Annual Report

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Defined Learning Implementation in Connecticut Schools
2023-24 Academic Year Annual Report
Prepared by MIDA Learning Technologies, LLC

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For

Defined Learning

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Executive Summary

This research study investigated the implementation and impact of Defined Learning, a project-based learning (PBL) platform, in Connecticut schools during the 2023-2024 academic year. Employing a mixed-methods approach, the study analyzed survey responses from 86 educators, conducted interviews and focus groups with 56 teachers and administrators, and examined usage data from over 300 schools.

Key findings reveal that Defined Learning is widely adopted across grade levels and subject areas, particularly in middle schools. Teachers predominantly utilize the platform for instruction, enrichment, and assessment, citing increased student engagement, collaboration, and communication skills as key benefits. The platform's real-world relevance and diverse project options were also highly valued. However, challenges such as the need for additional resources, differentiated instruction, and ongoing professional development were identified.

The Stafford Public Schools case study further validated the platform's effectiveness, showcasing how Defined Learning can drive student engagement, skill development, and achievement of learning targets through PBL.

The study concludes that Defined Learning holds significant promise for improving student outcomes in Connecticut. By addressing identified challenges and expanding professional development opportunities, schools and districts can maximize the platform's potential to foster a thriving culture of PBL, empowering students with the skills they need to succeed in the 21st century. Further research is recommended to explore the long-term impact of Defined Learning on student achievement and to investigate its effectiveness in specific contexts and populations.

Introduction

In the summer of 2021, MIDA Learning Technologies was contracted by Defined, LLC, to conduct longitudinal research focused on the state-wide implementation of Defined Learning in Connecticut. The three-year rollout of the project-based learning platform was designed to provide teachers with the necessary resources to incorporate project-based learning in their respective classrooms.

Defined Learning is a web-sourced project-based learning application designed to promote effective and relevant connections between classroom content and career pathways, thus providing deeper and more meaningful educational opportunities for students. Defined Learning provides teachers access to highly effective media content and related support materials. These resources and materials allow teachers to connect career awareness to existing lessons and curricular targets.

Under the state-wide agreement, all Connecticut school districts were granted access to Defined Learning beginning in the fall semester of 2021. The project's rollout began with several Defined-hosted professional development workshops, which have continued throughout the three-year implementation, including the 2023-24

school year. The workshops' focus has been to introduce teachers to project-based learning as a teaching strategy and the Defined Learning platform as a means to support that strategy.

MIDA researchers have followed the implementation process and provided periodic reports that have detailed continuous growth in usage. Those reports also chronicled the positive impact of PBL in classrooms across the state as well as the challenges and barriers teachers faced in the shift to PBL strategies. Specifically, Defined Learning was identified as having an overall positive impact on classroom instruction, student engagement, and teacher attitudes. It aided teachers in reaching all students and supported at-risk learners through allowances for differentiation. The application of Defined Learning also played a part in student development of soft skills, including collaboration, communication, and creativity, as well as social-emotional skills like self-moderation and interpersonal interactions. The challenges reported in the first two years included time constraints, the need for more refined curricular alignment, and the lack of resources necessary for project completion.

In this, the third year of the implementation plan, MIDA worked with Defined and the Connecticut State Department of Education to identify a sample of teachers and administrators. Over the course of the 2023-24 school year, researchers engaged Connecticut educators in various training sessions, interviews, focus groups, and surveys. This annual report contains data and analysis from these sources and the most current frequency of use data. The data analysis builds upon prior years to capture the longitudinal impact of the initiative.

Review of Current Literature

To set the context for this study, it is essential to connect the current research to the existing knowledge base surrounding project-based learning (PBL). The following literature review provides the theoretical foundation for this study and informs the framework for both qualitative and quantitative data collection.

Project-Based Learning (PBL): Definition and Benefits

Project-based learning (PBL) is a pedagogical approach centered on authentic tasks and student-driven engagement to foster a rich and effective learning environment. The Buck Institute for Education (2021b) defines PBL as "a teaching method in which students gain knowledge and skills by working for an extended period of time to investigate and respond to an authentic, engaging, and complex question, problem, or challenge."

Research consistently demonstrates the effectiveness of PBL. It is recognized as an innovative teaching method (Du et al., 2019; Safaruddin et al., 2020) gaining traction in schools (Hussein, 2021; McKay, 2018; Odell et al., 2019), and garnering support from K-12 education policymakers and funders (Condliffe et al., 2017). Notably, PBL enhances students' employability skills like collaboration, problem-solving, reflection, and critical thinking (Kolmos et al., 2020), preparing them for success in college and careers (Quint & Condliffe, 2018).

PBL and Durable Skills

Recent research emphasizes PBL's impact on skills highly valued by employers. Slyter (2019) categorizes these skills as:

- Learning skills: Creativity, critical thinking, collaboration, and communication.
- Literacy skills: Information, media, and technology literacy, focusing on evaluating and processing new information.
- Life skills: Adaptability, leadership, initiative, efficiency, and social skills.

These skills are crucial for postgraduate success, yet traditional assessments often fail to measure them (Bell, 2010). PBL bridges this gap by cultivating these competencies within an academic context.

PBL and Social-Emotional Learning (SEL)

PBL positively impacts students across diverse backgrounds, content areas, and grade levels (Jagers et al., 2021; Lucas Education Research, 2021a; Spencer, 2021). Furthermore, PBL and SEL have a mutually beneficial relationship. PBL provides an ideal framework for teaching SEL competencies (Kaechele, 2019a), enhancing college and career readiness, 21st-century competencies (durable skills), and social-emotional competencies (SEL) outlined

by CASEL (Kaechele, 2019a). Integrating PBL and SEL enables students to better manage their emotions, collaborate effectively, and develop stronger interpersonal skills (Lucas Education Research, 2021b).

Authenticity and Student Empowerment in PBL

PBL empowers students through authentic, real-world problems (Grossman et al., 2021; Hussein, 2021; Jagers et al., 2021). It promotes active engagement (Frydenberg & Mentzer, 2021; Yuliana et al., 2018) in a learn-by-doing environment (Cintang et al., 2018) where students investigate concepts and skills (Almulla, 2020). PBL motivates students (Condliffe et al., 2017; Frydenberg & Mentzer, 2021; Juuti et al., 2021; Kolmos et al., 2020; Setiawan et al., 2021) and encourages collaboration, challenges, and discussions (Jagers et al., 2021; Juuti et al., 2021; Setiawan et al., 2021).

Student empowerment in PBL arises from their autonomy in making learning decisions (Bell, 2010; Frydenberg & Mentzer, 2021; Kolmos et al., 2020; Lebid & Shevchenko, 2020) and applying knowledge to real-world projects (Mahasneh & Alwan, 2018). Intrinsic motivation fosters inquiry and knowledge acquisition (Almulla, 2020; Condliffe et al., 2017) as students take ownership of their learning (Jagers et al., 2021).

PBL Design Considerations

Gold Standard PBL, as defined by the Buck Institute for Education (2021a), encompasses essential elements: a challenging problem/question, sustained inquiry, authenticity, student voice and choice, reflection, critique and revision, and a public product. PBL engages students in authentic, real-world problems (Grossman et al., 2021; Juuti et al., 2021; Kolmos et al., 2020; Merritt et al., 2017; Miller & Krajcik, 2019; Setiawan et al., 2021), fostering freedom to question while developing metacognitive skills and self-directed learning (Frydenberg & Mentzer, 2021; Hussein, 2021). PBL is rooted in constructivism, emphasizing inquiry and investigation (Budiarti et al., 2021; Condliffe et al., 2017). Students address a driving question (Jagers et al., 2021; Juuti et al., 2021; Miller & Krajcik, 2019; Quint & Condliffe, 2018), research, and gather data to solve the problem or complete the task.

The Role of Assessment in PBL

Assessment in PBL presents unique challenges due to the nature of academic content and the PBL learning process (Condliffe et al., 2017; Kovácsné Pusztai, 2021). PBL focuses on creative solutions rather than a single right answer (Kovácsné Pusztai, 2021) and extends beyond specific disciplines (Lebid & Shevchenko, 2020), making it a holistic

educational approach. Research suggests that PBL supports conceptual understanding and enhances preparedness for standardized tests (Hussein, 2021).

PBL aligns with the Standards for Mathematical Practice, emphasizing processes like problem-solving, reasoning, communication, representation, and connections (Standards for Mathematical Practice, 2016). Educators utilizing PBL provide students with a real-world context for meaningful content understanding (Condliffe et al., 2017) while fostering higher-order thinking skills (Overholt, 2017). PBL empowers students to actively engage in learning according to their individual styles (Cintang et al., 2018), offering a pathway to success in the classroom and beyond.

Landmark Studies Supporting the Literature

Literature is dotted with studies that examine experiences of students and teachers in cases where PBL is implemented as a teaching strategy. Below are the findings from a select few gold standard studies recently supported by Lucas Education Foundation to ascertain the effectiveness and influences of PBL (Terada, 2021). In addition, a recent study conducted by MIDA Learning Technologies on the specific impact of Defined Learning in Fort Wayne, Indiana is detailed.

Fort Wayne Mixed Methods Study

In the spring of 2022, MIDA Learning Technologies conducted an independent, mixed methods retrospective study in Fort Wayne Community Schools, a large urban school district in Indiana, to determine the impact of Defined Learning's (DL) project-based learning platform on student performance and school climate. The study used existing test data to determine if there were differences between schools that recorded high frequencies of DL use compared to schools with limited or no use of Defined Learning.

This mixed-methods study utilized a two-group, retrospective, quasi-experimental design to examine the effect of project-based learning (PBL)—specifically PBL utilizing the Defined Learning platform—on elementary students' reading and mathematics growth scores. In addition, qualitative data were collected utilizing focus groups and interviews of experimental group teachers and administrators.

The data collection consisted of existing test scores for the 2021-22 school term secured in April 2022. The data reflected student growth scores using the beginning-of-year (BOY) and end-of-year (EOY) scores on FastBridge assessments conducted by the school district. FastBridge, a product from Illuminate, is a valid and reliable assessment tool used to help educators identify students' academic and social-emotional behavior (SEB) needs. Researchers isolated FastBridge student growth scores for third, fourth, and fifth grades in reading and mathematics.

Overall, findings indicated that students in the experimental group in the third, fourth, and fifth grades significantly outperformed control group peers in reading. Findings also showed that the experimental group significantly outperformed peers in third and fourth-grade mathematics. In fifth grade, the experimental group outperformed the control group but not at the .05 level of significance.

Students outperformed their peers in both reading and mathematics in each of the third, fourth, and fifth grades (significance was detected in all but fifth grade mathematics). These findings are consistent with existing literature that suggests that students who engage in project-based learning score higher in academic measures than peers who do not participate in a similar environment.

The University of Southern California Study

Researchers from the University of Southern California (Lucas Education Research, 2021a) found that when a PBL approach was used, advanced placement (AP) courses showed an increase regarding student achievement on AP exams.

> When Gil Leal took AP Environmental Science in his junior year of high school, he was surprised by how different it was from his other AP classes. Instead of spending the bulk of the time sitting through lectures, taking notes, and studying abstract texts, his class visited a strawberry farm in the valley nearby.
>
> It wasn't just for a tour. Leal and his peers were tasked with thinking about the many challenges that modern farms confront, from water shortages to pest infestations and erosion. More surprising to Leal: Students were asked to design their own solutions, incorporating what they had learned about things like soil composition, ecosystem dynamics, and irrigation systems. (Terada, 2021, para. 1-2)

The sample for this study consisted of 3,600 students selected from five school districts that serve a diverse student body (Terada, 2021). Findings revealed that the percentage of students successfully completing the AP exam increased by 8%. This increase was exhibited equally by students from varying socio-economic backgrounds (SES), suggesting that PBL as an approach may be a way of addressing the needs of all students. In fact, the demographics of the population revealed that participation in AP classes by students from low-income households increased. The implication of this finding suggests a potentially important thread for future investigation (Terada, 2021). The results of the study also demonstrated sustainability as the results were tracked over several years. Students successfully completed the AP exam at an even higher level (10%) in year two.

Michigan State University Study

In a second landmark study supported by Lucas Educational Research, researchers from Michigan State University studied 2,371 third-grade students across 46 schools. The sample population represented a diverse group of students. Specifically, 62% of the students were from low SES and 58% were students of color. An example of what students in the experimental group experienced is highlighted in Terada's (2021) article:

> "Third-grade students work on the 'Toy Unit,'" said Freeland. "But don't let the name fool you; they are not just playing around. Third graders learn the concepts of gravity, friction, force, and direction by designing toys from simple objects such as water bottles, straws, and recycled milk cartons. The unit ends with them designing their own toys that use magnetic or electrical force," she told researchers, while emphasizing that the projects are aligned with Next Generation Science Standards (NGSS). (para. 2)

In this study, PBL students outperformed their peers on science assessments by 8 percentage points. Congruent with the AP study, the increased student performance was reflected across all SES groups and among all reading levels (Terada, 2021).

Lucas Education Research

Lucas Education Research (2021b), in an investigation of a multiple literacies - PBL (ML-PBL) science program, found that third-grade students in classes using ML-PBL more frequently reported the value of reflecting on their work and collaborating than their peers reported.

Design Principles of PBL (Adaptive, Responsive, And Satisfying) with Three-Dimensional Science Learning

Adah Miller et al. (2021) conducted a longitudinal study that combined the design principles of PBL (adaptive, responsive, and satisfying) with three-dimensional science learning as envisioned by The Framework for K-12 Science Education, then tested these features to derive design principles that serve as commitments for designing for teacher change and student learning. They found that teachers and students were motivated, learning was visible, learners used creativity, and deep engagement resulted.

PBL on Secondary-Mathematics Students' Academic Skill Development and Motivation for Learning

In a mixed-methods longitudinal study, Holmes and Hwang (2016) investigated the benefits of PBL on secondary-mathematics students' academic skill development and motivation for learning. The emphasis of this study was academic skill development in the areas of algebra and geometry. The study also examined the relationship between PBL and racially/ethnically and economically diverse secondary students. Results showed that at-risk and minority students profited greatly from PBL when studying mathematics. The academic performance gap between

these different student populations was significantly reduced. Students who participated in this study also demonstrated significantly higher critical thinking skills and higher levels of motivation when compared to those students who did not participate in PBL.

The Impact of The Learning Through Performance (LTP) Project-Based Learning (PBL) Science Curriculum

Deutscher et al. (2021) conducted a three-year study in California to explore the impact of the Learning Through Performance (LTP) project-based learning (PBL) science curriculum on middle school students. They found that students engaged in the LTP PBL curriculum not only outperformed their peers on standardized science tests, but also showed improvement in math and English language arts (ELA). Additionally, English language learners in the LTP group demonstrated superior performance on a standardized English proficiency test, highlighting the curriculum's broad benefits.

IQWST (Investigating and Questioning our World through Science and Technology) PBL Science

Krajcik & Schneider (2021) conducted a cluster randomized controlled trial in Michigan to examine the impact of the IQWST (Investigating and Questioning our World through Science and Technology) PBL science curriculum on third-grade students' science learning. Their research revealed that students who experienced the IQWST curriculum achieved significantly higher scores on a science assessment compared to students in traditional classrooms. Notably, the positive effects of the IQWST curriculum were particularly pronounced for students from low-income families and those with lower reading abilities, suggesting its potential to reduce achievement gaps.

The Effectiveness of a PBL Curriculum in Advanced Placement (AP) Courses

Saavedra et al. (2021) evaluated the effectiveness of a PBL curriculum in Advanced Placement (AP) courses across various subjects. Their study demonstrated that students who participated in PBL AP courses consistently outperformed their peers in traditional AP courses on the AP exams. Furthermore, teachers implementing PBL reported increased teaching efficacy and a greater sense of professional fulfillment. Remarkably, the positive effects of PBL were not only sustained over time but even amplified in the second year of implementation.

Literature Review Conclusion

Consistently across studies, findings indicate that PBL enhances student performance, motivation (Setiawan et al., 2021; Ummah et al., 2019), student engagement (Frydenberg & Mentzer, 2021), teacher/student interaction, the Five C's of 21st Century Learning [creativity, critical thinking (Mahasneh & Alwan, 2018), collaboration, cooperation, and communication], and social-emotional learning. PBL transcends a single academic discipline, offering the potential for employability skills that employers seek, such as teamwork, emotional intelligence, and critical and

creative thinking (Lebid & Shevchenko, 2020). The research cited above shows that there are implications for promoting student success across diverse backgrounds and abilities.

Given these consistent findings, one is left to wonder why more classrooms have not adopted PBL as a methodology. Research supports that students who engage in PBL perform better on both standardized assessments and project tests than students in traditional direct instruction programs and that they learn both real-world application of skills (Yuliana et al., 2018).

> *In the future, children must enter a workforce in which they will be judged on their performance. They will be evaluated not only on their outcomes but also on their collaborative, negotiating, planning, and organizational skills. By implementing PBL, we are preparing our students to meet the twenty-first century with preparedness and a repertoire of skills they can use successfully. (Bell, 2010, p. 43)*

In our current test-centric educational society, teachers strive to deliver the most pertinent content to ensure student success on standardized, high-stakes testing. Yet in many traditional classrooms, students continue to struggle to attain mastery. "Critics [have even suggested] that the pedagogy places too much responsibility on novice learners and ignores the evidence about the effectiveness of direct instruction by teachers" (Terada, 2021). Yet direct instruction and project-based learning are not mutually exclusive. They can coexist in a functional learning environment that supports the needs of all students and promotes maximum opportunities for student success.

The review of the literature brought out several key points regarding project-based learning.

1. PBL Increases student engagement and motivation.
2. PBL has been linked to increased student academic performance.
3. PBL increases student competencies in soft skills, including durable skills and social-emotional learning skills.
4. PBL helps students at all levels. It equalizes the playing field, so to speak. It is a great way to differentiate instruction.
5. PBL has been linked to improved teacher attitudes.

In short, research findings indicate that PBL is a teaching method that supports student academic performance for all students while inherently promoting durable and SEL skills.

Methodology

Research Design: Embracing a Qualitative Approach

This study adopted a qualitative research design to delve into the multifaceted experiences and perspectives of teachers and administrators regarding the implementation and impact of Defined Learning. This study primarily adopted a phenomenological research design to delve into the multifaceted experiences and perspectives of teachers and administrators regarding the implementation and impact of Defined Learning in Connecticut schools. The phenomenological approach was chosen to capture and describe the essence of these individuals' lived experiences as they navigated the integration of this educational platform within their classrooms and institutions. This approach aligns with Merriam and Tisdell's (2016) definition of a phenomenological study as one that contemplates how an individual's experience forms consciousness and "understanding about the essence and the underlying structure of the phenomenon" (p. 24). Phenomenological studies support a focus on following "structural steps": analyzing the reported "what" and "how" to identify themes within the Moustakas approach, which ensures a more accurate depiction of what the participants have experienced (Creswell & Poth, 2018, p. 78). Thus, the phenomenological interview process represented the "primary method of data collection" (Merriam & Tisdell, 2016, p. 27) to obtain an appropriate depth of information (Ravitch & Carl, 2021).

This approach was chosen for several key reasons:

1. Depth and Richness: Qualitative research methods, such as interviews and focus groups, allowed for in-depth exploration of the nuances and complexities inherent in the implementation process. These methods captured the "how" and "why" of Defined Learning's usage, providing rich data that goes beyond quantitative measures.

2. Contextual Understanding: Qualitative research emphasized the importance of understanding the context in which Defined Learning was being implemented. This included examining the school culture, teacher practices, and student characteristics, which all influence the effectiveness of the platform.

3. Emergent Insights: The qualitative approach facilitated the discovery of unanticipated themes and patterns, leading to a more comprehensive understanding of the phenomenon under investigation. This openness to emergent insights was particularly valuable in identifying both challenges and unexpected benefits of using Defined Learning.

4. Participant Voice: Qualitative research prioritized the voices and perspectives of teachers and administrators, giving them a platform to share their experiences, insights, and concerns. This emphasis on participant voice ensures that the findings are grounded in the lived realities of those most directly involved in the implementation process.

Embedded Case Study

As the research progressed, specific cases of interest emerged, warranting a deeper exploration beyond the phenomenological scope. These instances were identified through preliminary data analysis and were characterized by unique implementation strategies, exceptional outcomes, or significant challenges.

To address these unique instances, an embedded case study approach was integrated into the overall research design. A case study approach is appropriate to "understand a real-world case and assume that such an understanding is likely to involve important contextual conditions pertinent to [the] case" (Yin, 2018, p. 15).

These case studies provided detailed contextual analysis of particular schools or classrooms, offering insights into the specific conditions and practices that influenced the implementation and impact of Defined Learning. This approach allowed for a nuanced understanding of the factors contributing to the variability in experiences and outcomes across different settings.

Data Collection Methods

In the fall of 2023, researchers reviewed usage data and established a threshold of 2,300 school-wide engagements with Defined Learning as a criterion for selecting schools for the study. This threshold was chosen to ensure that participating schools had a significant level of experience with the platform, thereby maximizing the potential for insightful data collection.

The initial analysis identified 18 school districts and 27 specific school buildings that met the engagement threshold. In the spring of 2024, researchers collaborated with representatives from the Connecticut Department of Education to extend the sample and identified a specific set of STEM teachers to be included in the survey and interview data collection process.

- **Semi-structured Interviews:** In-depth interviews were conducted with a purposive sample of teachers and administrators from the selected schools. The interviews explored their experiences with implementing and using Defined Learning, as well as their perceptions of its impact on student outcomes, engagement, and classroom climate.

- **Focus Groups:** Focus group discussions were held with groups of teachers from different schools to encourage dialogue and shared reflections on their experiences with Defined Learning. This approach allowed for a deeper exploration of common themes and challenges faced by teachers in implementing the platform.

- **Surveys:** A survey was administered to a broader sample of teachers and administrators to gather quantitative data on usage patterns, satisfaction levels, and perceived impact.

- **Usage Data Analysis:** Researchers analyzed the usage data collected by Defined Learning to identify trends in platform engagement, resource utilization, and student performance.

Data Collection: A Multi-Faceted Approach

To gather data on the implementation and impact of Defined Learning in Connecticut schools, a multifaceted approach was employed, encompassing interviews, focus groups, surveys, usage data analysis, and collection of student artifacts.

Interviews and Focus Groups: Both in-person and virtual interviews and focus groups were conducted using Zoom for remote participants. All sessions were guided by a set of open-ended questions (see Appendix A), designed to encourage participants to share their experiences, insights, and perspectives on Defined Learning. MIDA researchers facilitated these sessions, ensuring a comfortable and open environment for discussion. All sessions were audio-recorded and transcribed using Otter AI to ensure accuracy and facilitate subsequent analysis.

Survey: A comprehensive survey was administered to teachers within the identified sample schools. The survey instrument (see Appendix B) included both closed-ended questions for quantitative analysis and open-ended questions to gather qualitative insights. Survey data were analyzed using descriptive statistics to identify trends and patterns in teacher perceptions, usage, and perceived impact of Defined Learning.

Usage Data Analysis: Frequency of use data was collected directly from Defined Learning's platform, tracking the number of engagements by both teachers and students throughout the academic year. These data were compared to usage statistics from previous years to determine growth patterns and identify any shifts in platform adoption or utilization.

Student Artifacts: In select cases, researchers collected student artifacts, such as project samples, to supplement the qualitative and quantitative data. These artifacts provided concrete examples of student work and served as tangible evidence of the impact of Defined Learning on student learning and engagement.

Data Analysis: The qualitative data from interviews and focus groups were analyzed using thematic analysis. This involved identifying, coding, and categorizing recurring themes and patterns in the participants' responses. The quantitative data from surveys and usage statistics were analyzed using descriptive statistics to assess frequency distributions, central tendencies, and correlations.

By combining these various data collection methods, the research team was able to gain a holistic understanding of how Defined Learning is being implemented in Connecticut schools, its impact on students and teachers, and the factors that contribute to its successful adoption and integration into the curriculum.

Sample Size, Demographics, and Selection Criteria

Based on the initial usage data analysis and collaboration with the Connecticut Department of Education, the research sample was drawn from a pool of teachers identified as frequent users of Defined Learning. This purposive sampling strategy aimed to gather the most meaningful data from educators with significant experience using the platform.

Survey Sample: The initial survey was sent to 400 teachers, selected randomly from the broader list of educators within the targeted school districts. The final sample consisted of 86 respondents, yielding a response rate of 21.5%. This sample size provided sufficient data for meaningful analysis and insights.

Professional Development Survey: *As* a follow-up to professional development sessions, participants were asked to complete a brief survey to reflect on their experience. There were a total of 168 responses recorded for this aspect of data collection.

Interview and Focus Group Sample: A total of 37 teachers and administrators participated in at least one data-gathering interview or focus group session. These participants were purposively selected to represent a diverse cross-section of schools, encompassing urban, suburban, and rural areas. This diversity ensured that the research captured a range of perspectives and experiences with Defined Learning across different educational contexts.

Stafford School District Case Study: In addition to the broader sample, a case study was completed on the Stafford School District, which had uniquely implemented Defined Learning in elementary content areas. This case study provided an in-depth look at the district's implementation process through a coaching model, challenges, successes, and the impact of the platform on student learning and engagement. The data collection for the case study also provided informative artifacts in the form of student project submissions.

Usage Data: Frequency of use data was obtained from Defined Learning's web access portal statistics, encompassing all participating schools. This data provided a comprehensive overview of platform usage patterns, allowing for comparisons across schools and identification of trends in teacher and student engagement.

Combining the data from these diverse sources allowed the research team to triangulate findings and develop a nuanced understanding of Defined Learning's implementation and impact in Connecticut schools.

Data Analysis: Illuminating Themes Through AI-Assisted Thematic Analysis

Qualitative data analysis was central to this research, aiming to reveal deeper meanings and patterns within the narratives shared by teachers and administrators. Thematic analysis, a widely recognized approach to qualitative data analysis, was employed to rigorously and systematically examine the interview and focus group transcripts. This process was facilitated by AI assistants, including Otter AI for transcription and GPT-4 for theme identification and refinement, enhancing efficiency and ensuring a comprehensive analysis.

The analysis process involved several iterative steps:

1. **Familiarization:** Researchers immersed themselves in the data, reading and re-reading transcripts to gain a comprehensive understanding of the experiences and perspectives shared by participants.

2. **AI-Assisted Coding and Theme Development:** Transcripts were processed using Otter AI to generate accurate and time-stamped transcriptions. These transcripts were then analyzed using GPT-4, which assisted in identifying and coding relevant segments of text that captured key concepts, ideas, or patterns. This collaborative effort between human researchers and AI tools streamlined the coding process and allowed for a more efficient and comprehensive identification of emergent themes.

3. Theme Refinement and Validation**:** The identified themes were further refined and clarified through iterative discussions among the research team, incorporating insights from both human interpretation and AI-generated suggestions.

This innovative approach, combining the strengths of human researchers and AI assistants, enabled a deeper and more nuanced understanding of the data. The use of AI tools facilitated the identification of recurring themes and patterns that might have been overlooked in a purely manual analysis, while the expertise of human researchers ensured the validity and interpretability of the findings.

This rigorous analysis provided the foundation for the findings and recommendations presented in this report, ensuring that they are grounded in the lived experiences of teachers and administrators.

Limitations of the Study

While this study offers valuable insights into the implementation and impact of Defined Learning in Connecticut schools, it is important to acknowledge several limitations that may affect the generalizability and interpretation of the findings:

1. Limited Survey Response Rate: The survey response rate of 21.5% raises concerns about potential non-response bias. It is possible that the respondents may not be fully representative of the broader population of teachers using Defined Learning, potentially skewing the results.

2. Diverse Applications of the Platform: The diverse ways in which Defined Learning is being used across schools (enrichment, assessment, direct instruction) made it challenging to conduct a comprehensive quantitative analysis of its impact on student academic performance. This diversity limits the ability to isolate the specific effects of the platform when used for direct instruction.

3. Focus on Early Implementation Phase: The study primarily captured the experiences of teachers and administrators during the early stages of Defined Learning implementation. As teachers become more comfortable with the platform and transition towards using it for direct instruction, the potential impact on student outcomes will be measurable.

4. Qualitative Focus**:** While the qualitative data provided rich insights into the experiences and perspectives of participants, the lack of a robust quantitative component limited the ability to establish causal relationships between Defined Learning usage and student academic performance.

Future Directions:

To address these limitations, future research should focus on:

- Targeted Sampling: Conducting studies with a larger and more representative sample of teachers, particularly those using Defined Learning primarily for direct instruction.

- Longitudinal Studies: Tracking the impact of Defined Learning over multiple years to assess its long-term effects on student outcomes and teacher practices.
- Mixed Methods Design: Combining qualitative and quantitative methods to gain a more comprehensive understanding of the relationship between Defined Learning usage and student achievement.
- Focus on Specific Outcomes: Investigating the impact of Defined Learning on specific student outcomes, such as critical thinking, problem-solving, and 21st-century skills.

Addressing these limitations and pursuing these potential research directions can further refine our understanding of Defined Learning's potential to transform education in Connecticut and beyond.

Findings

Qualitative Findings: Implementation and Impact of Defined Learning in Connecticut Schools

The qualitative data gathered through interviews and focus groups with Connecticut educators reveals several key themes regarding the implementation and impact of Defined Learning in their classrooms:

How Teachers Are Implementing Defined Learning

- Diverse Applications: Teachers are utilizing Defined Learning across a broad range of grade levels and subjects, including STEAM, math, ELA, and science. This flexibility allows for integration into various curricular areas and instructional approaches.
- Instructional Strategies: While some teachers primarily use Defined Learning for enrichment or assessment, others are incorporating it into their core instruction. This practice suggests a growing recognition of the platform's potential for project-based learning (PBL) in the classroom.
- Project Selection and Adaptation: Teachers approach project selection in diverse ways, including personal choice based on student interest, alignment with district curricula, and modification of existing projects to fit specific needs and resources. This adaptability highlights the platform's versatility and responsiveness to individual classroom contexts.

Impact on Student Performance, Engagement, and Class Climate

- Increased Engagement and Motivation: A recurring theme across interviews was the significant increase in student engagement observed when using Defined Learning projects. Students were described as more excited, invested, and eager to participate in the learning process.

- Real-World Relevance: Teachers consistently emphasized the value of the real-world connections embedded in Defined Learning projects. These connections sparked student interest, made learning more relevant, and opened up discussions about potential career pathways.

- Collaboration and Communication: The collaborative nature of Defined Learning projects fostered teamwork, communication, and problem-solving skills among students. Teachers observed students working together effectively, negotiating ideas, and supporting each other's learning.

- Deeper Learning and Skill Development: Through hands-on activities and authentic tasks, Defined Learning projects facilitated deeper learning and the development of 21st-century skills, such as critical thinking, creativity, and communication. Students were able to apply their knowledge in meaningful ways and develop a deeper understanding of the subject matter.

- Positive Classroom Climate: The increased engagement and collaboration fostered by Defined Learning projects contributed to a more positive and supportive classroom climate. Teachers reported fewer behavioral issues and a greater sense of community among students.

Challenges and Successes with the Platform

- Successes: Teachers overwhelmingly reported positive experiences with Defined Learning. They appreciated the platform's ease of use, flexibility, and the high-quality, engaging projects that sparked student interest and fostered deeper learning.

- Challenges: Teachers identified several challenges, including the need for more structured guidance for some students, difficulties with group work due to absenteeism, limited resources for certain projects, and the need for alignment of projects with specific grade-level standards.

Supporting Quotes:

- "The kids get really excited about the trains... I have several students... they might be students who are difficult, but they're so engaged with the projects."

- "The collaborative part of the Defined Learning project, really sort of supported and assisted, giving them [students] more practice...having to negotiate, collaborate those sorts of important skills."

- "It [Defined Learning] gives them [students] another way of expressing what they've learned -- that it's outside of the traditional paper and pencil."

- "The kids are really excited about the projects. And the first thing that they want to do is they want to just jump in, they want to build something..."

Overall:

The qualitative findings from this study paint a promising picture of Defined Learning's potential to enhance project-based learning in Connecticut schools. While challenges exist, the platform's positive impact on student engagement, collaboration, and deeper learning is evident. The feedback provided by teachers offers valuable insights for further refinement and expansion of the platform to better meet the diverse needs of students and educators.

Survey Data

This section summarizes the survey results conducted in the spring 2024 semester. The following section discusses these results and how they relate to other data sources. Results are from 86 respondents representing 15 school districts of varying size and demographics.

Survey Results: Grade Levels Taught

The survey data revealed that the majority of respondents were middle school teachers, with a significant presence across grades four through eight. This distribution reflects the diverse range of grade levels in which Defined Learning is being implemented across Connecticut schools. Notably, there was some overlap in responses, with some teachers indicating that they taught multiple grade levels. This finding emphasizes the flexibility of Defined Learning as a tool adaptable to various grade levels and subject areas.
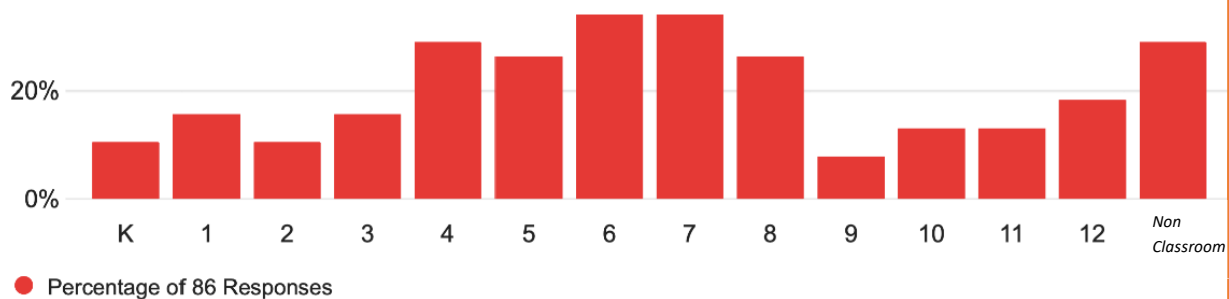
Figure 1: Grade Levels Represented in the Sample

This distribution reinforces that Defined Learning is finding traction across the middle grades, a critical period for student development and engagement in STEM subjects. The balanced representation from grades 4-8 indicates the platform's potential to cater to a wide range of student needs and learning styles within this age group.

Interestingly, 29% of respondents reported holding non-classroom positions, such as technology coaches, STEAM coordinators, gifted and talented specialists, and curriculum leaders. This suggests that Defined Learning is being

utilized not only by classroom teachers but also by educators in various leadership roles to support and enhance STEAM instruction across schools and districts.

The involvement of non-classroom educators underscores the potential of Defined Learning to be a valuable resource for a wider audience within the educational community. These educators can leverage the platform's resources to provide professional development, support teachers in implementing PBL, and integrate STEM concepts across the curriculum.

Survey Results: Project Completion Rate

The survey data reveals a strategic approach to project implementation among teachers using Defined Learning. A substantial 42% of respondents reported completing three or more projects throughout the school year, suggesting a consistent integration of project-based learning (PBL) into their instructional practices. Conversely, 58% of respondents indicated conducting one or two projects with their classes, potentially aligning with a model where Defined Learning projects serve as culminating events for each semester.

Further analysis of qualitative data, such as interviews and focus groups, was used to shed light on the specific reasons behind these varying implementation patterns and provide a more nuanced understanding of how teachers are leveraging Defined Learning to enhance their instructional practices.

This distribution of project completion rates could reflect various pedagogical approaches. Teachers who implemented multiple projects may have incorporated shorter, more focused projects throughout the semester to address specific learning objectives or to cater to diverse student interests. On the other hand, those who focused on one or two projects might be utilizing them as comprehensive, summative assessments that synthesize learning across multiple units or content areas.

This pattern suggests that Defined Learning offers teachers the flexibility to tailor project implementation to their individual teaching styles and curricular needs. Whether used as ongoing learning experiences or culminating assessments, the platform's projects provide a valuable framework for engaging students in authentic, real-world problem-solving and promoting deeper learning.

Survey Results: Subject Areas Taught and PBL Integration

The survey results highlight the diverse range of subject areas taught by Connecticut educators who use Defined Learning. The distribution demonstrates a broad platform adoption across various disciplines, reflecting its versatility and potential for cross-curricular integration.

Subject Area Taught	Percentage of Respondents
Mathematics	28%
Science	22%
Other	17%
Language Arts	11%
Computer Science	9%
Social Studies/History	9%
English	4%

Table 1: Subject Areas Taught

Notably, the distribution of subject areas where PBL is being implemented closely mirrors the distribution of subjects taught by respondents. This suggests that teachers are effectively integrating Defined Learning into their existing curricula, regardless of their specific subject areas.

Subject Area with PBL Use	Percentage of Respondents
Mathematics	31%
Science	22%
Other	15%
Language Arts	10%
Computer Science	8%
Social Studies/History	8%
English	5%

Table 2: Subjects with PBL Inclusion

This consistent application of PBL across various subjects underscores the platform's potential to promote a school-wide culture of project-based learning. It also suggests that Defined Learning offers resources and projects that are adaptable to diverse disciplines, enabling teachers to create engaging and meaningful learning experiences for their students, regardless of their specific content areas.

The data also indicate that PBL is most frequently utilized in mathematics classrooms (31%), followed closely by science (22%). This could reflect a perceived alignment between PBL and the inquiry-based nature of these subjects, as well as the availability of relevant projects within the Defined Learning platform.

The "other areas" category, representing 15% of PBL usage, indicates that teachers are also finding creative ways to incorporate project-based learning into less traditional subjects, demonstrating the versatility of the approach and the platform.

Overall, this analysis reveals a promising landscape of PBL implementation in Connecticut schools, with Defined Learning serving as a catalyst for engaging students in real-world problem-solving and promoting deeper learning across diverse subject areas.

Survey Results: Formal PBL Training

A notable majority of teacher respondents (68%) indicated that they had participated in formal project-based learning (PBL) training. This suggests that a significant proportion of educators utilizing Defined Learning have a foundational understanding of PBL principles and practices. This high percentage of formally trained teachers bodes well for the successful implementation of Defined Learning, as it indicates a readiness to embrace the project-based approach and leverage the platform's resources effectively.

The remaining 32% of teachers who have not received formal PBL training may represent a potential area for professional development. Providing targeted support and training opportunities for these educators could further enhance the implementation of Defined Learning and empower them to maximize the benefits of PBL in their classrooms.

The presence of a significant number of formally trained teachers suggests that educators are growing aware of the value and importance of PBL in fostering student engagement, deeper learning, and 21st-century skills. This positive trend aligns with broader educational initiatives promoting student-centered, inquiry-based pedagogies.

Professional Development Survey Findings

Individuals who participated in project-based learning professional development were asked to complete survey questions regarding their sentiments about the sessions. As a follow-up, they were asked what they saw as needed support to be able to effectively use project-based learning in their classroom.

Question 1 - What is one thing that you found most effective/beneficial from the PD session?

Key Findings:

- High Interest in PD: 88.4% of respondents expressed interest in participating in future PD sessions on Defined Learning, indicating a strong desire among teachers to enhance their skills and knowledge in utilizing the platform effectively.

- Preferred PD Format: In-person workshops were identified as the most preferred format for PD (56.9%), followed by a combination of in-person and online sessions (39.5%). This suggests that teachers value the interactive and collaborative nature of in-person learning while also recognizing the convenience and flexibility of online options.

- Topics of Interest: Teachers expressed diverse interests in PD topics, with a strong focus on practical aspects of PBL implementation, such as:

    o Finding and modifying projects (69.8%)
    o Embedding PBL into existing curricula (61.6%)
    o Differentiating instruction within projects (60.5%)
    o Strategies for student engagement and assessment (58.1%)
    o Integrating technology tools (55.8%)
- Additional Support: Teachers also indicated a need for ongoing support beyond formal PD sessions, including access to mentors, online resources, and communities of practice.

Question 2 - What would you like to have more support with beyond the PD session?

Professional Development Support Needs: A Summary of Teacher Feedback

Teachers expressed a wide range of needs for further professional development (PD) and support in implementing Defined Learning. Key themes that emerged from the survey responses include:

1. Deeper Understanding of the Platform: Many teachers requested more in-depth training on specific aspects of Defined Learning, such as navigating the site, enrolling students, and accessing course information. Some teachers also expressed a desire for more time to explore and familiarize themselves with the platform's features.

2. Implementation Strategies and Curriculum Integration: Teachers sought guidance on effective implementation strategies, including how to integrate Defined Learning projects into their existing

curricula, differentiate instruction for diverse learners, and assess student learning within the PBL framework.

3. Collaboration and Sharing Best Practices: A significant number of teachers expressed interest in collaborating with colleagues and learning from their experiences. They suggested various forms of collaboration, such as district-wide PD sessions, online forums, and opportunities to share success stories and challenges with other educators using the platform.

4. Additional Resources and Support: Teachers requested access to a wider range of resources, including differentiated materials, exemplars, and guidance on connecting Defined Learning with other initiatives like the Portrait of a Graduate. Some teachers also sought continued support from Defined Learning staff and expressed interest in virtual office hours or follow-up training sessions.

5. Specific Areas of Focus: Teachers expressed a particular interest in receiving more support on topics such as:

   o Defined Careers and its integration into classroom instruction.
   o Planning Career and Technical Education (CTE) units.
   o Virtual internships and resources for Family and Consumer Sciences.
   o Post-secondary planning and connecting with college application processes.
   o Navigating GoOpenCT and exploring HBCU options.

Additional Considerations:

1 Some teachers expressed a need for support in gaining administrative buy-in for Defined Learning and PBL implementation.
2 Others requested data on the platform's impact in other districts to help "sell" its value to their colleagues and stakeholders.
3 Some teachers highlighted the importance of connecting Defined Learning with state-level initiatives and requirements.

These findings underscore the importance of providing comprehensive, ongoing, and tailored professional development opportunities for teachers using Defined Learning. By addressing these diverse needs and interests, schools and districts can empower educators to effectively leverage the platform's potential and create transformative learning experiences for their students.

Survey Results: Use of Project-Based Learning in the Classroom

The survey data (Figure 2) reveals a diverse range of applications for project-based learning (PBL) in Connecticut classrooms, with Defined Learning serving as a versatile tool to support these various approaches. A significant proportion of teachers (42%) reported using PBL primarily for instruction, indicating that they have integrated it into their core teaching practices. This suggests a growing recognition of PBL's effectiveness in fostering deeper learning, engagement, and the development of 21st-century skills.

Sixty-six percent of respondents indicated utilizing PBL for enrichment activities, highlighting its potential to extend and enhance learning beyond the standard curriculum. This could include providing opportunities for students to explore topics in greater depth, pursue individual interests, or apply their knowledge in creative and meaningful ways.

Furthermore, 26% of teachers reported using PBL for assessment purposes, demonstrating the platform's flexibility in supporting formative and summative evaluations of student learning. This approach allows for a more authentic assessment of student understanding and skills, as it requires them to apply their knowledge to real-world problems and demonstrate their abilities through tangible products or performances.

An additional 13% of respondents reported using PBL for other purposes, underscoring the approach's and platform's adaptability. This diverse range of applications suggests that teachers are finding creative ways to integrate PBL into their classrooms, tailoring it to meet their students' specific needs and interests.
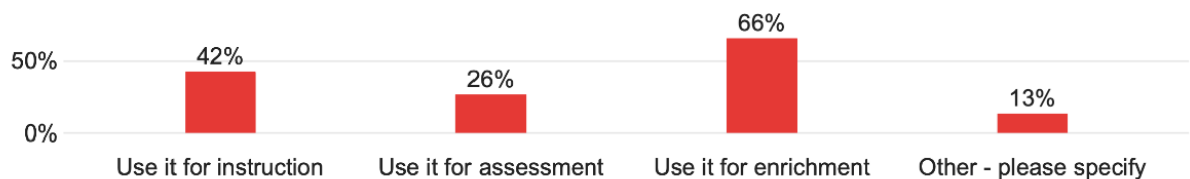

Figure 2: PBL Teaching Strategies

The fact that the percentages add up to more than 100% indicates that many teachers are using PBL for multiple purposes, further highlighting its versatility and potential to transform instructional practices. This trend reflects a growing recognition among educators of the value and effectiveness of PBL in fostering a more student-centered, engaging, and relevant learning experience.

Survey Results: Impact of Project-Based Learning on Student Performance

The survey results provide compelling evidence for the positive impact of project-based learning (PBL) on various aspects of student performance compared to traditional classroom settings. Connecticut educators reported significant improvements in key areas:

Student Engagement: 73.78% increase in student engagement was observed in PBL environments, highlighting the effectiveness of project-based learning in capturing students' interest and motivation. This heightened engagement translates to increased participation, focus, and overall enthusiasm for learning.

Student Engagement

73.78

Teamwork and Collaboration
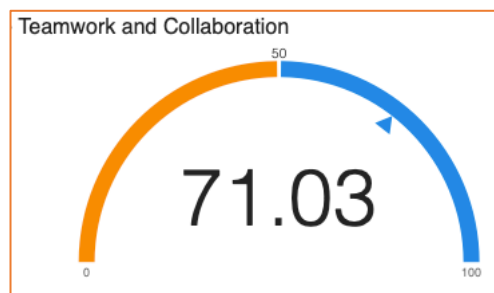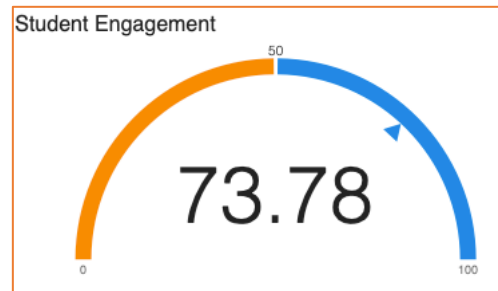
71.03

Teamwork and Collaboration: PBL fostered a collaborative learning environment, with 71.03% of teachers reporting improvements in students' teamwork and collaboration skills. Students learned to work together effectively, share ideas, negotiate differences, and contribute to a shared goal. This collaborative spirit not only enhances the learning experience but also prepares students for the collaborative nature of the modern workplace.

Communication Skills: Project-based learning also significantly improved students' communication skills, with a 67.89% increase reported by teachers. Students honed their abilities to articulate ideas, present findings, and engage in meaningful discussions with their peers and teachers. These communication skills are essential for success in both academic and professional settings.

Communication

67.89

Student Academic Performance
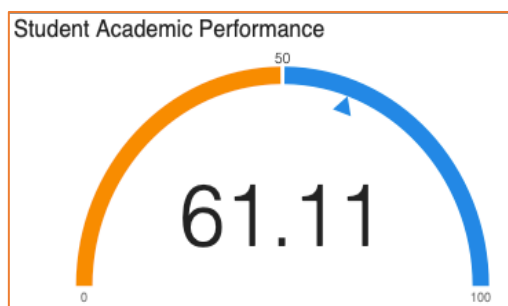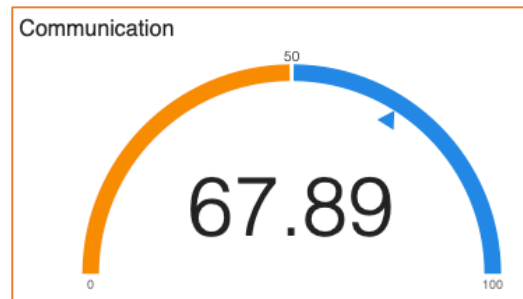
61.11

Overall Academic Performance: Notably, 61.11% of teachers observed an improvement in overall academic performance among students engaged in PBL. This suggests that the project-based approach not only enhances specific skills but also translates to better overall academic outcomes. By actively applying their knowledge and skills to real-world problems, students deepen their understanding of the subject matter and develop a stronger grasp of core concepts.

Frequency of Use Data 23-24

Usage data indicates a significant increase in Defined Learning utilization from July 1, 2022, to June 30, 2023, with a 96% growth rate. This trend continued into the 2023-24 school year, with 216 new schools adopting the platform by the end of June 2024. The year-over-year (YOY) data as shown in the figure depicts a continuous growth pattern. Even though the data for 2023-24 is only current to April 30th, the levels of engagements were well over half a million, a significant growth pattern.

YOY Usage Comparison Full Year & YTD for 2023-24

(bar chart showing values for 2021-22 to June 30, 2022-23 to June 30, and 2023-24 to April 30; legend: July 1 - June 30)
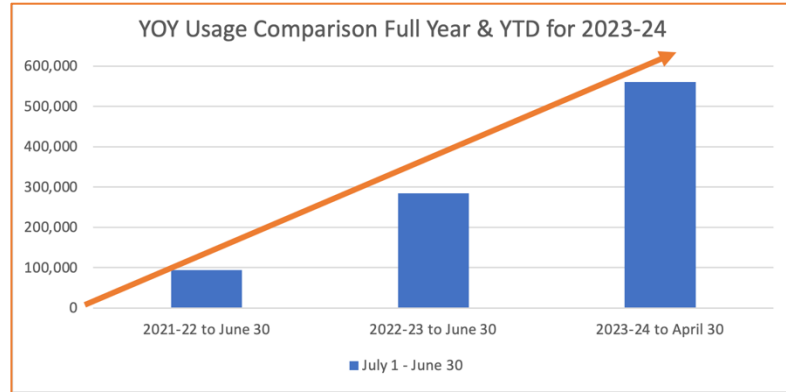
Also of special note would be the analysis of frequency of use data that MIDA researchers conducted in 2022-23 that suggested that the number of engagements as they are tracked significantly underrepresents the actual number of student engagements. The pure metrics of usage data report on teacher and student engagement, whereas the qualitative data paints a more comprehensive picture, suggesting that the initiative's influence on students surpasses what the metrics alone reveal. Underrepresentation in student metrics can be ascribed to several occurrences: teacher-centric PBL use, in which the teacher uses the tool as a focal point of instruction and distributes resources to students, limited access and computer resources for students, and the group access nature of many projects in which one student in a group access the tool. Taking these instances into account suggests that the overall engagement of students is indeed much higher than reported by pure metrics.

Building Type Usage Analysis – Based on Grade-Level Bands

The data on Defined Learning usage by building type reveals a strong presence in schools serving a wide range of grade levels, with the most significant concentration in elementary and middle schools.

Schools serving grades K-5 exhibit the highest engagement, with 72 schools (serving K-5) accounting for 27,282 total engagements. Similarly, schools serving K-6 demonstrate substantial engagement, with 25 schools reporting 35,076 engagements. These numbers highlight Defined Learning's adaptability to elementary school settings, supporting a variety of subjects and grade levels.

Middle schools, particularly those serving grades 6-8, also demonstrate significant engagement, with 68 schools recording a total of 86,144 engagements. This suggests that Defined Learning aligns well with middle school curricula and pedagogical approaches.

High schools (grades 9-12) represent a sizable portion of the user base, with 122 schools reporting 78,053 engagements. This indicates that Defined Learning is finding traction in secondary education, offering project-based learning opportunities relevant to high school students' interests and academic needs.

One hundred four (104) districts reported usage without a grade-level granular view for a total of 92,531 engagements.

Overall, the usage data suggests widespread adoption of Defined Learning across diverse educational settings in Connecticut. The platform is proving to be a widely adopted resource for elementary, middle, and high schools, as well as district-level initiatives. This broad application suggests the platform's versatility and potential to support a variety of educational goals and objectives.

Stafford Public Schools Case Study: A Summary of Findings

The Stafford Public Schools case study focused on the implementation of Defined Learning to support project-based learning (PBL) in a single classroom. Despite its limited scope, the study revealed promising results aligned with broader research on PBL. The "Mini Golf Course Designer" project successfully engaged students, facilitated collaboration and fostered 21st-century skills like problem-solving and communication. Teachers reported achieving learning targets aligned with district curricula and observed increased student motivation due to the real-world application of concepts.

Defined Learning played a crucial role in streamlining PBL implementation by providing comprehensive resources and eliminating the need for extensive preparation. The platform's structured tasks and "chunking" approach proved effective in maintaining student engagement and preventing overwhelm.

The study also highlighted the importance of teacher training and support in overcoming initial apprehensions towards adopting new pedagogies. The presence of a dedicated PBL/Defined Learning coach was instrumental in facilitating a smooth transition and fostering teacher confidence.

While this case study provides valuable insights, its limited scope calls for further research to examine the impact of Defined Learning in a wider range of classrooms and educational contexts. Nevertheless, the findings affirm the platform's potential to transform learning experiences and equip students with essential skills for future success.

Discussion: Connecting Findings to the Broader PBL Landscape

The findings from this mixed-methods study of Defined Learning's implementation in Connecticut schools paint a compelling picture of the platform's potential to enhance project-based learning (PBL) and improve student outcomes. The qualitative data from interviews and focus groups, quantitative survey results, and usage statistics converge to reveal several key insights.

The survey and interview data reveal a dynamic landscape of Defined Learning implementation across Connecticut schools. Teachers are embracing the platform's versatility, using it for instruction, enrichment, assessment, and a variety of other purposes across diverse grade levels and subject areas. The platform's adaptability is evident in its widespread adoption across elementary, middle, and high schools and in district-wide initiatives.

This diversity in implementation aligns with the existing literature on PBL, which emphasizes the importance of tailoring the approach to meet the specific needs and contexts of individual classrooms and schools (e.g., Condliffe

et al., 2017). The finding that most teachers have received formal PBL training further supports the successful integration of Defined Learning, as it indicates a foundation of understanding in PBL principles and practices.

Alignment with PBL Research:

The experiences shared by teachers and administrators in this study strongly resonate with the existing body of research on project-based learning (PBL). The observed increase in student engagement, collaboration, communication, and deeper learning aligns with the well-documented benefits of PBL in fostering 21st-century skills and preparing students for success in college and careers (Grossman et al., 2021; Jagers et al., 2021). This alignment suggests that Defined Learning is effectively facilitating the implementation of PBL principles in Connecticut classrooms.

The teachers' emphasis on the real-world relevance of Defined Learning projects echoes the importance of authenticity in PBL, as highlighted in the literature (Larmer, 2020). By connecting classroom learning to real-world problems and career pathways, Defined Learning appears to ignite student interest and motivation, as evidenced by the Stafford Public Schools case study where students actively engaged in the "Mini Golf Course Designer" project, and anecdotal accounts from teachers across various grade levels and subjects.

Furthermore, the challenges identified by teachers, such as the need for additional resources, differentiated instruction, and ongoing support mirror common barriers to PBL implementation found in previous research (Condliffe et al., 2017; Kovácsné Pusztai, 2021). This suggests that successful PBL adoption requires a multi-faceted approach, encompassing not only high-quality instructional materials like those offered by Defined Learning, but also professional development, collaborative opportunities, and a supportive school culture.

In conclusion, this study's findings reinforce the evidence base for PBL's positive impact on student learning and engagement. They also highlight the role of Defined Learning in facilitating PBL implementation and suggest areas for further improvement to maximize the platform's effectiveness in supporting student success.

Implications for Educational Practice in Connecticut:

The findings of this study have significant implications for educational practice in Connecticut. The widespread adoption and positive impact of Defined Learning across diverse schools and districts suggest that the platform can be a valuable tool in the state's ongoing efforts to enhance STEM education and prepare students for the demands of the 21st-century workforce.

The data on grade-level usage highlights the platform's potential for both elementary and secondary education, offering opportunities for vertical alignment and a cohesive PBL experience throughout a student's academic journey. The involvement of non-classroom educators, such as technology coaches and curriculum leaders, further emphasizes the platform's potential to foster a school-wide culture of PBL and support teachers in implementing this innovative approach.

The strong interest in professional development and collaboration among teachers underscores the need for ongoing support and resources to ensure the successful and sustainable implementation of Defined Learning. By providing targeted training, opportunities for collaboration and sharing best practices, and access to additional

resources, schools and districts can empower educators to fully leverage the platform's potential and create transformative learning experiences for their students.

Recommendations Based on Findings and Interpretation of the Data

Based on the comprehensive analysis of qualitative and quantitative data, the following recommendations are proposed to enhance the implementation of Defined Learning and project-based learning (PBL) in Connecticut schools:

For Defined Learning Platform: Building Upon a Strong Foundation

The data collected throughout this study demonstrate a high level of satisfaction among Connecticut educators with the Defined Learning platform. Teachers and administrators alike praised its ease of use, flexibility, engaging projects, and positive impact on student engagement and learning. The platform's alignment with project-based learning principles and its ability to foster 21st-century skills further solidified its value in the eyes of educators.

However, even the most successful tools can benefit from continuous improvement. The feedback gathered through surveys, interviews, and focus groups provides valuable insights into areas where Defined Learning can be further enhanced to better meet the evolving needs of educators and students. The following recommendations aim to build upon the platform's existing strengths and address identified challenges, ultimately maximizing its potential to transform learning experiences in Connecticut schools.

1. Enhance Project Diversity and Alignment: Further expand the library of projects to include a wider range of topics, grade levels, and subject areas, particularly for elementary grades and specific content areas like social studies and language arts. **NOTE** that steps have been taken in this process to date and Defined has worked with the state on alignments in science, math, ELA and social studies. It is recommended that this work continues and that districts be made aware of the alignments.
2. Improve User Experience and Functionality: Implement an "undo" button for easier project customization. Enhance the platform's integration with learning management systems (LMS) like Google Classroom and Canvas. Develop a more intuitive interface for students to access and navigate projects.
3. Provide More Structured Guidance: Offer additional scaffolding and differentiation options within projects to support diverse learners and address varying levels of readiness. Incorporate interim check-ins and progress-tracking features to help students stay on track and ensure timely completion.
4. Expand Resource Library: To enhance student understanding of topics and support independent learning, including more research articles, readings, and multimedia resources within each project. Consider incorporating AI-powered tools like chat GPT or Gemini to help teachers generate relevant and up-to-date resources.
5. Develop Kid-Friendly Rubrics: Revise rubrics to make them more student-friendly and accessible, using clear language and concrete examples to communicate expectations and facilitate self-assessment.

For Professional Development and Support: Enhancing a Valued Resource

The professional development (PD) opportunities provided to educators on Defined Learning have been well-received, with 88.4% of survey respondents expressing interest in participating in future sessions. Teachers value the support and guidance offered through these sessions as they navigate project-based learning (PBL) implementation and explore the platform's features.

As PD opportunities continue, respondents suggested the following enhancements to maximize their effectiveness and impact:

1. Offer Diverse PD Formats: Provide a variety of professional development opportunities, including in-person workshops, online sessions, and hybrid models, to accommodate different learning styles and preferences. External research conducted by MIDA staff associated with university practices suggests that PD formats have to be flexible and convenient for teachers. This could be accomplished through online, personalized learning modules and courses that target the needs and time constraints of educators in asynchronous or synchronous modalities.
2. Tailor PD to Teacher Needs: PD should also be personalized in meeting the needs of individual teachers as their base level of knowledge and expertise varies widely. Address teachers' diverse needs and interests by offering PD sessions on topics such as project selection and modification, curriculum integration, differentiation, assessment strategies, technology integration, and collaboration techniques.
3. Foster Collaboration and Sharing: Create opportunities for teachers to connect, collaborate, and share best practices with each other through online forums, communities of practice, and district-wide events. Currently, there is a teacher group on Connecticut's Go-Open that is moderated by PBL experts. In conversations with teachers, it was noted that very few of them actually subscribe to the opportunity. It is recommended that measures be taken to encourage wider participation in support of collaborative efforts in the PBL journey.
4. Provide Ongoing Support: Offer continuous support for teachers beyond formal PD sessions, such as virtual office hours, mentorship programs, and access to online resources and tutorials.

Professional Development Follow-up Surveys

The findings related to professional development follow-up surveys strongly suggest that project-based learning, facilitated by platforms like Defined Learning, offers a powerful approach to transforming education and improving student outcomes. By fostering engagement, collaboration, communication, and overall academic performance, PBL prepares students for the challenges and opportunities of the 21st century.

Additional Considerations for Enhancing Adoption and Integration

Several factors beyond the purview of this study may influence the broader adoption and integration of Defined Learning in Connecticut schools. These considerations present both challenges and opportunities for stakeholders, including the Connecticut Department of Education (DOE) and Defined Learning:

- Building Awareness and Promoting Utilization: While the state has invested in providing Defined Learning as a resource, its underutilization in some areas suggests the need for increased awareness and promotion. A potential strategy could involve the DOE developing and disseminating communications to district and school leaders, highlighting the platform's alignment with state educational goals and its potential to support innovative instructional practices. This could include sharing success stories from schools that have effectively implemented Defined Learning, showcasing the platform's versatility and impact on student learning.

- Demonstrating Value: To effectively encourage broader adoption, it may be beneficial to co-produce and share local case studies highlighting successful implementations in Connecticut schools. These

case studies could showcase the platform's impact on student engagement, learning outcomes, and teacher practices, providing tangible evidence of its effectiveness and value.

Data collected from teachers provided possible suggestions for strengthening the initiative.

- Some teachers expressed a need for support in gaining administrative buy-in for Defined Learning and PBL implementation.
- Others requested data on the platform's impact in other districts to help "sell" its value to their colleagues and stakeholders.
- Some teachers highlighted the importance of connecting Defined Learning with state-level initiatives and requirements.

While Defined Learning has demonstrated a positive impact in Connecticut schools, broader adoption requires a multifaceted approach to increasing awareness, providing evidence of its value, and addressing teacher needs for administrative buy-in and additional resources.

For Schools and Districts:

1. Promote School-wide Adoption: Encourage the adoption of Defined Learning as a school-wide initiative to foster a culture of PBL and ensure consistent implementation across classrooms and grade levels.
2. Provide Resources and Materials: Allocate funding and resources to support the purchase of materials needed for hands-on projects, ensuring equitable access for all students, regardless of socioeconomic background.
3. Create Leadership Opportunities: Establish PBL leadership teams or designate PBL coaches to provide ongoing support, mentorship, and guidance for teachers implementing Defined Learning and PBL in their classrooms.
4. Collect and Share Data**:** Collect data on the impact of Defined Learning on student outcomes, engagement, and classroom climate to inform future decision-making and demonstrate the platform's effectiveness to stakeholders.

By considering these recommendations, Connecticut schools can create a sustainable and thriving ecosystem for project-based learning, empowering teachers and students to reach their full potential and prepare for the challenges of the advancing years of the 21st century.

A Shift Toward Direct Instruction

The challenge of integrating PBL into the classroom often stems from a perceived lack of time to cover state-mandated standards. Teachers may view PBL as an add-on rather than an instructional method. However, PBL effectively covers curricular content and cultivates future-ready skills in a cohesive, engaging manner. Transitioning the narrative in professional learning to project-based instruction (PBI) clarifies that this approach is a proven instructional strategy designed to meet and exceed educational standards through applied learning.

From Add-On to Integrated: The Evolution of Project-Based Learning

Historically, PBL has been viewed as a supplementary activity to traditional teaching. While educators recognized the value of hands-on learning and student engagement, misconceptions about time constraints and compatibility with rigorous standards limited PBL's full potential (Larmer & Mergendoller, 2015).

The concept of project-based instruction (PBI) offers a solution by repositioning PBL as the primary mode of instruction. This shift is supported by the framework of High-Quality Project-Based Learning (HQPBL), which outlines the essential elements of intellectually stimulating, rigorous projects aligned with skill development (HQPBL, 2018).

Conclusion

This study reveals the transformative potential of Defined Learning in enhancing project-based learning (PBL) experiences in Connecticut schools. Through a mixed-methods approach encompassing surveys, interviews, focus groups, and usage data analysis, this research has illuminated the diverse ways in which educators are implementing Defined Learning and its positive impact on student engagement, collaboration, communication, and overall academic performance. The findings underscore the platform's versatility, as it is being utilized across various grade levels and subject areas, and its effectiveness in fostering a student-centered, inquiry-based learning environment.

The significant growth in Defined Learning usage, particularly among middle schools, and the positive feedback from teachers and administrators indicate the platform's potential to improve student outcomes across Connecticut. By providing high-quality, real-world relevant projects, fostering collaboration and communication, and promoting deeper learning, the Defined Learning PBL platform is empowering students with the 21st-century skills necessary for success in college and careers.

While this study offers valuable insights, it also suggests avenues for future research. Further investigation is needed to explore the long-term impact of Defined Learning on student achievement, examine its effectiveness in specific content areas and diverse student populations, and assess the role of professional development in maximizing the platform's benefits. Additionally, exploring the integration of emerging technologies like artificial intelligence into the platform could further enhance its capabilities and expand its reach.

In conclusion, this study affirms the value of Defined Learning as a catalyst for educational innovation and a powerful tool for fostering student-centered, project-based learning in Connecticut. By addressing the identified challenges and building upon the platform's strengths, educators and policymakers can harness its potential to create more engaging, relevant, and impactful learning experiences for all students.

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Appendix A: Focus Group Questions for Semi-Structured Sessions

Questions for Teachers

For the recorded record, questions 1 & 2 may be repetitive of prior surveys. Still, it is important to be able to ascribe comments during this session to specific participants without cross-matching each comment.

1. *Briefly introduce yourself and tell us what…*
   a. *grade level,*
   b. *subjects,*
   c. *and how many students you teach.*
2. *In what subjects are you using project-based learning?*
3. *When did you first start using Defined Learning?*
4. *How are you using Defined Learning in your classes?*
   a. *Instruction*
   b. *Enrichment*
   c. *Assessment*
   d. *Other – multiple?*
5. *Did you participate in formalized Defined Learning training?*
6. *Did you have any PBL experience before starting to use Defined Learning?*
7. *In this school year, how many Defined Learning projects have your students completed to date?*
8. *How many tasks do you think your students will engage in per semester (Half a school year)?*
9. *How are projects selected? (e.g., by each teacher, teacher teams, or district-level curriculum alignment)*
10. *Have projects been aligned to your curriculum? If so, who completed the alignment?*
11. *Before implementing PBL, what were your anticipated learning outcomes/skill development targets?*
12. *To determine progress toward those outcomes, what forms of evidence (quantitative or qualitative) are you using?*
13. *How do you design and structure project-based learning units to meet student learning objectives and standards?*
14. *What strategies do you use to support student collaboration and teamwork during project-based learning activities?*
15. *How do you differentiate instruction and provide support for students with diverse learning needs in project-based learning activities?*
16. *How do you use technology and digital tools to enhance project-based learning outcomes?*
17. *How do you involve community partners and stakeholders in project-based learning, and what benefits do they bring to student learning outcomes?*
18.
19. *Based on your observations, how, if at all, has PBL impacted*
    a. *student engagement,*
    b. *teamwork*
    c. *communication*
    d. *problem-solving*
    e. *academic performance?*
20. *What challenges have you encountered in implementing PBL?*
21. *Specifically, regarding Defined Learning, what are your impressions? How, if at all, has it helped you develop a PBL class environment?*
22. *What, if any, challenges have you had in utilizing Defined Learning?*
23. *Can you share any specific anecdotes or data highlighting the outcomes of PBL in your classroom?*

24. *Recommendations for other teachers beginning PBL – especially concerning using Defined Learning.*
25. *Do you have anything else to share about your experience with PBL and Defined Learning that we haven't covered?*

Questions for Administrators:

1   How has implementing project-based learning impacted overall student engagement and achievement in your school or district?

2   What strategies have you used to support teachers in designing and implementing effective project-based learning units?

3   How have you evaluated the effectiveness of project-based learning, and what data do you use to make decisions about instructional practices?

4   How do you provide teachers with resources and support to differentiate instruction and meet student learning needs during project-based learning activities?

5   What role do community partners and stakeholders play in supporting project-based learning in your school or district, and what impact do they have on student learning outcomes?

6   How do you support teachers in using technology and digital tools to enhance project-based learning outcomes?

7   How do you assess the impact of project-based learning on students' critical thinking skills, problem-solving ability, and creativity?

8   What professional development opportunities have you provided for teachers to support their implementation of project-based learning, and how have they influenced instructional practices?

9   What role do parents and caregivers play in supporting project-based learning, and how do you involve them in the learning process?

10   How do you evaluate the effectiveness of project-based learning assessments, and what changes have you made to improve these assessments over time?

11   How do you ensure that project-based learning units align with state standards and learning objectives?

12   How do you encourage collaboration and interdisciplinary learning through project-based learning, and what impact does this have on student learning outcomes?

13   What challenges have you faced in implementing project-based learning, and how have you addressed these challenges?

14   What resources and support do you need to effectively support project-based learning in your school or district?

15   How do you balance the demands of project-based learning with other instructional responsibilities and administrative duties?

16 *What are the long-term impacts of project-based learning on student learning outcomes and retention, and how do these compare to traditional teaching methods?*

17 *How do you communicate the benefits of project-based learning to parents, community members, and other stakeholders?*

18 *How do you ensure equitable access to project-based learning opportunities for all students, including those from marginalized backgrounds or with diverse learning needs?*

19 *What is your vision for the future of project-based learning in your school or district, and how do you plan to achieve this vision?*

20 *What advice would you give to other administrators who are considering implementing project-based learning in their schools or districts?*

Appendix B: Screen Shots of Survey Questions

Please take a couple of minutes to complete this short survey to help our researchers understand how Defined Learning is being implemented across your state.

Full Name

Email

School District

School Building

Grade Level(s) Taught (check all that apply)

- ☐ K
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10
- ☐ 11
- ☐ 12
- ☐ Not a classroom teacher? Please specify your role.

Please select subjects that you teach and if you are using project-based learning (PBL) in that area, please check that box as well. (check all that apply)

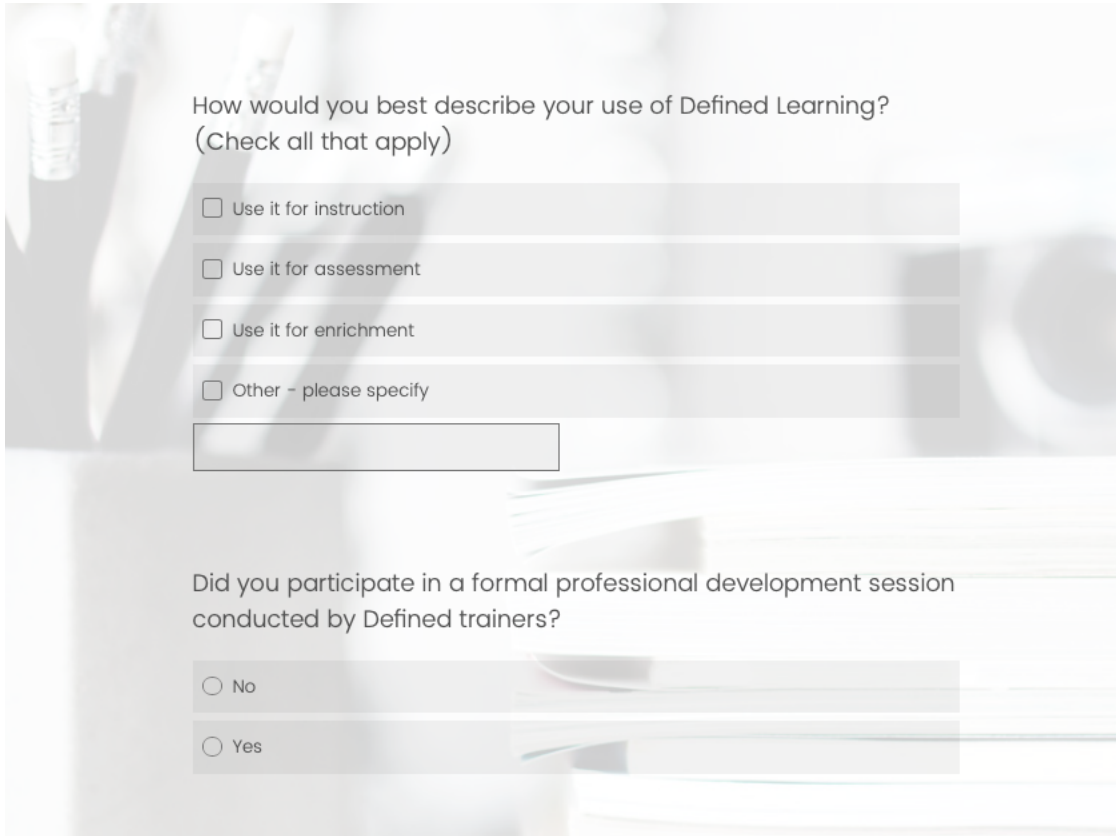|	Subject Taught	I Use PBL in this area
Mathematics	☐	☐
Science	☐	☐
Computer Science	☐	☐
Langauage Arts (ELA)	☐	☐
Social Studies / History	☐	☐
English	☐	☐
Other	☐	☐

How many PBL projects/tasks have you completed with your students since the beginning of the school year?

○ 1-2

○ 3-4

○ 5-6

○ 6+

How would you best describe your use of Defined Learning?
(Check all that apply)

☐ Use it for instruction

☐ Use it for assessment

☐ Use it for enrichment

☐ Other – please specify

Did you participate in a formal professional development session conducted by Defined trainers?
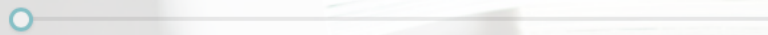
○ No

○ Yes

Use sliders below to answer this question. When compared to a traditional classroom setting, what has been your overall observation of student performance in a project-based learning environment?

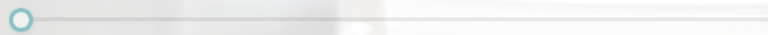| No Change							A great deal of improvement		
0	10	20	30	40	50	60	70	80	90	100

Student Engagement
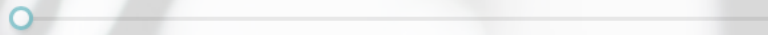
Student Academic Performance

Teamwork and Collaboration

Communication

After our team reviews the survey results, it will be important to conduct focus groups focused on implementing Defined Learning. Would you be willing to participate in a 30–45 minute session to share your insights? Sessions will be scheduled to accommodate multiple time blocks to make it convenient for participants.

○ Yes

○ No

→

Connecticut Usage Data 7-1-2023 to 4-30-2024

Total Defined Learning Projects Utilized: 560,184

Breakdown by School Type (Note: Each District chooses how they set up their authentication, which can result in either grade level or district level data. We are providing both exact data and extrapolated in some circumstances if districts report data at the district level rather than building level).

Notable Highlights for 2023-24:
- 96% growth in overall utilization compared to July 1, 2022 – June 30, 2023 with two months remaining in 23-24.
- 216 new schools accessing the service so far in 23-24.

YOY Usage Comparison Full Year & YTD for 2023-24
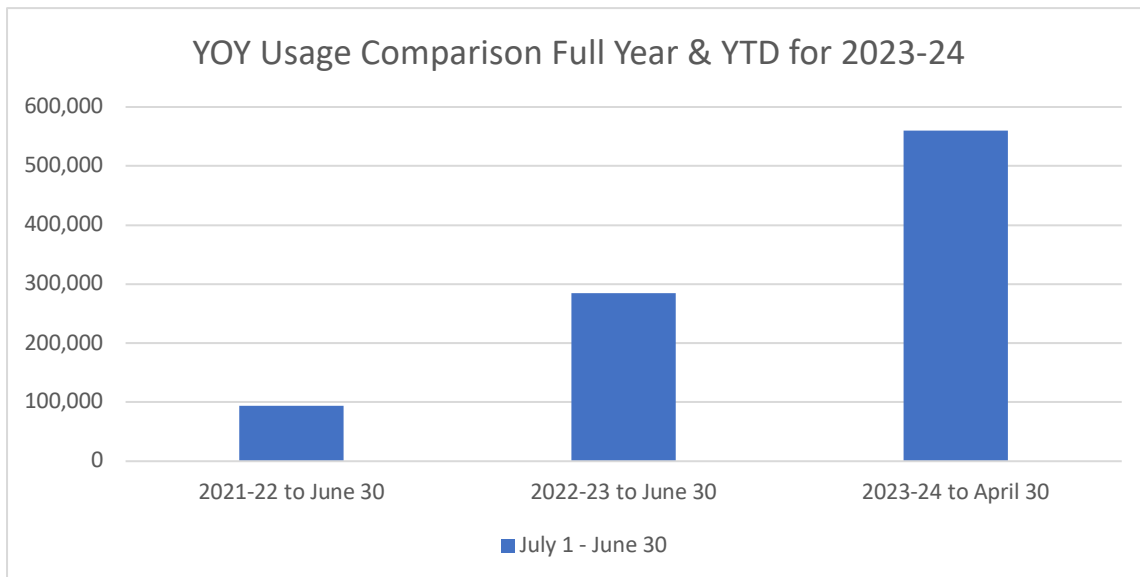
As Reported by CT School Districts:

Building Type (Grades Served)	Number of Schools	Sum of Total Engagements
K – 2	10	657
K – 3	3	249
K – 4	27	1,855
K – 5	72	27,282
K – 6	25	35,076
K – 8	70	128,597
K - 12	8	1,382

Gr 1 - 5	4	35,960
Gr 1 - 6	5	1,420
Gr 2 – 5	1	944
Gr 2 – 8	1	67
Gr 2 - 12	1	18
Gr 3 - 5	7	17,328
Gr 3 - 6	2	223
Gr 4 - 5	1	18
Gr 4 - 6	1	334
Gr 4 - 8	5	4,203
Gr 5 - 6	4	186
Gr 5 - 8	16	26,027
Gr 6	1	1,269
Gr 6 - 8	68	86,144
Gr 6 - 9	1	9
Gr 6-12	4	1,364
Gr 7 - 8	10	16,291
Gr 7 - 12	8	2,600
Gr 8 - 12	2	35
Gr 9 - 12	122	78,053
Gr 10 - 12	3	242
District	104	92,531
Grand Total	**N/A**	**560,184**

Building Category	Sum of Total Engagements
Elem	121,439
Middle	133,953
High	82,318
K - 12	1,382
K - 8	128,866
District	92,226
Grand Total	**560,184**

Breakdown by Grade Level Estimated:

Gr. K	34,131
Gr. 1	41,048
Gr. 2	41,295
Gr. 3	47,003
Gr. 4	47,866
Gr. 5	54,064
Gr. 6	65,998
Gr. 7	58,719
Gr. 8	58,726
Gr. 9	27,564
Gr. 10	27,643
Gr. 11	27,643
Gr. 12	27,647