL cases were misclassified in our first analysis. We instead changed our descriptions and explanations where we realized that our understanding of a PBL case aligned with our participant's understanding, but their understanding of the classification framework was misaligned with ours.

Similarly, there may be wide variation in the field (and thus in our sample) in the definition of project-based learning, as opposed to problembased learning, inquiry-based learning, and/ or design-based thinking instructional models. To mitigate this potential problem we asked all participants who indicated they were not currently implementing PBL whether they were implementing other similar learning models instead.

While these limitations are real and affect the extent to which we can generalize the findings from this study, we also wish to caution readers of this document that this study is a preliminary, exploratory first step in documenting the nuances of designing project-based learning in low resource contexts. None of our findings, therefore, should be considered the final say or broadly generalizable.

FINDINGS: PATTERNS IN PBL: AN OVERVIEW FROM AROUND THE WORLD

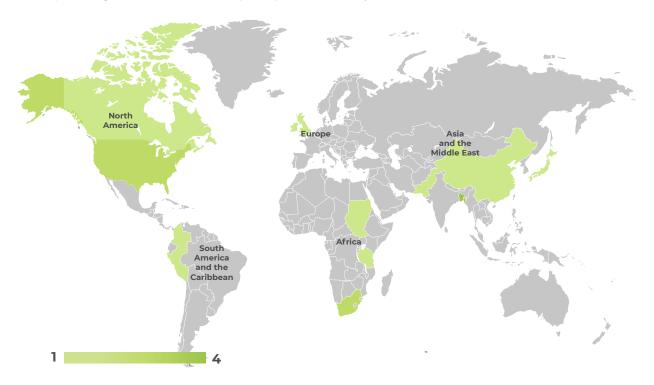
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FINDINGS: PATTERNS IN PBL: AN OVERVIEW FROM AROUND THE WORLD

27

Ultimately, interviews proved to be more popular with participants than the survey. A total of 21 interviews were conducted (one with two interviewees from a single site), and we received nine survey responses. These 31 participants had a range of roles, from teachers (sometimes called guides, mentors, or facilitators), in-school heads of content or subject area departments, school leaders and administrators, to school designers, and founders of independent schools, to heads of nongovernmental and nonprofit organizations. After consolidating participants from the same sites where the model was implemented in the same way, we analysed the responses from 24 distinct PBL cases. Participants spoke about PBL cases in 17 countries from five regions of the world (as illustrated in Figure 4.1 Africa, Asia and the Middle East, Europe, North America, and South America and the Caribbean), with one site providing humanitarian and educational services to a displaced community, and one program designed for, and being used by, over 70 countries worldwide.

Figure 4.1



Map showing location and number of participants in this study

We found that 18 of the 24 PBL cases in our sample were sustained and currently ongoing, with plans to continue in future years; the remaining six either didn't sustain PBL at their site or considered but decided not to implement PBL at all. Also, participants described the majority of cases (16 of the 24) as occurring in low resourced contexts, and eight as happening in high-resource settings. The definition of "low" and "high" was left up to each participant. But in addition to financial resources, all participants considered student needs, the economic and language status of local communities they were in and aiming to serve, their school's access to facilities, resources, and materials, as well as their social networks in defining overall levels of resources.

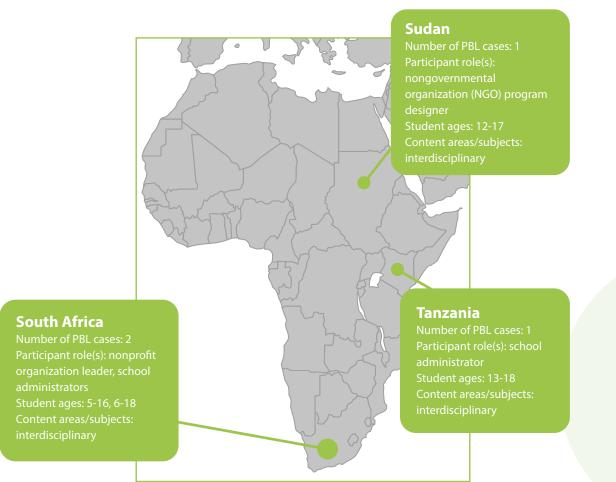
More specific details about each case are discussed by region below. Upon the request of participants, we have tried to preserve the anonymity of each case by using broad categories and not specifying quantitative descriptive data since the number of participants from each country is quite low.

Africa

Five participants shared about PBL cases in three countries in Africa: South Africa, Sudan, and Tanzania, illustrated in Figure 4.2. These four PBL cases included a mix of high- and low-resourced contexts, as well as a mix of sustained, and unsustained project-based learning initiatives.

Figure 4.2

Map showing location and number of participants from Africa



Asia and the Middle East

Seventeen participants shared about PBL cases in the seven countries shown in Figure 4.3 in Asia and the Middle East: Bangladesh, Cambodia, China, Hong Kong, Japan, Qatar, and Pakistan. Several of these came from the same site, one served a displaced community, and one model was used by over 70 countries around the world. These eleven unique cases included a mix of high- and low-resourced contexts, as well as a mix of sustained, and unsustained project-based learning initiatives.

Figure 4.3

Map showing location and number of participants from Asia and the Middle East

Pakistan

Number of PBL cases: 1 Participant role(s): school designer and school administrator Student ages: 4-15 Content areas/subjects: interdisciplinary

China

Number of PBL cases: 1 Participant role(s): former teacher Student ages: 5-17 Content areas/subjects: primarily STEM (science, technology, engineering, and mathematics)

Japan

Number of PBL Cases: 1 Participant role(s): Teacher and Teacher Trainer Student ages: 15-17 Content areas/subjects: primarily STEM

Qatar

Number of PBL cases: 3 Participant role(s): nonprofit leader, school head of department, school administrator, Student ages: 4-14, 9-12, 11-15 Content areas/subjects: multiple subjects, interdisciplinary

Bangladesh

Number of PBL cases: 4 Participant role(s): school designer, School designer, university-based School designer, school designer and School system administrator, Student ages: 0-6, 3-5, 4-5, 9-10 Content areas/subjects: developmental domains

interdisciplinary

Hong Kong

Number of PBL cases: 1 Participant role(s): school designer and school system administrator Student ages: 2-6 Content areas/subjects: developmental domains

Cambodia

Number of PBL cases: 1 Participant role(s): cofounder, school designer, and schools ystem administrator Student ages: 12-18 Content areas/subjects: interdisciplinary

Europe

Two participants shared about PBL cases in two countries in Europe (Figure 4.4): Denmark and England. These cases included a mix of high- and low-resourced contexts, as well as a mix of sustained, and unsustained project-based learning initiatives.

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Figure 4.4

Map showing location and number of participants from Europe

Denmark

Number of PBL cases: 1 Participant role(s): school designer and school administrator Student ages: 6-16 Content areas/subjects: interdisciplinary

England

Number of PBL cases: 1 Participant role(s): school designer and school administrator Student ages: 3 - 18 Content areas/subjects: interdisciplinary

North America

As can be seen in Figure 4.5, four participants shared about PBL cases in two countries in North America: Canada (in the province of British Columbia) and the United States (in the states of California and New York). These cases represented mostly low-resourced contexts, and sustained project-based learning initiatives.

Figure 4.5

Map showing location and number of participants from North America

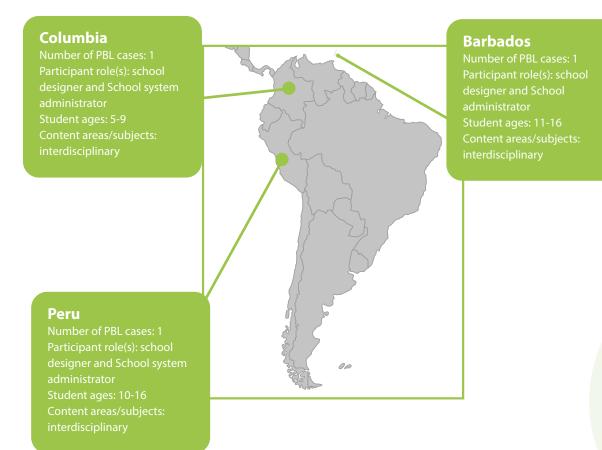


South America and the Caribbean

Three participants shared about PBL cases shown in Figure 4.6, in three countries in South America and the Caribbean: Barbados, Columbia, and Peru. These cases were mostly in low-resourced contexts, and a mix of sustained, and unsustained project-based learning initiatives.

Figure 4.6

Map showing location and number of participants from South America and the Caribbean



Social capital

As we conducted interviews, a curious pattern began to emerge. We noticed that apart from the challenges we expected to hear about, most of our participants mentioned the outsized role that relationships played in their ability-or inability-to implement PBL sustainably in their learning environments. Coupled with this, we found examples of sustained implementation in contexts where knowledge, motivation, and organization challenges were present, and conversely, we found examples of unsustained implementation in contexts where all of the knowledge, motivation, and organization challenges could be overcome. There seemed to be another dimension of potential resources and challenges that could fill in missing resources, or present unforeseen challenges, in implementation. This missing dimension was exemplified by relationships, networks, and trust, all of which appeared to exist outside of the knowledge, motivation, and organizational gaps captured in the Gap Analysis Framework (Clark & Estes, 2008).

These resources seem to be best described by the concept of social capital, defined as, "the resources that arise from a web of relationships which people can access and mobilize to help them improve their lives and achieve their goals, which inevitably shift over time." (Scales, Boat, & Pekel, 2020, p. 9). In this study, participants described how their web of relationships gave rise to (or, in some cases, prohibited) trust, flexibility in decision-making, autonomy, an ability to take risks and leverage motivation, and the ability to define or demonstrate success of PBL implementation among all the stakeholders in their learning communities, including students, families, teachers, school leaders and designers, administrators and policymakers, and other community stakeholders like experts and businesses. This led to decreased power dynamics among stakeholders and more opportunities for PBL cases that ultimately were sustained.

In alignment with the gap analysis framework and the ways in which we broadly define resources and challenges within knowledge, motivation, and organizational domains, our definition of social capital here is broader than others. For example, we include trust, flexibility, and buy-in-and the autonomy in decisionmaking and implementation that these allowas social capital resources, while others have conceptualized this aspect of relationship as more the result of social influences⁵. In any case, we view these as resources and challenges that stem from the number, quality, and strength of relationships that a school or system had access to when making decisions about implementing PBL.

For example, there were two cases that reported very similar contexts, both of which were considered to be high-resource. They both had supportive organizations in the form of administrative and policy support, motivational resources in the form of teachers and students who were engaged and willing to experiment with a new learning model, and knowledge resources in the form of professional development and curricula to guide implementation. But one case thrived and was sustained to the present, while the other, according to the participant, ended after only a year or two. Both sites reported that teachers all valued PBL and found it effective with their students. The difference, according to our participants, was the trust that existed among the learning environment, its community, and administrators in the broader (government) school system.

In the sustained implementation, school leaders were allowed by their regional administration to work with teachers for an entire year before using PBL with students. Leaders gave teachers the opportunity to see and try PBL, and at the end of the first year, teachers were asked to commit to PBL as a core instructional model in order to continue at the school, or opt for placement at a different school which did not require such a commitment. Both the local community—including families as well as businesses that were participating in projects and the school's district were supportive of this approach.

⁵ <u>https://www.christenseninstitute.org/blog/is-k-12-transformation-post-covid-realistic/</u>

In the PBL case that was not sustained, teachers were trained and supported in implementation, but there was not that same trust from the school community and district. In fact, families and businesses were, at best, indifferent to the model and remained largely uninvolved. The administration saw their role as managers, and required monitoring and compliance paperwork that added hours of effort to each teacher's workday. Even though this case had broad resources across the knowledge, motivation, and organizational domains, the lack of trust and supportive relationships made PBL implementation unsustainable.

In a third PBL case, there was in fact no policy support for the model, but there was community support. This case existed within a self-described low-resourced context, unlike the two cases described previously, suggesting that PBL might be an unsustainable instructional model there. PBL, however, is now a core instructional model, and indeed a signature of the learning community, having been sustained for years. PBL is a reason that students enroll there today. When PBL was first implemented in this learning environment, they understood the broader community support that they had, and so they quietly refined their implementation inconspicuously until they had a model that worked for them, their teachers, and their students. Only then did they invite government officials to come and observe PBL at work in their school, and this visit is what led them to eventually gain broader organizational administrative and policy support for the model.

As we continued to analyse our interviews and survey responses, it became clear that social capital itself can be a resource or a challenge to PBL implementation, and that networks, relationships, and trust are often-overlooked contributors to the level of resources in any given implementation context. Participants even mentioned that people and relationships were a far greater resource than money could ever be, as illustrated by the following quotes from six different participants:

"I think having diversity within the process and the construction of that school enriches the thing you're building, and that goes from talking with potential parents, students, teachers, other learning communities, going to learn what others are doing to identify what works and doesn't work, and then upon that try to build your own identity and your own model, I think you have to read, listen, explore, and also create conversations to build what you want to do."

"...it was all scrappy and I want to make that point because it is possible. You don't need a lot of funding to do this, you can do it for totally free, as long as someone somewhere has the will to do it."

"I think it could be a really good tool for even low resource contexts and contexts where people are not that well-trained. It's really a tool which is very intuitive, it's a way of teaching and learning which is very intuitive. It's a real journey using everything around you in a very practical way. And I think that if we demystify it a little bit, and don't necessarily hold ourselves to all the same ideals, but retain the essence of what PBL is about, it's really doable in these kinds of contexts. Inquiry can bring phenomenal learning, because kids in these contexts have to be go-getters, and in so many ways they have a lot more innate resourcefulness and innovativeness, because they are forced to, because of the low resource context they live in."

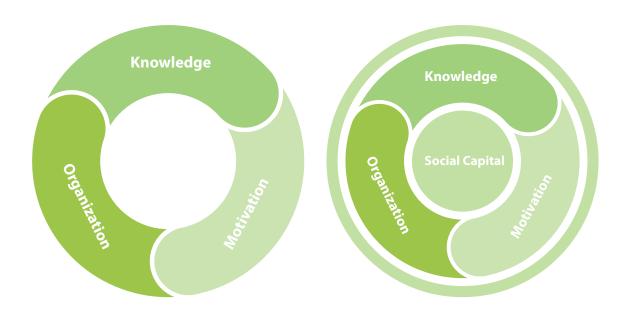
"I only focus on the people [human] resources. No one can replace it. Nothing. Because if you have a group of people, they can help you to draw money, facilities, and many, many other things. So that is the most important thing. If you get a group of trained teachers, you've got everything." "One of the things that we talked about a lot in my current environment is this idea that you have to play the game that exists in order to play the game that you want to play. And I think about that a lot in the context of PBL, which is in bringing the families along. Families often have a rational reason why they are educating their children, and particularly in low resource environments there are reasons - it's often economic, but it's not always economic - sometimes it's also around a sense of esteem, and being able to show that you're doing the "right" thing, whatever that is. There are lots of reasons. And, what I've seen in pretty much every place where we've been able to do PBL effectively, is the fact that we're able to show families that they're getting the benefits that they wanted to get in the first place. And then we're able to show, and on top of those, you're also getting these other benefits."

"The way to get resources can differ from context to context, but what you need are the people to frame and mentor."

Turning back to the Clark & Estes (2008) gap analysis framework, it may be that social capital is a fourth domain that is central to, and encompassing, knowledge, motivation, and organizational factors in implementing PBL. Moreover, social capital may act to fill the gaps created by knowledge, motivation, and organizational challenges to PBL implementation. This idea is captured in Figure 4.7. The gap analysis framework as conceptualized by Clark and Estes, and used by many across several fields since 2008 is represented on the left. The role that social capital (both relationships and the other resources those relationships lead to, such as trust, buy-in, flexibility, and autonomy in decision-making) may play in filling in remaining gaps as well as reinforcing the domains in which there aren't as many gaps is illustrated on the right.

Figure 4.7

Illustration of the potential role that social capital can play in filling knowledge, organization, and motivation gaps



COVID-19

Similarly unanticipated as the emergence of social capital as a key component of gaps, was the uneven impact of COVID-19 on projectbased learning from place to place. A handful of participants specifically mentioned COVID-19 as having a positive or negative impact on PBL implementation. Some stated that the pandemic had a more positive effect in that the PBL model was not competing against other, usually in-person, instructional models. Others mentioned that PBL was discontinued at least temporarily (whether or not they planned to continue using the model in the longer-term) during the pandemic, and especially during remote learning necessitated by guarantines and physical distancing.

For those choosing to implement PBL during remote learning, projects were generally completed by individual students rather than groups. Initial guidance and direction was provided by the teacher from a distance, i.e. online, over the phone, or however teachers were holding lessons in that context, and any guiding materials and resources that were available were distributed to students along with other (digital or print) learning materials.

For those who were able, PBL implementation during COVID-19 remained much as it was in pre-COVID-19 times. Residential school sites seemed to fare especially well, although the impact of COVID-19 on PBL implementation did not seem to clearly differ along the dimensions sustainability and level of resources that were most apparent in our group of participants.

PBL cases that were sustained and unsustained, or in high- or low-resourced contexts, were equally likely to respond to the pandemic either by using PBL as an opportunity, or by stopping PBL while focusing on other instructional models.

Dimensions of Decision-Making

Innovators have long recognized that effective decision-making requires acknowledging that two seemingly opposing ideas can both be true. Further, it is often the case that making the most beneficial choice between two apparently contradictory paths forward requires understanding the benefits and challenges of either choice, as well as the context in which the choice is being made (Martin, 2007, The Learning Accelerator, 2019⁶, Transcend Education, 2020⁷). For educational innovators, this both/and thinking has perhaps never been more necessary than during the pandemic when conditions beyond anyone's control challenged all of our beliefs about the contexts in which our schools operate.

We found that our participants were making use of both/and thinking, perhaps implicitly, when making decisions about implementing project-based learning for their students, and in their communities. Broadly, we found six such dimensions that loosely outline possible answers to the "how, where, why, when, what, and who" questions of embarking on projectbased learning. The names of the dimensions describe the two extreme ends of the spectrum in terms of the choice that is being made.

Of course, most if not all PBL implementations are a mixture of the two extremes on any dimension. However, as we will describe later, all of the PBL cases described to us usually fell closer to one extreme than the other within each dimension. In addition, a few of the cases included in this study used the same model across various sites, leading to inevitable differences in implementation across sites, but not large enough differences in decisionmaking to consider them distinct cases for the purposes of this analysis. In such cases, the member-check was used as a first level of checking the reliability of our classifications,

⁶ https://practices.learningaccelerator.org/strategies/whitepaper-look-both-ways_

⁷ https://www.transcendeducation.org/6-tensions-for-school-recovery_

and where absolute consensus could not be reached, broad agreement between the researcher and the participant was sought. Ultimately, the researchers' classifications were weighted only slightly more heavily than the participants's, given the participants' deep knowledge of their individual case and the researchers' broader view—from the perspective of these dimensions—across all of the cases included in the study.

The six dimensions we noticed, summarized in Figure 4.8, are:

- Core instructional model vs. supplemental activity: How should we use PBL? Will projects be the primary means for daily instruction or will they be occasional activities that supplement daily instruction?
- 2. Community-driven vs. curriculumaligned projects: Where should our projects' driving questions come from? Will they come from the needs of our community or from our need to cover curricular content?

- 3. Student agency vs. broad learning experiences: Why should we implement PBL? Is our goal to advance learner agency, or enhance learner experiences?
- 4. Academic vs. non-academic skills: When in our students' developmental trajectory should PBL be used? Will projects primarily focus on developing their academic skills, or their non-academic skills?
- 5. Standardized vs. individualized: What will our PBL model be? Will we use or develop a more prescriptive, guided model or one that requires teachers and students to co-design a more flexible model?
- 6. Concentrated vs. diffuse: Who should we implement PBL with and for? Will PBL primarily support certain teachers and students, or all teachers and students across our school or system?

Summary of the six dimensions along which implementation choices were being made, and for each, the two extreme ends of the spectrum

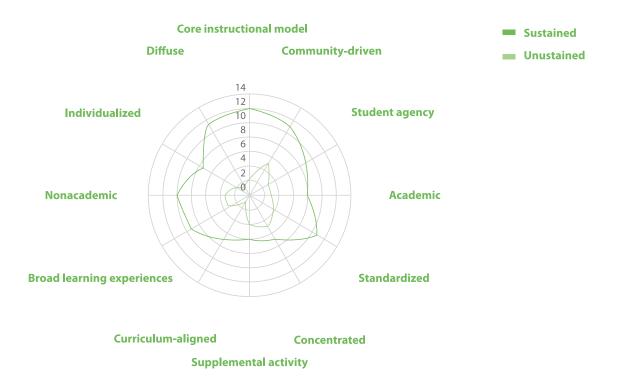
Core instructional model Schools choose to center PBL in all of the instruction they do.		 How should we use PBL? Will projects be the primary means for daily instruction or will they be occasional activities that supplement daily instruction? 	Supplemental activity Schools choose to use PBL as and when needed.
Community-driven projects Projects are centered in real-world issues faced by students' own communities.		 Where should our projects' driving questions come from? Will our projects' driving questions come from the needs of our community or our need to cover curricular content? 	Curriculum-aligned projects Schools choose aligned curricula and standards in order to generate projects.
Student agency PBL is used for students to realize their own role responsibility in their learning.	Why	 Why should we implement PBL? Is our goal to advance learner agency, or enhance learner experiences? 	Broad learning experiences PBL is selected to broaden learning experiences beyond in-class learning.
Academic skills PBL is used for learning academic skills (e.g., math and science).		 When in our students' developmental trajectory should PBL be used? Will projects primarily focus on developing their academic skills, or their nonacademic skills? 	Non-Academic skills PBL is meant for students to gain non-academic skills (e.g., civics/citizenship, advocacy).
Standardized The administrative guidance and support provided foster a consistent model of PBL.		 What will our PBL model be? Will we use or develop a more prescriptive, guided model or one that requires teachers and students to co-design a more flexible model? 	Individualized Individuals choose what the model looks like in their learning environment.
Concentrated Schools choose to focus on a particular grade level, age, or content/subject.		 Who should we implement PBL with and for? Will PBL primarily support certain teachers and students, or all teachers and students across our school or system? 	Diffuse Schools choose to use PBL across the whole school or system.

The radar charts in Figures 4.9 and 4.10 present each dimension on its own axis to show the number of cases (out of the 24 total cases) that elected each choice within a dimension, broken out by model sustainability (sustained vs. unsustained) in the first chart, and level of resource (access to a low vs. high level of resources) in the second.

For example, 12 of the cases that chose to implement PBL as a core instructional model were sustained, while two that chose this approach were unsustained.

Figure 4.9

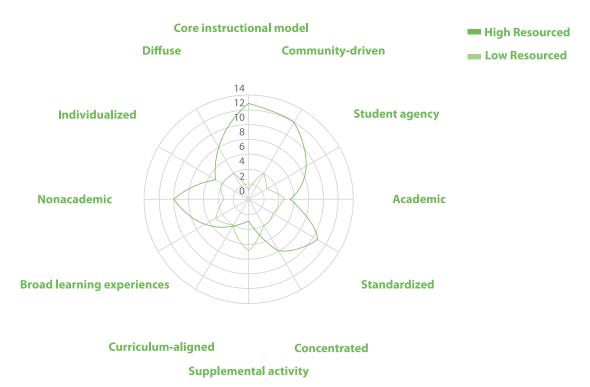
Radar chart illustrating the frequency with which choices were made along each dimension by sustainability



Similarly, 13 of the cases in low-resourced contexts opted to implement PBL as a core instructional model, while only one case in a high-resourced context chose this approach.

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Radar chart illustrating the frequency with which choices were made along each dimension by level of resource



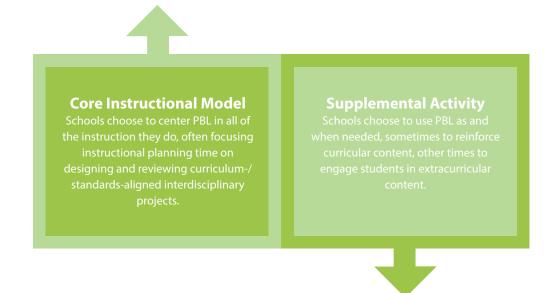
Similarly, 13 of the cases in low-resourced contexts opted to implement PBL as a core instructional model, while only one case in a high-resourced context chose this approach.

As we describe these dimensions and seemingly opposite choices below, we have included quotes from our participants that illuminate what each choice looked like in various contexts. Because each interview and survey was unique, we found that while all participants self-identified as making one choice or the other within each of the six dimensions, we did not have an accompanying descriptive quote about every dimension from each participant. Therefore, there are cases where we ideally would have included a quote from a particular context that seemed relevant to the choice being made, but were unable to do so.

Core instructional model vs. supplemental activity

When our participants were first considering or designing PBL for their learning community (including students, families, teachers, administrators), they asked to what extent PBL should be used as a primary instructional model, shown in Figure 4.11. Some PBL cases used projects as a "core instructional model". In these cases, PBL was central to all of the instruction happening in the learning environment. Often, this meant implementation focused instructional planning time on designing and reviewing interdisciplinary projects, or projects across the developmental range of a subject or content area. Other cases employed PBL to provide supplemental activities. These used PBL as and when needed, sometimes to reinforce curricular content, and at other times to engage students in extracurricular content. Supplemental use of PBL also included cases where the PBL model was being implemented by others, perhaps in partnership with the school, but alongside the more typical school model and day.

Description of opposing choices that participants made about how to implement PBL



Findings

Based on both our survey and interview respondents, 14 (58 percent) of PBL cases used PBL as a core instructional model for their students (see Figure 4.12). Of these, most (12, or 86 percent) had sustained implementation (shown in Figure 4.13).

Figure 4.12

Proportion of cases implementing PBL as a core instructional model versus a supplemental activity

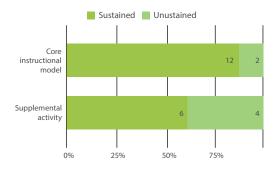


As shown in Figure 4.12, ten cases (42 percent) elected to implement PBL in their supplemental learning activities; a slight majority of these (six, or 60 percent) also had

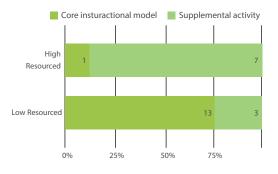
sustained implementation, suggesting little to no relationship of either choice to be made in this dimension and the sustainability of PBL implementation, illustrated in Figure 4.13.

Figure 4.13

Bar charts comparing the number of sites implementing PBL as a core instructional model versus a supplemental activity by sustainability (left) and level of resources (right)



In contrast, level of resources seemed to be more strongly related to which choice was made. Seven of eight, or 88 percent of cases in high-resourced contexts elected to use PBL supplementally, while 81 percent (13 of the 16) cases in low-resourced contexts chose it as a core instructional model (Figure 4.13).



Examples

Table 4.1 includes descriptions of both of these apparently conflicting choices about "how" projects should be implemented in their instructional model in our participants' own words. Although the level of resources was found to be related to which choice was made, we did not have a descriptive quote about using PBL as a supplemental activity to include here.

Table 4.1

Participant's descriptions of how they implement PBL

	ore Instructional odel	Supplemental Activity
In o PBL dec corre syst "On be p we thro 15-2 syst ade of le high class cou	resourced ne case, which was a sustained model, this is how and why the ision to use PBL as part of the e instructional model in a school em was made: e of the things we think could bossible and powerful is how can show, throughout time and bughout scale when we have 20,000 students in the school em we're developing, that it's quate to have a different type earning process that provides a in quality education for a middle s and vulnerable families in our ntry without following the same d curriculum, structure, as the al system."	Low resourced This participant described how and why a supplemental model of PBL, alongside and outside of the conventional school day, was selected and ultimately sustained: "We have a national curriculum. In the curriculum projects are written primarily as an assessment option that most teachers don't use, so our initiative is trying to formalize projects, to make them easier for teachers to adopt and use in their classrooms. The way the curriculum is currently set, there is a very specific set of weeks in the school term in which teachers can do projects. So our initiative is about creating scripts for projects, and then making those available to teachers who can just pick them up and run with them by themselves; and also training teachers to use them."

Unsustained

Low resourced

This unsustained PBL model was designed to be a core instructional model for the following reasons: "Based on all of our constraints, we decided to implement projectbased learning from fifth graders all the way to ninth graders. We decided that math and English as a Second Language would not be part of PBL, but we decided to integrate all of the other subjects in different levels. We chose units but if there was a topic across units, then we decided how we would implement it from grade five to grade nine. We have a specific way of using projects within our unit sessions so we used that methodology. It was kind of like a building block that we already had developed in our teachers and our students, so we built on top of that."

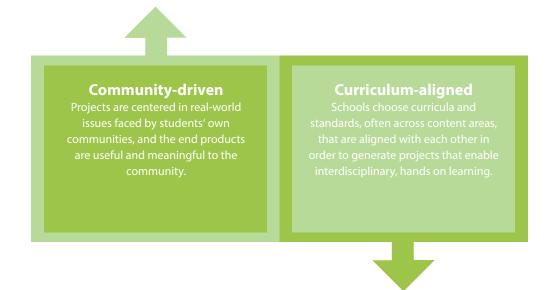
Low resourced

A supplemental model (which was ultimately unsustained) was selected in this case because: "I think we recognized very quickly that what we needed to do was build something that was going to be supplemental to the system, and non-threatening to the system. And so, we didn't necessarily look at any of the formal PBL-type models. We just started from an asset-based view of the community to say, 'What are the skill opportunities that exist within this community?' where we could focus on building some kind of real-world-ish projects that students could engage in."

Community-driven projects vs. curriculum-aligned projects

The central question that students work on is the foundation of any project. These questions can be designed from a variety of perspectives, and often outline the "how" of PBL implementation. In this study, participants mostly identified two potential sources of questions or problems for students to learn from (Figure 4.14). Some used problems or questions that are "community driven" or centered in real-world issues faced in the students' own communities, and for which the end products are useful and meaningful to the community (broadly defined). Another approach was to use questions or problems that were "curriculum-aligned", designed from curricula and standards—often across content areas/subjects—that are aligned with each other in order to generate projects that enable interdisciplinary, hands-on learning.

Description of opposing choices that participants made about where to implement PBL



Findings

A full two thirds (16 or 67 percent) of PBL cases (shown in Figure 4.15) used community-driven questions or problems for their students. Of these, most (11, or 69 percent) had sustained implementation, as can be seen in Figure 4.16.

Figure 4.15

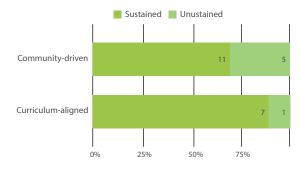
Proportion of cases implementing PBL using community-driven versus curriculum-aligned project questions

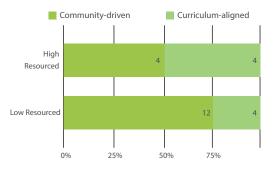


Alternatively, eight cases (33 percent) elected to use curriculum-aligned driving questions in their PBL implementation, making this the least popular choice across all options in all dimensions. Almost all of these (seven or 88 percent) also had sustained implementation (Figure 4.16). Given that implementation was sustained in large proportions across both of these choices, it appears that this particular dimension is not related to the sustainability of PBL.

Figure 4.16

Bar charts comparing the number of sites implementing PBL using community-driven versus curriculumaligned project questions by sustainability (left) and level of resources (right)





Similarly, this preference for communitydriven core questions remained—although it appeared weaker—when parsing the data by the level of resources available to support implementation, as in Figure 4.16. Half of cases in high-resourced contexts (four, or 50 percent) selected community-driven projects, while 12 (75 percent) of cases in low-resourced contexts also chose community-driven project questions.

Examples

This distinction between "how" to implement through community-driven, and curriculumaligned projects is best made by our participants in their own words in Table 4.2.

Table 4.2

Participant's descriptions of where they implement PBL

	Community-driven	Curriculum-aligned
Sustained	Low resourced PBL is based on community-driven questions, broadly defined, in this sustained PBL case: "Typically, they're engaging in some sort of question that's complex or a challenge, or a problem of some kind. In a true project-based learning situation students are investigating something that's of relevance to them that has an impact on their community in some way, whether it's their immediate community within the school; or the community that their school resides in; or the largest 'human community', as it were."	Low resourced Designing within a more conventional culture and system system influenced this sustained PBL case to choose more curriculum-aligned questions: "In our society most people think STEM [science, technology, engineering, and mathematics] is more important [than socio- emotional learning, SEL]. Why? Because STEM is technology. Technology means being creative, it means innovation, it means Facebook, Google, Silicon Valley. Which means what? Means a good job, good pay, good life.
	community, as it were.	So that's the reason I emphasize STEM. Another reason is because of culture. They say that if a person can do good in math and science, a so-called 'scientist mathematician', people admire those professions right? That's the reason most of the projects are in STEM. Another reason is that STEM is easy to achieve and it is easy to demonstrate, to do the exhibition. So you do something you can present."

Sustained, but in a unique context Low resourced, and representative of many sites in the same case from the survey, but one of these reported unsustained implementation.

Although part of a larger system in which PBL is sustained, this particular case describes an unsustained model that selected community-driven projects: "In the program, we have designed activities based on culture, theme and developmental milestones, and domains."

High resourced

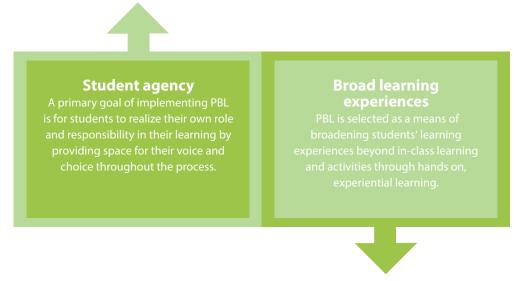
This sustained PBL model from a high resource context chose curriculum-aligned project using a more formal process: "At elementary level, the PBL

journey we went on was: in our initial training we followed the hexagon approach where you take your entire curriculum, you put it all out until it's small pieces on the hexagons and you see which ones fit together, and then those are the subjects that you can weave in."

Student agency vs. broad learning experiences

Explicitly identifying the "why" of PBL implementation was, predictably, a key question to be answered when deciding if and how to use the model, outlined in Figure 4.17. Some participants implemented PBL to achieve student agency, in order for students to realize their own role and responsibility in their learning by providing space for their voice and choice throughout the process. On the other hand, others implemented primarily to enhance learning experiences, as a means of broadening students' learning experiences beyond inclass, typically didactic, learning and activities through hands-on, experiential learning.

Description of opposing choices that participants made about why to implement PBL

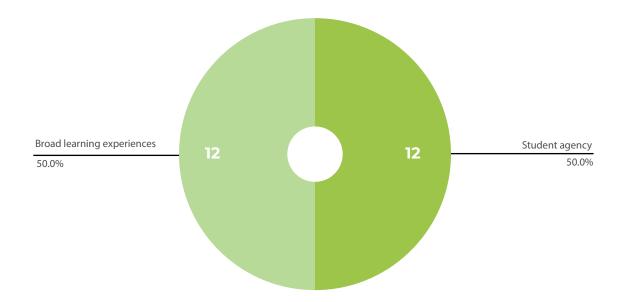


Findings

As Figure 4.18 shows, exactly half of our cases (12) reported implementing PBL to achieve greater levels of student agency. Of these, the majority (nine or 75 percent) had sustained implementation, shown in Figure 4.19.

Figure 4.18

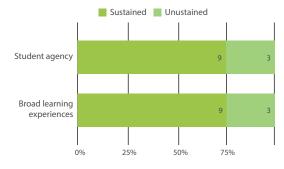
Proportion of cases implementing PBL to enable student agency versus broad learning experiences

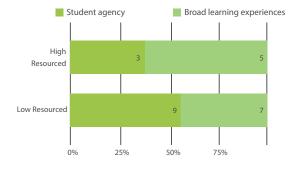


The remaining 50 percent of cases elected to implement PBL in order for their students to gain broader learning experiences (Figure 4.18); the same proportion of these (nine, or 75 percent) also had sustained implementation (see Figure 4.19), suggesting that the sustainability of PBL implementation bears no relationship with either goal of PBL.

Figure 4.19

Bar charts comparing the number of sites implementing PBL to enable student agency versus broad learning experiences by sustainability (left) and level of resources (right)





In contrast, level of resources seemed to be weakly related to which goal was driving PBL implementation. Five (or 63 percent) of cases in high resource contexts implemented PBL to achieve broad student learning experiences, while a similar proportion, 56 percent (nine of 16) cases in low-resourced contexts chose it instead to achieve more student agency (Figure 4.19).

Examples

Here in Table 4.3 are descriptions of both of these opposing choices about "why" PBL would benefit their students in our participants' own words.

Table 4.3

Participant's descriptions of why they implement PBL

	Student agency	Broad learning experiences
Sustained	Low resourced	Low resourced
	This sustained PBL model was designed to give students agency in their learning because of a human- centered design value that the school has: "By definition, human-centered endeavors [in this case, PBL] are informed by the insights, ingenuity, and impulse of individuals who are living an experience or set of experiences that are dynamic and fluid, and, often, social. A human- centered approach treats the individual and their relationships to self and others as more instructive for [instructional] design than any meaning or utility presumed inherent in a tool or activity."	This play-based PBL model, which was ultimately sustained, chose to use projects as a means of augmenting more conventional learning experiences: "In the curriculum there are a couple of activities, and we have divided the activities under relevant developmental domains. So, for language development, there are some activities there, for physical development, or social-emotional development. For example, for self-regulation, there are so many play activities, so all of the children are actually playing, they are engaged in some activity, but the skill they are getting through this activity, clearly, the play leader is facilitating."

Sustained, but in a unique context

High resourced

This play-based PBL model is implemented in a high-resource context, and was designed to support young students' agency: "I think we let [our two to six year old] students hold the learning. We are the adults who have to follow their interests, and give them place, pace, and the equipment they need to use. The core of the implementation was activities that include the elements of children-centered pedagogies: follow the interests, let them have free exploration and construct knowledge by observation and their hands-on experience. That's our school."

Low resourced

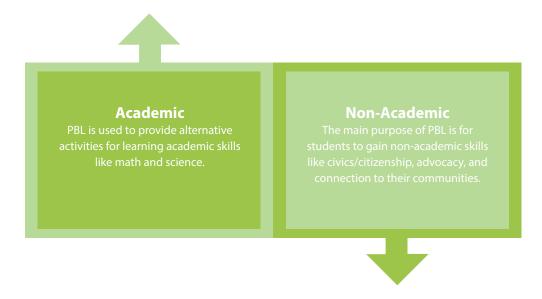
PBL was designed to give students engaging learning experiences alongside remote learning in response to COVID-19 in this sustained case:

"Right now, project-based learning is going to be implemented for all of our schools. Because of COVID we decided to use PBL to mitigate learning loss, thinking maybe we can use these interventions [projects], so we can have some sort of learning activities so that the students stay engaged and we can ensure long term retention of the content."

Academic vs. non-academic skills

In thinking about "when" in the developmental trajectory of learning PBL could be useful (Figure 4.20), participants selected which skills implementation should focus on. Some used PBL for students to develop academic skills by providing activities for learning academic content like mathematics, science, or even creative writing. Others used PBL for nonacademic skills development for students to gain skills like civics, citizenship, advocacy, and connection to their communities through culture- and language-based projects.

Description of opposing choices that participants made about when to implement PBL



Findings

Almost half of the cases we studied (11, or 46 percent) focused PBL on academic skills (Figure 4.21). Of these, most (eight or 73 percent) had sustained implementation, as in Figure 4.22.

Figure 4.21

Proportion of cases implementing PBL for academic versus non-academic skills

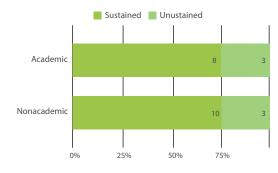


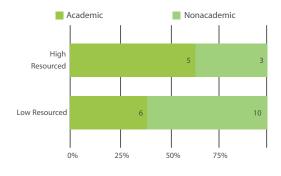
Almost the same number of cases (13 of 24, or 54 percent; Figure 4.21) instead focused on non-academic skills, and most (ten or 77 percent) also experienced sustained implementation (Figure 4.22), displaying

no relationship at all between the types of skills implementation focuses on and the sustainability of PBL implementation.

Figure 4.22

Bar charts comparing the number of sites implementing PBL for academic versus nonacademic skills by sustainability (left) and level of resources (right)





Alternatively, as shown in Figure 4.22, the level of resources seemed somewhat related to the type of skills selected for PBL focus. A little over half, five of eight, or 63 percent of cases in high-resourced contexts elected to use PBL for academic skills, while 38 percent (six of the 16) cases in low-resourced contexts chose it for non-academic skills instead.

Examples

Descriptions of both of these opposing choices about "when" projects should be implemented in their instructional model in our participants' own words are presented in Table 4.4.

Table 4.4

Participant's descriptions of when they implement PBL

	Academic	Non-academic
Sustained	Low resourced When deciding how academic this (sustained) PBL model should be, the global design of the model was considered: "The way we did it for the different age groups is we looked at four or five different international curricula, kind of looked at the topics that they were teaching at different age groups, and then loosely mapped to say, 'Okay, all of these curricula are teaching, for example, fractions in grade two or three. So, this level of our projects could include concepts on fractions, whereas this other level of projects would maybe include something else.' A lot of our projects are actually styled so there is a level one, level two, level three of the same project, they work towards largely the same outcome, and try and cover similar concepts but get progressively much harder for each level, based on the age group and therefore the cognitive abilities of each child.	Low resourced This sustained PBL model focused on what learners needed and weren't getting from conventional models when it was decided to focus on non-academic skills development: "We asked ourselves, 'How do we ensure they go from a small village, isolated, non-English speaker in six years to have knowledge of the world —not just get a good job—but also have them change the community and country?' We knew students would have knowledge from conventional programs, but they wouldn't be game changers. We needed PBL to help them develop leadership skills, ability, and passion for changing their own country. Students needed relationship- building experiences, to practice caring. We felt that if you're a game changer in your country at 13, you'll continue to be one as an adult. We have given up the practice of students sitting through an entire year of a course. We know they are missing certain facts from the standards and the broader knowledge-base, but maybe most people don't actually deeply learn that in any case?"

Unsustained

High resourced

In this unsustained model, an academic focus was part of the reason PBL was considered, but not implemented:

"We implement inquiry-based learning where students have some choice over their learning and the ways that they are assessed, but the assessments are not authentic PBL. Instead [of PBL], we prioritize our professional development resources to support the International Baccalaureate Middle Years and Diploma Programs [standardized curriculum and assessments]. We also support inclusionary learning practices."

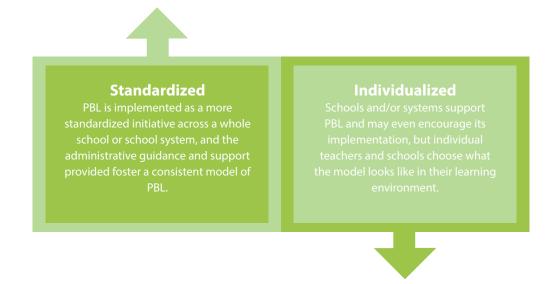
Low resourced globally, high resourced locally

PBL was designed to grow nonacademic skills in this model which was ultimately not sustained: "Most of all I wanted to see them be curious. I wanted to see them ask questions, but more than anything else I wanted to see them work collaboratively with their peers. And I wanted to see them doing that in a really empathetic, considered way. I wanted to see them take initiative. I wanted to see them be creative, come up with new ideas, and document things of interest. I was looking for these things because I didn't see them doing it in their regular classes where they were working individually and always studying for tests. I was really hoping to accomplish two things: being okay with uncertainty, and viewing your peers as 'notcompetition."

Standardized vs. individualized implementation

All participants addressed the question of "what" exactly PBL implementation would be in their learning community, through the question of how developed and in some cases, prescriptive, a model they should seek to adopt. As presented in Figure 4.23, some supported PBL using "standardized models" in which PBL is implemented as a more coherent, perhaps prescriptive, initiative across a whole school or school system, and the administrative guidance and support provided foster a consistent model of PBL. Other implementation supports are "individualized models" in which schools and/or systems support PBL and may even encourage its implementation, but individual teachers, schools, and sometimes students (co-)design what the model looks like in their specific learning environment.

Description of opposing choices that participants made about what to implement as PBL



Findings

Figure 4.24 shows that overall, 15 (63 percent) of PBL cases relied on more standardized models in their learning environments. Most of these, illustrated in Figure 4.25, (11 or 73 percent) had sustained implementation.

Figure 4.24

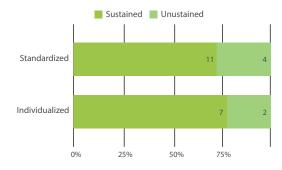
Proportion of cases implementing PBL as a standardized versus individualized model



Only nine cases as in Figure 4.24 (38 percent) instead adopted customized models. In spite of its relative unpopularity, a slightly higher proportion of individualized cases, (seven, or 78 percent) also had sustained implementation (see Figure 4.25), again suggesting little to no relationship between standardization of the model and the sustainability of PBL implementation.

Figure 4.25

Bar charts comparing the number of sites implementing PBL as a standardized versus individualized model by sustainability (left) and level of resources (right)



In contrast, also depicted in Figure 4.25, the level of resources seemed to have some weak relationship to which choice was made: four of eight (50 percent) cases in high-resourced contexts used customized models, while 69 percent (11 of the 16) of cases in low-resourced contexts chose standardized models instead. This makes sense, as it seems reasonable to predict that contexts with more available resources can support more individualized choices within instruction, whether these choices are being made by administrators,
 High Resourced
 4
 4

 Low Resourced
 1
 5

 0%
 25%
 50%
 75%

Individualized

teachers, students, or anyone else, than contexts with fewer available resources.

Standardized

Examples

To illustrate the "what" of PBL implementation described by our participants, especially the differences between more standardized and more individualized models of support and implementation, we have included our participants' own words in Table 4.5.

Table 4.5

Participant's descriptions of what they implement as PBL

	Academic	Non-academic
Sustained	High resourced In this high resourced context, the sustained PBL model and support was quite standardized across public/government schools: "Coordinators from the Ministry of Education came along and observed classes where PBL was implemented. And they also followed up on the whole process and saw the outcomes. They gave us some guidelines from the administration. Also, whenever a project was done successfully, there were thank you letters to schools for implementing in a good way. The administration itself helped students, it praised them and teachers, it thanked both students	Low resourced In this low resourced context that also had government support and was sustained, the PBL design approach was individualized: "I think that the city council had decided that they wanted to do something different. They saw these problems and when we started building a new school they said, 'We don't want to build a normal school, we want to do something different.' We started out with a design-based model. And in the teachers education system here, that has been going around for a couple of years now so so that was what we started out with, but I also could see that it didn't scaffold the
	and teachers."	teachers enough, they needed more support in specifics like, 'How do we do, Second Language Education in projects? How do we do Special Needs?' We made our own project model, but I also could see that we needed in-depth support."

Contrast

Unsustained, High resourced

This PBL model was also in a high resource context with support and model from the government, and so was also standardized across schools, but this case was ultimately unsustained:

"Actually the Ministry decided to implement project-based learning. They conducted some workshops for the teachers, and there was a framework, an outline, coming from the Minister, into which they put all the guidelines and everything needed. There was a lot of paperwork to be done by the teachers. Actually we had a syllabus too, a syllabus from the Ministry to be taught. It was a whole book and workbook, and in parallel we had to implement project-based learning as students needed to make a project."

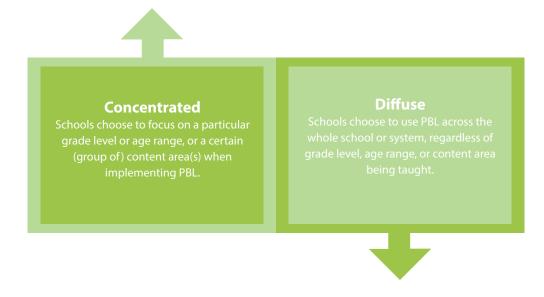
High resourced

This sustained model, in a high resourced context, chose an individualized approach: "Different teachers do different things. So of course some subjects like art and film lend themselves more to project-based learning because they're making products all the time. Maybe the humanities subjects you could also say, when they are writing an essay or doing research like an internal assessment, that is also project-based learning, especially if they're coming up with their own driving question. And so it's not like a schoolwide policy but the school employs educators who are innovative, and some also very traditional educators, so it's not a schoolwide policy but a lot of teachers do it."

Concentrated vs. diffuse

Another question participants tackled with "both/and" thinking was who PBL implementation should support (see Figure 4.26). This could have meant a particular group of teachers or students, selected based on any of a number of dimensions related to the students or teachers themselves; or it could have referred to the projects and driving questions being developed. One end of this spectrum resulted in PBL cases that were "concentrated", or those focusing on particular grade levels or age ranges, or a certain (group of) content area(s) or subjects. Other models of PBL were "diffuse"; PBL was used across a whole school or system, regardless of grade level, age range, and content area or subject being taught.

Description of opposing choices that participants made about who to implement PBL with

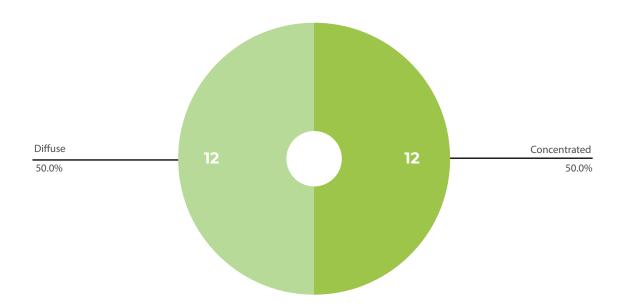


Findings

Half of PBL cases in this study, 12 (50 percent), were concentrated on a particular group of students and/or teachers in a school or school system, seen in Figure 4.27. Of these, the majority (seven, or 58 percent) had sustained implementation, which is depicted in Figure 4.28.

Figure 4.27

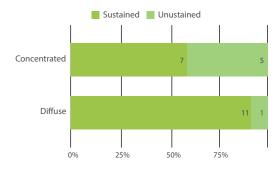
Proportion of cases implementing PBL in a concentrated versus diffuse manner



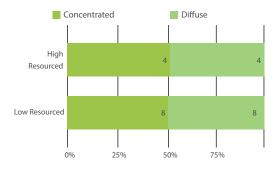
The other half of cases (12 or 50 percent) elected to diffuse PBL across their entire learning community (Figure 4.27); all but one of those (11, or 92 percent) also had sustained implementation (Figure 4.28), suggesting some relationship between choosing a more diffuse model and the sustainability of PBL implementation.

Figure 4.28

Bar charts comparing the number of sites implementing PBL in a concentrated versus diffuse manner by sustainability (left) and level of resources (right)



In contrast, the level of resources a case had access to seemed to be unrelated to which choice was made: four of eight, or 50 percent (Figure 4.28), of cases in high-resourced contexts elected to use PBL in a concentrated manner, while the same proportion (eight of the 16 cases) in low-resourced contexts, also chose to implement in a concentrated way.



Examples

Table 4.6 includes descriptions of both of these opposing choices about "who" in their learning communities should be supported by PBL in our participants' own words.

Table 4.6

Participants' descriptions of who they implement PBL with

	Concentrated	Diffuse
Sustained	Low resourced	Low resourced
	A concentrated model, focusing on students who exited the conventional education system, was selected and sustained because, according to the participant: "I spent a lot of time working with students who had behavioral issues when I was in the school system, then when I was out of the school system, a lot of the students that would come to work with me and needed that different environment were students who are having behavioral issues, who may have been failing in class, but at the end of it when you would speak to them, you realize they were actually quite intellectual people, and they had a lot to offer, they were just - for whatever reason - rebelling in a regular system, they were bored, they felt frustrated, they felt like they couldn't express themselves, whatever it was. So for me it was really seeing the difference in my students from a constrained environment to a more flexible environment where they were able to drive their learning and engage in it more and understand the why behind what they were doing."	This sustained case selected a diffuse model because, according to the participant: "The number one instructional agenda of the school is the implementation of project-based learning across all departments, and then within that, some focus on interdisciplinary project-based learning. When I came on board, the mandate from the board office was really to re-envision the school, and they gave me a lot of latitude to be able to do that. And what we have done is we began by saying to teachers, 'If you stay at the school you agree to teach in a project-based learning pedagogy, and we will fully support you in the implementation, and in the learning curve that takes. But if you're here, this is the mode that you're going to use. If you would like to not teach in that style, we will allow you to transfer to other schools.'"

Sustained, but in a unique context

Low resourced

This concentrated, sustained, play-based PBL model, focuses on learners from a specific region and builds on their cultural background: "We are implementing a project for forcefully displaced foreign nationals in our country and the adjacent local community. Through this project, we are implementing a model that is a play-based intervention to ensure early childhood development, learning, and healing. There are two different modalities, one is home-based, and another is center-based. In the home-based program, ... children [to age two] and their caregivers receive intervention at home in the same community. In the centerbased program, two to six year old children receive play-based intervention in a center which is culturally decorated. Play-materials and types of games have been collected from their culture."

Low resourced

This sustained PBL model began as a concentrated one in one school, but soon became diffuse as word of the success of the model spread to other schools:

"We started off in secondary school, but as we grew, we expanded to our primary school. We were friends with them and they realized the work we were doing, they said, 'Could we do some expeditions [projects]?' and then actually later, after we'd been open—I think it was about three [or] four years—they joined our trust. So we've got a number of primary schools now. So we've got the full age range really from four to 18 year olds that we that we work with. We do expeditions [projects] and things like that."

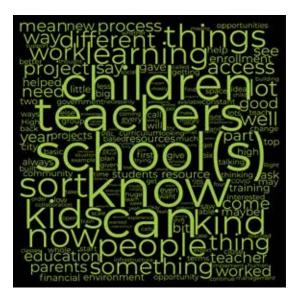
Resources

Many of the resources participants described as being relevant or necessary for the success of their PBL implementation mirrored those from the previous research. As described earlier, participants mentioned resources related to knowledge about PBL (e.g., knowledge about the practices and logistics of PBL), motivation for implementing PBL (e.g., attitudes and beliefs about what teaching and learning is, and how they relates to PBL), and organizational supports of PBL implementation (e.g., infrastructure, flexible hiring and assessment policies, and being able to choose how the success of a PBL model can be demonstrated).

In addition, and more unexpectedly, almost all participants mentioned students themselves, as well as the communities they operated in, and the networks the participants had access to, as being key resources for sustained implementation, regardless of their contexts. To illustrate what our participants were thinking about as they shared what resources they had access to when implementing PBL, the word clouds in Figure 4.29 highlight the most used words for the cases in low-resourced contexts and those in high-resource contexts. Note that these word clouds were generated from the raw transcripts, and do not themselves answer the questions we asked. Instead, they illustrate any concepts one group mentioned more than the other, which gives some insight into differences in thinking across the groups. As you can see, those in low-resource contexts mentioned "can", "teachers", and "children" more often than "learning", "new", and "want" which were mentioned more often by those in highresource contexts. Both groups used the words "know", and "school(s)" most frequently.

Figure 4.29

Words used by participants when describing the resources they used to implement PBL by low-(left) versus high-(right) resourced contexts





Overall, the most often mentioned resources were:

- Organizational resources, as defined using the gap analysis framework of Clark & Estes (2008):
 - a. Access to necessary time (including scheduling flexibility), resources (including technology), and materials for PBL [mentioned in 12 cases]
 - b. Government and/or administrative support and recognition, or Policy and administrative flexibility (including assessment-related), or having a private school license (and the ability to operate more flexibly) [ten cases]
- Social capital resources:
 - a. Trust in the model from parents and/or the broader community [ten cases]
 - Good international network to seek help from, or Access to experts and to see examples of implementation [eight cases]
- Knowledge resources:
 - a. Professional development provided to teachers [eight cases]
- Motivation resources:
 - a. Interest from students and teachers in experimenting and trying new things [eight cases]

Regarding the resource level each case had access to, the biggest resource disparities appeared to be:

- Sixty-three percent high-resourced vs. 19 percent low-resourced contexts mentioned having interest from students and teachers in experimenting and trying new things (motivation)
- Seveny-five percent high-resourced vs. 38 percent low-resourced contexts mentioned access to necessary time/ scheduling flexibility, resources (including technology), and materials for PBL (organizational)
- Zero percent high-resourced vs. 38 percent low-resourced contexts mentioned facilities, or access to an extended environment, natural and local resources (organizational)

No similar large differences were noted with respect to sustainability of implementation.

Other interesting patterns are illustrated in the heatmaps below (Figure 4.30), which outline the resources that were named by participants, organized using the gap analysis framework plus social capital, in order from most commonly cited within each area, to least commonly mentioned. Each cell shows the percentage of all cases (both numerically and through shading) that mentioned the challenge, broken out by the choices within each dimension (first 12 columns), the level of resources (next two columns), and finally the sustained nature of implementation (last two columns).

Heatmap showing resources participants described using to implement PBL by each of the six dimensions along which they were making implementation decisions, level of resource, and sustainability

Resources Number of cases	Student agency	Broad learning experiences	of Community-driven	8 Curriculum-aligned	L Academic	R Non-academic	Core instruction	0 Supplemental	<mark>더</mark> Standardized	6 Individualized	Concentrated	Diffuse	8 High resourced	Low resourced	Sustained	0 Unsustained
Number of cases	12	12	10	U		wledg		10	15	5	12	12	0	10	10	U
Professional development provided to teachers	25%	42%	25%	50%	45%	23%	36%	30%	33%	33%	25%	42%	50%	25%	39%	17%
Guidance/mentors for teachers to implement and facilitate projects to a meaningful conclusion	8%	8%	13%	0%	0%	15%	7%	10%	0%	22%	0%	17%	13%	6%	11%	0%
Knowing how to ask for help	8%	0%	6%	0%	0%	8%	7%	0%	7%	0%	0%	8%	0%	6%	6%	0%
					Mot	ivatio	on									
Interest from students and teachers in experimenting and trying new things	42%	25%	19%	63%	45%	23%	21%	50%	27%	44%	33%	33%	63%	19%	39%	17%
Had a blank slate/new school meant no existing culture to "unlearn"/ability to configure classrooms exactly as desired	25%	8%	13%	25%	27%	8%	14%	20%	13%	22%	17%	17%	0%	25%	22%	0%
PBL as a means of mitigating learning loss/keeping students engaged during COVID19-	0%	17%	0%	25%	9%	8%	0%	20%	7%	11%	8%	8%	0%	13%	11%	0%
Specific interest in the region	17%	0%	13%	0%	0%	15%	14%	0%	13%	0%	0%	17%	0%	13%	11%	0%
Buy-in from and co-design with multiple stakeholders within the school community	8%	8%	13%	0%	0%	15%	0%	20%	0%	22%	8%	8%	0%	13%	11%	0%
Ability to locate schools close to communities, convenient for families	0%	8%	6%	0%	0%	8%	0%	10%	0%	11%	0%	8%	0%	6%	6%	0%
				C	rgan	izatio	onal									
Access to necessary time/ scheduling flexibility, resources (including technology), and materials for PBL	42%	58%	50%	50%	55%	46%	43%	60%	53%	44%	42%	58%	75%	38%	44%	67%

Government/administrative support and recognition/ policy and administrative flexibility (including assessment-related)/Private school license	42%	42%	31%	63%	45%	38%	43%	40%	47%	33%	17%	67%	63%	31%	50%	17%
Financial resources in excess of other schools/sufficient funds	42%	17%	31%	25%	27%	31%	29%	30%	20%	44%	17%	42%	50%	19%	33%	17%
Facilities/access to an extended environment, natural and local resources	25%	25%	31%	13%	9%	38%	36%	20%	27%	22%	25%	25%	0%	38%	22%	33%
Flexibility to staff the way the model required	25%	8%	25%	0%	9%	23%	14%	20%	13%	22%	8%	25%	0%	25%	22%	0%
Own teacher preparation program/Integrated professional development	0%	17%	6%	13%	0%	15%	0%	20%	7%	11%	0%	17%	13%	6%	11%	0%
Flexibility to adapt "ideal" model to own (policy and other) context	8%	0%	6%	0%	0%	8%	7%	0%	7%	0%	0%	8%	0%	6%	6%	0%
				9	Socia	l Cap	ital									
Trust in the model from parents/community	58%	25%	38%	50%	36%	46%	50%	30%	47%	33%	33%	50%	50%	38%	50%	17%
Good international network to seek help from/access to experts/see examples	42%	25%	38%	25%	36%	31%	50%	10%	40%	22%	33%	33%	25%	38%	33%	33%
Students themselves are most valuable resource	33%	25%	25%	38%	36%	23%	29%	30%	33%	22%	25%	33%	25%	31%	33%	17%
Welcoming/supportive communities (including businesses) and workplaces to conduct projects	25%	25%	25%	25%	9%	38%	21%	40%	33%	11%	8%	42%	25%	25%	28%	17%
Ability to attract willing teachers	33%	0%	25%	0%	9%	23%	21%	10%	13%	22%	17%	17%	13%	19%	17%	17%
Interest from other schools/ visibility and ability to share learnings/can demonstrate success	17%	17%	19%	13%	18%	15%	21%	10%	13%	22%	8%	25%	13%	19%	22%	0%
Community involvement in the model as teachers, facilitators, parents, experts, disseminators of materials, language used, and culture	0%	17%	6%	13%	9%	8%	14%	0%	7%	11%	8%	8%	0%	13%	11%	0%

Challenges

Overall, all participants noted substantial and ongoing challenges, regardless of how sustained their PBL case was, or their access to resources. In almost every case, where challenges were mentioned, participants shared more about working or designing the model around these challenges, or simply focusing on deploying resources to build on their strengths instead of actively trying to overcome a challenge. For example, in policy and assessment contexts that challenged PBL as an instructional model, some participants chose to implement a supplemental or a concentrated model, or chose to pursue a private school license or other waiver, instead of trying to change the conventional system to be more supportive of PBL.

Unsurprisingly, many of the reported challenges when implementing PBL mirrored a lack of access to the resources listed above. Curiously, there were some participants who reported having a resource, but also found it challenging not to have more of that resource for their implementation. Unequivocally, participants agreed that funding was not the only, nor even a major challenge to implementation, even in contexts where funds were lacking. In fact, more than one participant made the case that a lack of funding was more of an opportunity than a challenge, since fundraising and budgeting could be incorporated into projects themselves, so that students learned to be resourceful in the face of inadequate funds. In addition, as described in the section on social capital, above, many participants agreed that having human capital—whether in the form of relationships, trust, or capacity—outweighed having financial capital when implementing PBL.

Again, to illustrate the ideas being mentioned when participants spoke about challenges, Figure 4.31 depicts two word clouds, one for those in low resource contexts, and the second in high resource contexts. For those in low resource contexts, "kids" were mentioned more frequently than "time", mentioned more often by those in high resource contexts. Both groups again mentioned "school(s)" and "know" most often, with the addition of "teachers" being a frequently used word when talking about challenges in either context.

Figure 4.31

Words used by participants when describing the challenges they faced when implementing PBL by low-(left) versus high-(right) resourced contexts





The single most commonly cited challenge by far was a motivational one: Culture and mindset that school only looks a certain way, or the prevailing perception that teachers' role is as learning director, or the widespread existence of an "assessment" culture in schools across the globe. Eighteen cases, in comparable proportions of sustained, unsustained, high-resource, and low-resource settings, mentioned this conventional way of thinking as a significant and broad challenge to shifting instruction to any student-directed, experiential learning model.

Other commonly mentioned challenges were all organizational as defined using the gap analysis framework of Clark & Estes (2008); two of these also showed the greatest disparities between PBL cases with different levels of resources:

- Inflexible government regulations and/ or limiting curriculum, standards, or assessments (including limited ability to demonstrate PBL efficacy) [mentioned in eight cases; 63 percent high-resourced vs. 19 percent low-resourced contexts]
- Lack of time for students and/or teachers to plan and implement PBL well or deeply [mentioned in seven cases] and Lack of infrastructure, and technology, or limited or restricted access to project resources and materials due to the constraints of the natural and geopolitical environment, or Unpredictable environment due to COVID-19 [seven cases; zero percent high-resourced vs. 44 percent lowresourced contexts]

In addition, the following two organizational challenges also illustrated the next largest disparities in terms of level of resources each case had access to, with no high-resourced vs. 38 pecent low-resourced contexts reporting a:

- lack of funds for PBL implementation, and a
- lack of resources and supports to develop/grow human capacity

Similar to resources, there were much smaller disparities in the implementation challenges participants mentioned facing with respect to sustainability.

Other interesting patterns are illustrated in the heatmaps below (Figure 4.32), which outline the challenges that participants named as barriers to their PBL implementation, organized using the gap analysis framework with the inclusion of social capital, in order from most to least often mentioned. Each cell shows the percentage of all cases (both numerically and through shading) that mentioned the challenge, broken out by the choices within each dimension (first 12 columns), the level of resources (next two columns), and finally the sustained nature of implementation (last two columns).

Heatmap showing challenges participants described when implementing PBL by each of the six dimensions along which they were making implementation decisions, level of resource, and sustainability

Challenges	Student agency	Broad learning experiences	Community-driven	Curriculum-aligned	Academic	Non-academic	Core instruction	Supplemental	Standardized	Individualized	Concentrated	Diffuse	High resourced	Low resourced	Sustained	Unsustained
Number of cases	12	12	16	8	11	13	14	10	15	9	12	12	8	16	18	6
Knowledge																
Having to create projects from scratch/projects too open ended or challenging	17%	33%	25%	25%	36%	15%	21%	30%	13%	44%	17%	33%	25%	25%	28%	17%
Limited access to professional development, especially locally	17%	17%	19%	13%	18%	15%	21%	10%	20%	11%	25%	8%	0%	25%	17%	17%
Access to resources in languages other than English	17%	8%	13%	13%	27%	0%	7%	20%	0%	33%	17%	8%	25%	6%	11%	17%
Students not knowing how to operate in model/out of a learning routine (due to COVID-19)	17%	8%	13%	13%	9%	15%	21%	0%	20%	0%	8%	17%	0%	19%	17%	0%
Lack of implementation guidelines/separation of teachers and designers	0%	17%	0%	25%	18%	0%	7%	10%	13%	0%	8%	8%	13%	6%	11%	0%
PBL leaves gaps in content knowledge	8%	8%	6%	13%	0%	15%	7%	10%	13%	0%	0%	17%	13%	6%	11%	0%
Didn't know what to ask at initial trainings	0%	8%	0%	13%	9%	0%	0%	10%	7%	0%	0%	8%	13%	0%	6%	0%
					Mot	ivatio	on									
Culture and mindset that school only looks a certain way/teachers' role is as learning director/ assessment culture	75%	75%	69%	88%	82%	69%	79%	70%	67%	89%	75%	75%	75%	75%	78%	67%
"Ideal" PBL model is not flexible/ adaptable to low resource contexts/perception that model is not replicable, or unattainable/ lack of examples in similar contexts	25%	17%	19%	25%	18%	23%	21%	20%	13%	33%	17%	25%	13%	25%	28%	0%
Student and teacher turnover, or supplemental nature of model, prohibit/inhibit long-term sustainability	8%	33%	19%	25%	18%	23%	7%	40%	7%	44%	25%	17%	38%	13%	17%	33%

17%	17%	13%	25%	27%	8%	14%	20%	20%	11%	8%	25%	25%	13%	22%	0%
17%	17%	13%	13%	9%	15%	14%	10%	7%	22%	8%	17%	0%	19%	17%	0%
			C	rgan	izati	onal									
33%	33%	19%	63%	45%	23%	21%	50%	47%	11%	25%	42%	63%	19%	33%	33%
33%	25%	13%	63%	45%	15%	21%	40%	33%	22%	17%	42%	50%	19%	28%	33%
17%	42%	31%	25%	27%	31%	36%	10%	27%	44%	42%	17%	0%	44%	28%	33%
25%	25%	25%	25%	18%	31%	43%	0%	40%	0%	42%	8%	0%	38%	22%	33%
25%	25%	25%	25%	18%	31%	29%	20%	20%	33%	25%	25%	0%	38%	33%	0%
8%	33%	0%	63%	45%	0%	14%	30%	27%	11%	17%	25%	38%	13%	22%	17%
8%	17%	13%	13%	0%	23%	0%	30%	7%	22%	17%	8%	25%	6%	6%	33%
			9	Socia	l Cap	ital									
25%	25%	25%	25%	27%	23%	36%	10%	27%	22%	42%	8%	13%	31%	22%	33%
8%	17%	13%	13%	9%	15%	21%	0%	20%	0%	25%	0%	0%	19%	17%	0%
8%	8%	0%	25%	18%	0%	7%	10%	13%	0%	8%	8%	13%	6%	6%	17%
8%	0%	6%	0%	0%	8%	7%	0%	7%	0%	0%	8%	0%	6%	6%	0%
8%	0%	6%	0%	0%	8%	7%	0%	7%	0%	0%	8%	0%	6%	6%	0%
0%	8%	0%	13%	9%	0%	0%	10%	0%	11%	8%	0%	13%	0%	6%	0%
0%	8%	0%	13%	9%	0%	0%	10%	0%	11%	8%	0%	13%	0%	6%	0%
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RECOMMENDATIONS: CONSIDERATIONS FOR THE IMPLEMENTATION OF PBL

CHAPTER FIVE

RECOMMENDATIONS: CONSIDERATIONS FOR THE IMPLEMENTATION OF PBL

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These findings and recommendations should help shine light on valuable considerations for school leaders interested in implementing project-based learning, or curious whether PBL could be a relevant model for meeting their learners' educational needs. With the limitations mentioned above in mind, we offer the following recommendations.

Perhaps our most significant finding in this study was that every single PBL case we examined had access to some resources, even if they considered themselves to be in the lowest-resource contexts. Often, identifying as "low resourced" was related to the financial resources of the school or school system itself, and/or of the community and students the school served. However, especially where there were large financial gaps, participants reported having strong motivational, organizational, and social capital resources. In fact, participants themselves overwhelmingly stated that money was not the biggest challenge to PBL implementation—people were.

The definition of this "human" challenge ranged from knowledge gaps, such as not having access to training materials, guidance, and coaching for teachers and students to be comfortable in a PBL model, to motivation gaps, such as general beliefs about the roles of teachers and students, and a pervasive mindset that PBL did not fit into that belief system. Conversely, there seemed to be a pervasive belief that there is only one, "ideal" way to implement PBL, and anything short of that ideal model is not worth trying at all. Sometimes this "human" challenge referred to organizational or even systemic factors on human capacity, such as pay structures that prioritized more conventional forms of teaching, or a lack of access to the time and materials necessary for teachers and students to fully engage in PBL. Almost always, this challenge included some aspect of relationships, primarily skepticism of the model among internal or external stakeholders whose participation and support were necessary for successful, sustained implementation.

When considering or designing PBL for your school or school system, we recommend examining all of the various ways people in the learning environment can serve as resources or challenges. This should be the first step and priority, before considering access to financial resources. After all, as one of our participants put it, "if you have a group of people, they can help you to draw money, facilities, and many, many other things." For example, if you have good relationships with the community, and/or external PBL experts, but are considering implementing PBL in a system that is constrained towards more conventional models, you could consider how to use your relationships to design a trial or pilot PBL model within the existing system. This could be in a few classes, or with groups of students whose parents support them in after school or extra curricular activities.

Similarly, our most surprising finding was that social capital can play a role as a resource or challenge in PBL implementation. The web of relationships among decision-makers, teachers, and students was a valuable category of resources, and one that could fill gaps in knowledge, motivation, and organizational resources as well. We recommend explicitly considering social capital (or relationship) resources along with other available resources. Doing so allows for more intentional decisionmaking and can help to predict and perhaps even reduce the risk of PBL not working in each unique context.

We found our participants were making decisions regarding use of resources in potential PBL implementation across the familiar dimensions of how, who, when, why, where and what. For each dimension, seemingly opposing decisions could be made. However, neither choice is clearly the right choice for all PBL, nor is either choice the right choice even for a given context. In fact, there are benefits to either choice within a given dimension; these should be explicitly considered when deciding about or designing a PBL model. We found that some resources and some challenges, however, were described more often when one or the other choice was made; apparently these resources and challenges distinguished one choice from the other. Those considering the PBL model should consider which of these distinguishing resources and challenges are most applicable to their own context when making these choices.

The following discussion guides outline these benefits, distinguishing resources, and distinguishing challenges. They are meant to facilitate conversations about designing PBL, to encourage reflection on which decision point within each dimension is likely to work best in your unique context, based on the benefits you wish to achieve, the resources you have available to you, and the challenges you can anticipate through PBL implementation. Whether or not you use these guides, we encourage you to, like our participants, systemically focus your PBL resource allocation and design to maximize your resources by identifying and implementing the type of model for which you have access to the most distinguishing resources, and minimize your challenges by either working or designing around those challenges you are most likely to encounter in implementation. Doing so will help you design a PBL model that meets the needs of your learners and improves the chance that the model is sustained over time.

Discussion Guide: How to implement PBL? Core instructional model vs. supplemental activities

As you think about how to implement PBL, which of the following benefits and resources seem most applicable to your learning environment? Seeing where the majority of benefits and resources lie may help you decide which choice is a better fit.

How?	Core Instruction	Supplemental
Benefits	 Can use PBL as a single, coherent instructional model throughout the school day without other models or priorities competing for resources and teachers' and students' attention. 	 Can have the flexibility to implement PBL exactly as designed without having to give up existing instructional and other learning practices in order to do so.
Distinguishing Resources	 Motivation - Specific interest in the region from external supporters of the school. Organizational - Access to facilities, an extended environment outside the school buildings, natural and local resources. Social Capital - A web of relationships that foster: Trust in the model by parents and the community Robust networks to seek help and examples from international and local PBL experts, et al The ability to attract teachers willing to use PBL 	 Motivation - A desire to implement PBL driven by: Interest among students and teachers in experimenting and trying new things Using PBL as a means of continuing learning remotely and keeping students engaged during COVID-19 Buy-in from and co-design with multiple stakeholders within the school community Ability to locate schools close to communities, convenient for families Organizational - Access to systemic resources such as:

- A level of interest and visibility among other schools/ systems that allow the sharing of learning, and the demonstration of PBL success as an instructional model
- Community involvement in PBL as teachers, facilitators, parents, experts, disseminators of materials, language used, and culture
- The required time, scheduling flexibility, materials, and technology for PBL to be implemented as designed
- Flexibility to staff and hire in the way the model required
- Internal teacher preparation programs and integrated professional development
- Social Capital Welcoming and supportive communities, including businesses and workplaces with which to conduct projects.

Discussion Guide: How to implement PBL? Core instructional model vs. supplemental activities

As you think about how to implement PBL, which of the following challenges seem most applicable to your learning environment? If you have a majority of anticipated challenges on one side of the decision, you may consider choosing the other side.

How?	Core Instruction	Supplemental
Distinguishing Challenges	 Knowledge - Teachers and students needing more knowledge about their roles within PBL, and how to operate within PBL models, especially when being out of a learning routine due to COVID-19. Organizational - Lack of funds, infrastructure, and technology, and being in a challenging and unpredictable environment due to geography and/or COVID-19. 	 Knowledge - Limited access to resources in languages other than English. Motivation - Student and teacher turnover, or the supplemental nature of the model, prohibited and inhibited long-term sustainability. Organizational - Systemic barriers to implementation such as:

- Social Capital A lack of human capacity due to difficulty engaging people in projects and getting buy-in to the model, including from the community and teachers, even in cases where the community was intrigued by the model.
- Inflexible government regulations and limiting curricula, standards, or assessments, including requirements to demonstrate PBL's success using conventional, standardized metrics such as student performance on standardized assessments
- Lack of time given to students and teachers to plan and implement PBL deeply
- Increased workload of PBL especially alongside other requirements
- Pay structures and laws that disincentivize or overly complicate PBL implementation

Discussion Guide: Where to implement PBL? Communitydriven project questions vs. curriculum-aligned project questions

As you think about where to implement PBL, which of the following benefits and resources seem most applicable to your learning environment? Seeing where the majority of benefits and resources lie may help you decide which choice is a better fit.

Where?	Community-driven	Curriculum-aligned
Benefits	 Projects and questions are relevant and significant to students, teachers, and the community which creates a sense of purpose and engagement for everyone and makes the learning meaningful. 	 Projects and questions allow students to gain required skills from a variety of perspectives, which fosters transfer and generalization of knowledge and skills to other contexts.
Distinguishing Resources	 Knowledge - Access to guidance and mentors for teachers to implement and facilitate projects to a meaningful conclusion Motivation - A desire to implement PBL driven by: Starting with a new school and the ability to configure classrooms exactly as desired because there was a blank slate, and no existing culture to "unlearn" Specific interest in the region from external supporters of the school. Buy-in from and co-design with multiple stakeholders within the school community 	 Knowledge - Professional development provided to teachers Motivation - A desire to implement PBL driven by: Interest among students and teachers in experimenting and trying new things Using PBL as a means of continuing learning remotely and keeping students engaged during COVID-19 Organizational - Government and/or administrative support and recognition in the form of policy and administrative flexibility (including assessment-related policies), or a private school license

- Organizational Access to systemic resources such as:
- Access to facilities, an extended environment outside of the school's buildings, and natural and local resources.
- Flexibility to staff and hire in the way the model required

Social Capital - A web of relationships that foster:

- Robust networks to seek help and examples from, including international and local PBL experts
- The ability to attract teachers willing to use PBL

Social Capital - A web of relationships that foster:

- Trust in the model from parents and the community
- Students themselves as the most valuable resource

Discussion Guide: Where to implement PBL? Communitydriven project questions vs. curriculum-aligned project questions

As you think about where to implement PBL, which of the following challenges seem most applicable to your learning environment? If you have a majority of anticipated challenges on one side of the decision, you may consider choosing the other side.

Where?	Community-driven	Curriculum-aligned
Distinguishing Challenges	There were no unique challenges named by participants who chose to design projects around questions driven by their local community.	 Knowledge - Inability to design a sustainable model due to: A lack of implementation guidelines, often due to the separation between teachers and PBL designers Not knowing what to ask at initial trainings

Motivation - Desire to maintain conventional teaching model because:

- The culture and mindset suggests that school only looks a certain way, with the teacher's role being the director of learning, and often including a culture of assessment
- The learning process in PBL is "messier" than in conventional learning, which makes teachers nervous to start or try PBL

Organizational - Systemic barriers to implementation such as:

- Inflexible government regulations and limiting curricula, standards, or assessments, including requirements to demonstrate PBL's success using conventional, standardized metrics such as students' performance on standardized assessments
- Lack of time given to students and teachers to plan and implement PBL deeply
- Increased workload of PBL especially alongside other requirements

Social Capital - A need for relationships that could overcome:

- Insufficient family engagement in and awareness of the model needed to understand objectives, and leading to a lack of support, even when there is no pushback
- Global networks' preference for English as the language of communication
- Regulations that inhibit the ability to develop and grow networks

Discussion Guide: Why to implement PBL? Student agency vs. broad learning experiences

As you think about why to implement PBL, which of the following benefits and resources seem most applicable to your learning environment? Seeing where the majority of benefits and resources lie may help you decide which choice is a better fit.

Why?	Student agency	Broad learning experiences
Benefits Distinguishing Resources	 Fosters active student engagement in their own learning which is personally motivating and encourages lifelong learning. Motivation - A desire to implement PBL driven by: 	 Shows students multiple ways in which their learning is preparing them for life, which makes learning personally relevant. Knowledge - Professional development provided to
	 Interest from students and teachers in experimenting and trying new things Starting with a new school and the ability to configure classrooms exactly as desired because there was a blank slate, and no existing culture to "unlearn" Specific interest in the region from external supporters of the school. Organizational - Access to systemic resources such as: Sufficient funds or financial resources in excess of other local schools Flexibility to staff and hire in the way the model required Social Capital - A web of relationships that foster: Trust in the model from parents and the community 	 teachers Motivation - Using PBL as a means of continuing learning remotely and keeping students engaged during COVID-19 Organizational - Access to systemic resources such as: The required time, scheduling flexibility, materials, and technology for PBL to be implemented as designed Internal teacher preparation programs and integrated professional development Social Capital - Community involvement in PBL as teachers, facilitators, parents, experts, disseminators of materials, language used, and culture

- Robust networks to seek help and examples from, including international and local PBL experts
- The ability to attract teachers willing to use PBL

Discussion Guide: Why to implement PBL? Student agency vs. broad learning experiences

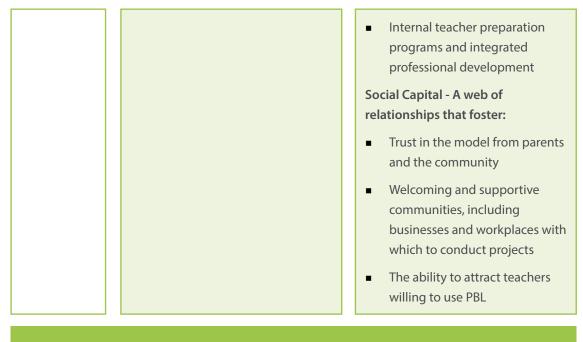
As you think about why to implement PBL, which of the following challenges seem most applicable to your learning environment? If you have a majority of anticipated challenges on one side of the decision, you may consider choosing the other side.

Why?	Student agency	Broad learning experiences
Distinguishing Challenges	 Knowledge - Inability to design a sustainable model due to: Limited access to resources in languages other than English. Students needing more knowledge about their roles within PBL, and how to operate within PBL models, especially when being out of a learning routine due to COVID-19. 	 Knowledge - Inability to design a sustainable model due to: Having to create projects from scratch Projects being too open ended or challenging A lack of implementation guidelines, often due to the separation between teachers and PBL designers Motivation - Student and teacher turnover, or the supplemental nature of the model prohibited and inhibited long-term sustainability. Organizational - Systemic barriers to implementation such as: Lack of infrastructure, and technology, and being in a challenging and unpredictable environment due to geography and/or COVID-19. Increased workload of PBL especially alongside other requirements

Discussion Guide: When to implement PBL? Academic skills vs. non-academic skills

As you think about when to implement PBL, which of the following benefits and resources seem most applicable to your learning environment? Seeing where the majority of benefits and resources lie may help you decide which choice is a better fit.

When?	Academic	Non-academic
Benefits	 Aligns PBL with a more conventional perspective of school and what students need to know before graduating, which can enable a more coherent learning experience. Knowledge - Professional 	 Allows students to develop skills alongside those that curricula and standards focus on, within the formal or structured learning environment for a holistic learning experience. Knowledge - Access to
Resources	 development provided to teachers Motivation - A desire to implement PBL driven by: Interest from students and teachers in experimenting and trying new things Starting with a new school and the ability to configure classrooms exactly as desired because there was a blank slate, and no existing culture to "unlearn" Social Capital - Students themselves as the most valuable resource 	 guidance and mentors for teachers to implement and facilitate projects to a meaningful conclusion Motivation - A desire to implement PBL driven by: Specific interest in the region from external supporters of the school Buy-in from and co-design with multiple stakeholders within the school community Organizational - Access to systemic resources such as: Facilities, an extended environment outside the school's buildings, and natural and local resources Flexibility to staff and hire as the model required



Discussion Guide: When to implement PBL? Academic skills vs. non-academic skills

As you think about when to implement PBL, which of the following challenges seem most applicable to your learning environment? If you have a majority of anticipated challenges on one side of the decision, you may consider choosing the other side

When?	Academic	Non-academic
Distinguishing Challenges	 Knowledge - Inability to design a sustainable model due to: Having to create projects from scratch Projects being too open ended or challenging A lack of implementation guidelines, often due to the separation between teachers and PBL designers 	 Knowledge - PBL leaving gaps in students' content knowledge Organizational - Systemic barriers to implementation such as: Lack of funds for PBL implementation Lack of resources and supports to develop and grow the required human capacity Pay structures and laws that disincentivize or overly complicate PBL implementation

Motivation - Desire to maintain conventional teaching model because:

- The culture and mindset suggests that school only looks a certain way, with the teacher's role being the director of learning, and often including a culture of assessment
- The learning process in PBL is "messier" than in conventional learning, which makes teachers nervous to start or try PBL

Organizational - Systemic barriers to implementation such as:

- Inflexible government regulations and limiting curricula, standards, or assessments, including requirements to demonstrate PBL's success using conventional, standardized metrics such as students' performance on standardized assessments
- Lack of time given to students and teachers to plan and implement PBL deeply
- Increased workload of PBL especially alongside other requirements
- Social Capital Insufficient family engagement in and awareness of the model to understand objectives, leading to a lack of support, even when there is no pushback

Discussion Guide: What PBL to implement? Standardized model vs. individualized model

As you think about what PBL to implement in your context, which of the following benefits and resources seem most applicable to your learning environment? Seeing where the majority of benefits and resources lie may help you decide which choice is a better fit for your context

What?	Standardized	Individualized
Benefits	 Can design and implement a model that provides a lot of guidance to teachers and students across subjects, and ages, so that everyone knows what they are supposed to be doing and learning. 	 Can implement a highly flexible, responsive model that is personalized to each student and teacher so that everyone is intrinsically motivated and is learning what they want and need to be learning at any given time.
Distinguishing Resources	 Motivation - Specific interest in the region from external supporters of the school. Organizational - Government and/or administrative support and recognition in the form of policy and administrative flexibility (including assessment-related policies), or a private school license Social Capital - A web of relationships that foster: Trust in the model from parents and the community Robust networks to seek help and examples from, including international and local PBL experts 	 Knowledge - Access to guidance and mentors for teachers to implement and facilitate projects to a meaningful conclusion Motivation - A desire to implement PBL driven by: Interest from students and teachers in experimenting and trying new things Buy-in from and co-design with multiple stakeholders within the school community An ability to locate schools close to communities, in places that are convenient for families

- Students themselves as the most valuable resource
- Welcoming and supportive communities, including businesses and workplaces with which to conduct projects
- Organizational Sufficient funds or financial resources in excess of other local schools

Discussion Guide: What PBL to implement? Standardized model vs. individualized model

As you think about what PBL to implement in your context, which of the following benefits and resources seem most applicable to your learning environment? Seeing where the majority of benefits and resources lie may help you decide which choice is a better fit for your context

What?	Standardized	Individualized
Distinguishing Challenges	 Knowledge - Inability to design a sustainable model due to: Students' needing more knowledge about their roles in PBL, and how to operate within PBL models, especially when being out of a learning routine due to COVID-19. A lack of implementation guidelines, often due to the separation between teachers and PBL designers PBL leaving gaps in student content knowledge Organizational - Systemic barriers to implementation such as: 	 Knowledge - Inability to design a sustainable model due to: Having to create projects from scratch Projects being too open ended or challenging Limited access to resources in languages other than English. Motivation - Desire to maintain conventional teaching model because: The "ideal" PBL model seems unattainable or not replicable nor adaptable to low resource contexts due to its inflexibility, often driven by a lack of examples in similar contexts

- Inflexible government regulations and limiting curricula, standards, or assessments, including requirements to demonstrate PBL's success using conventional, standardized metrics such as students' performance on standardized assessments
- Lack of time given to students and teachers to plan and implement PBL deeply
- Lack of funds for PBL implementation
- Increased workload of PBL especially alongside other requirements

Social Capital - A need for relationships that could overcome:

- A lack of human capacity
- Insufficient family engagement in and awareness of the model to understand objectives, leading to a lack of support, even when there is no pushback

- Student and teacher turnover, or the supplemental nature of the model, prohibited and inhibited long-term sustainability
- Of concerns that the model is too radical, or may even be harmful to student learning

Organizational - Systemic barriers to implementation such as:

- Lack of infrastructure, and technology, and being in a challenging and unpredictable environment due to geography and/or COVID-19.
- Lack of resources and supports to develop and grow the required human capacity
- Pay structures and laws that disincentivize or overly complicate PBL implementation

Social Capital - A need for relationships that could overcome:

- Global networks' preference for English as the language of communication
- Regulations that inhibit the ability to develop and grow networks

Discussion Guide: Who to implement PBL for? Concentrated implementation vs. diffuse implementation

As you think about who to implement PBL for, which of the following benefits and resources seem most applicable to your learning environment? Seeing where the majority of benefits and resources lie may help you decide which choice is a better fit.

Who?	Concentrated	Diffuse
Benefits	 Can tailor PBL to meet the very specific needs of a particular group of teachers and students, and provide guidance that is relevant to them. 	 Can develop a model that is broadly applicable and provides support to a wide range of teachers and students.
Distinguishing Resources	 Knowledge - Professional development provided to teachers 	 Knowledge - Access to guidance and mentors for teachers to implement and facilitate projects to a meaningful conclusion Motivation - Specific interest in the region from external supporters of the school Organizational - Access to systemic resources such as: The required time, scheduling flexibility, materials, and technology for PBL to be implemented as designed Government and/or administrative support and recognition in the form of policy and administrative flexibility (including assessment-related policies), or a private school license

Who?	Concentrated		Diffuse
Discussion Guide: Who to implement PBL for? Concentrated implementation vs. diffuse implementation As you think about who to implement PBL for, which of the following challenges seem most applicable to your learning environment? If you have a majority of anticipated challenges on one side of the decision, you may consider choosing the other side			
			 and the community Welcoming and supportive communities, including businesses and workplaces wwhich to conduct projects A level of interest and visibilit among other schools/systems that allow the sharing of learning, and the demonstration of PBL's succes as an instructional model
			professional development Social capital - A web of relationships that foster: Trust in the model from parer

- Sufficient funds or financial resources in excess of other local schools
- Flexibility to staff and hire as the model required
- Internal teacher preparation programs and integrated
- ents
- vith
- ity ess

RECOMMENDATIONS: CONSIDERATIONS FOR THE IMPLEMENTATION OF PBL

especially locally

Knowledge - Limited access

to professional development,

Organizational - Lack of funds,

infrastructure, and technology,

and being in a challenging and

unpredictable environment due to geography and/or COVID-19

Distinguishing

Challenges

Knowledge - Inability to design a

Having to create projects from

Projects being too open ended

sustainable model due to:

or challenging

scratch



PBL leaving gaps in student content knowledge

Motivation - Desire to maintain conventional teaching model

- The learning process in PBL is "messier" than in conventional learning, which makes teachers nervous to start or try PBL
- Of concerns that the model is too radical, or may even be harmful to student learning

Organizational - Systemic barriers to implementation such as:

- Inflexible government regulations and limiting curricula, standards, or assessments, including requirements to demonstrate PBL's success using conventional, standardized metrics such as students' performance on standardized
- Lack of time given to students and teachers to plan and implement PBL deeply



CONCLUSION

Project-based learning (PBL) continues to be a promising educational innovation in a variety of contexts. This study explored the decisions and challenges experienced by school systems implemeting PBL across the globe, with a specific focus on those in low resourced contexts, and including sustained and unsustained models. In identifying and investigating 24 cases of PBL from around the world, we found variety in the decisions being made about designing and allocating resources for PBL, even among the cases that had similar levels of resources and sustained implementation. Few resources and challenges to implementation were universal or even strongly aligned with level of resource or sustainability.

Overall, there were five broad trends in decision-making and resource allocation among the PBL cases we learned about:

- Social capital (networks, relationships, and trust—along with the flexibility and autonomy these afford) is a valuable, often overlooked, resource.
- 2. COVID-19 had both positive and negative impacts on PBL implementation or adoption in the 2020-21 school year.
- 3. There were six dimensions along which participants were making decisions when designing and implementing PBL to maximize their resources.
- Resources like people, time, materials, and the flexibility stemming from governmental, administrative, policy, and community trust and support were universally helpful to implementation.
- 5. Conversely, challenges like preconceived mindsets and cultures about the role and nature of school, inflexible regulations, policies, curricula, standards, and assessments, and a lack of time, technology, and other material resources were universal barriers to implementation.

Based on these trends, we recommend that leaders and others who are considering whether and how to implement PBL consider the following.

All school contexts, no matter the location, finances, or infrastructure, have resources that can be used to successfully implement PBL. The greatest of these resources are social: trust, relationships, and networks. Inversely, social factors can pose challenges to implementation as well. Our participants reported that these social resources and challenges were more important to using PBL than money. It is essential that decision-makers recognize the resources they do have access to when considering PBL.

Relatedly, social capital is often overlooked as a resource when determining if and how to use PBL, but is a powerful one, so be sure to identify the social resources available for PBL implementation. Our participants identified the people in their networks that served as a resource and designed their model to take advantage of those resources; relying on administrative, or community support, for example, when those were supportive of PBL.

During the decision-making or design process, there are six dimensions to think about, and multiple choices within each dimension can be effective, even if they appear to be opposing choices. These six dimensions encompass the how, where, why, when, what, and who of PBL: how central the model will be to instruction, where project questions will come from, the instructional goal of using PBL, the part of the developmental or learning trajectory PBL will be used, the flexibility of the model, and which teachers and students will use PBL.

Although there was variation in the choices being made within similar contexts, there were some resources and challenges that were more aligned with one choice than the other in each dimension. Therefore, rather than seeking the "right" choice within each dimension, instead consider the benefits of each choice relative to the specific resources and challenges of the context in which PBL will be used.

Finally, in order to facilitate application of these recommendations, we invite the use of the six discussion guides included in this report. These are intended to structure PBL conversations and guide decision-making, by providing concrete prompts about benefits, resources, and challenges specific to each unique context and aligning these with the spectrum of choices in each of the dimensions described above. As we continue to learn along with the field more about PBL and the conditions under which it is most successfully implemented, there remains no definitive answers about what is sure to work for any individual school or school system. Conducting such conversations about resources, challenges, benefits, and possible decisions allows decision-makers to apply the relevant findings from this exploratory study across a variety of contexts and situations in an adaptable, responsive way that ensures meaningful action; increasing the likelihood of successful and sustained PBL implementation within their individual circumstances.

ABOUT THE AUTHOR

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Saro fights the injustice of knowledge-hoarding by making deep, meaningful connections between research and practice to foster the best learning experiences for each learner. She has 15 years' experience in research/external evaluations of public, private, and non-profit education programs. Previously, Saro was Managing Partner, Research and Measurement at The Learning Accelerator, and the inaugural assistant director of two research units at the University of Texas at Austin. Saro is a reviewer for and advisor to multiple entities, including US federal EIR grants, Lea(R)n Platform, and SXSW EDU. Saro holds degrees from the University of Texas at Austin (PhD, educational psychology) and MIT (bachelor's, brain/ cognitive science).

ABOUT WISE

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WISE was established by Qatar Foundation in 2009 under the leadership of its Chairperson, Her Highness Sheikha Moza bint Nasser. WISE is an international, multi-sectoral platform for creative, evidence-based thinking, debate, and purposeful action toward building the future of education. Through the biennial summit, collaborative research and a range of on-going programs, WISE is a global reference in new approaches to education. The WISE Research series, produced in collaboration with experts from around the world, addresses key education issues that are globally relevant and reflect the priorities of the Qatar National Research Strategy. Presenting the latest knowledge, these comprehensive reports examine a range of education challenges faced in diverse contexts around the globe, offering action-oriented recommendations and policy guidance for all education stakeholders. Past WISE Research publications have addressed issues of access, quality, financing, teacher training, school systems leadership, education in conflict areas, entrepreneurship, early-childhood education, and twenty-first century skills.

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REFERENCES

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103

Bradley-Levine, J., & Mosier, G. (2014). Literature Review on Project-Based Learning.

Clark, R. E., & Estes, F. (2008). Turning research into results - A guide to selecting the right performance solutions (PB). Charlotte, NC: Information Age Publishing.

Condliffe, B., Quint, J., Visher, M. G., Bangser, M. R., Drohojowska, S., Saco, L., & Nelson, E. (2017). Project-Based Learning A Literature Review Working Paper.

Culclasure, B. T., Longest, K. C., & Terry, T. M. (2019). Project-based learning (Pjbl) in three southeastern public schools: Academic, behavioral, and social-emotional outcomes. Interdisciplinary Journal of Problem-Based Learning, 13(2). https://doi.org/10.7771/1541-5015.1842

de la Torre-Neches, B., Rubia-Avi, M., Aparicio-Herguedas, J.L. et al. (2020). Project-based learning: an analysis of cooperation and evaluation as the axes of its dynamic. *Humanitarian and Social Science Communications*, 7 (167). <u>https://doi.org/10.1057/s41599-020-00663-z</u>

Duke, N. K., Halvorsen, A.-L., Strachan, S. L., Kim, J., & Konstantopoulos, S. (2020). Putting PjBL to the Test: The Impact of Project-Based Learning on Second Graders' Social Studies and Literacy Learning and Motivation in Low-SES School Settings. *American Educational Research Journal*, 000283122092963. https://doi.org/10.3102/0002831220929638

Eickholt, J., Jogiparthi, V., Seeling, P., Hinton, Q., & Johnson, M. (2019). Supporting project-based learning through economical and flexible learning spaces. *Education Sciences*, 9(3). https://doi.org/10.3390/educsci9030212

Gao, Z. (2012). An Arduous but Hopeful Journey: Implementing Project-Based Learning in a Middle School of China. *Frontiers in Education China*, 7(4), 608–634. https://doi.org/10.3868/s110-001-012-0030-5

Grant, M. M. (2011). Learning, beliefs, and products: Students' perspectives with project-based learning. Interdisciplinary Journal of Problem-Based Learning, 5(2), 37–69.

Halvorsen, A.-L., Duke, N. K., Brugar, K., Block, M., Strachan, S., Berka, M., & Brown, J. (2012). Narrowing the Achievement Gap in Second-Grade Social Studies and Content Area Literacy: The Promise of a Project-Based Approach.

Kluver, J. & Robin, J. (2021). Changing the Subject: Twenty Years of Projects from High Tech High.

Kokotsaki, D., Menzies, V., & Wiggins, A. (2016). Project-based learning: A review of the literature. *Improving Schools, 19*(3), 267–277. <u>https://doi.org/10.1177/1365480216659733</u>

Krajcik, J. S., & Blumenfeld, P. C. (2006). Project-Based Learning. The Cambridge Handbook of the Learning Sciences.

Macmath, S., Sivia, A., & Britton, V. (2017). Teacher Perceptions of Project Based Learning in the Secondary Classroom (pp. 175–192).

Martin, R. (2007). How successful leaders think. Harvard business review, 85(6), 60.

Odell, M. R. L., Kennedy, T. J., & Stocks, E. (2019). The impact of PBL as a STEM school reform model. Interdisciplinary Journal of Problem-Based Learning, 13(2). https://doi.org/10.7771/1541-5015.1846

Parker, W., Mosborg, S., Bransford, J., Vye, N., Wilkerson, J., & Abbott, R. (2011). Rethinking advanced high school coursework: Tackling the depth/breadth tension in the AP US Government and Politics course. *Journal of Curriculum Studies*, 43(4), 533–559.

Pecore, J. L. (2013). Beyond beliefs: Teachers adapting problem-based learning to preexisting systems of practice. Interdisciplinary Journal of Problem-Based Learning, 7(2), 7–33.

Randazzo, M., Priefer, R., Khamis-Dawkar, R. (2021) Project-based learning and Traditional Online teaching of research methods during covid-19: An investigation. *Frontiers in Education*, *6*, 186. <u>https://www.frontiersin.org/article/10.3389/feduc.2021.662850</u>

Rees Lewis, D. G., Gerber, E. M., Carlson, S. E., & Easterday, M. W. (2019). Opportunities for educational innovations in authentic projectbased learning: Understanding instructor perceived challenges to design for adoption. *Educational Technology Research and Development*, *67*(4), 953–982. <u>https://doi.org/10.1007/s11423-019-09673-4</u> Revelle, K. Z. (2019). Teacher perceptions of a project-based approach to social studies and literacy instruction. *Teaching and Teacher Education*, 84, 95–105. https://doi.org/10.1016/j.tate.2019.04.016

Scales, P.C., Boat, A., & Pekel, K. (2020). Defining and Measuring Social Capital for Young People: A Practical Review of the Literature on Resource-Full Relationships. Minneapolis: Search Institute. Report for the Bill & Melinda Gates Foundation.

Schwalm, J., & Tylek, K. S. (2012). Systemwide Implementation of Project-Based Learning: The Philadelphia Approach. Afterschool Matters, 1–8.

Tamim, S. R., & Grant, M. M. (2013). Definitions and uses: Case study of teachers implementing project-based learning. *Interdisciplinary Journal of Problem-Based Learning*, 7(2), 72–101.

Waite, C. (2020). Spotlight on Project-Based Learning: Seeing the forest and the trees. Childhood Education, 96(2), 30–41. <u>https://doi.org/10.1080/</u> 00094056.2020.1733860

