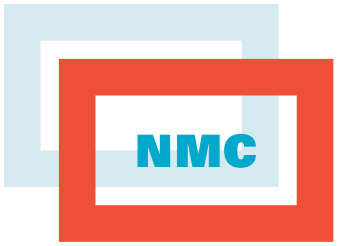

Sparking innovation, learning and creativity

Challenge Based Learning

The Report from the Implementation Project

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Challenge Based Learning

The Report from the Implementation Project

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Table of Contents

Challenge Based Learning
The Report from the Implementation Project

The first major study of challenge based learning (CBL[1]) took place in the fall of 2009, when 321 students and 29 teachers in six US high schools embarked on a set of projects that spanned some 17 disciplines. The outcomes of that study, conducted by the New Media Consortium, were significant on a number of levels, not the least of which was the clear efficacy of the approach.[2]

Based on these results, in 2011 a second more in-depth study was conducted by the NMC that involved 19 institutions that collectively range from primary to graduate education, 65 teachers, and 1,239 students. This report details specifics about the study of those institutions.

Executive Summary

We know we have work to do to address the problems that face American public education.

We've known this for nearly three decades, since the publication of *A Nation at Risk* in 1983,[3] which powerfully documented that the United States had lost the advantage it briefly held in the world in science, commerce, technology, and industry; that as custodians of the education of the young, we were failing; that without immediate, conscious, and focused effort, that failure would only compound itself; and that in countries all around the globe, students were being better prepared to take part in a rapidly flattening marketplace than our own students were.

No such immediate, conscious, and focused effort has taken place. Until now.

After two major studies involving 24 schools in three countries and 15 states, over 1,500 students, and 90 teachers, it is clear that challenge based learning (CBL) is one of the freshest ideas that has emerged over that time, with replicable, scalable results for students at nearly every grade level. The approach is consistent with standards-based curricula, and does not require a massive reinvention of schools, nor the kind of top-to-bottom overhaul that some say is needed. It is based on a simple but powerful idea — make learning relevant.

1 Apple Education wrote a concept piece on the topic in 2009 that describes the method in considerable detail. See http://challengebasedlearning.org/cbl/global/files/CBL_Paper.pdf

2 This report can be downloaded at http://www.nmc.org/pdf/Challenge-Based-Learning.pdf.

3 National Commission on Excellence in Education. (1983). *A Nation at Risk: The Imperative for Educational Reform.* Retrieved from http://www.ed.gov/pubs/NatAtRisk/index.html A subsequent study 25 years later found that years of documenting results only underscored the issues. See *A Nation Accountable: Twenty-five Years After A Nation at Risk.* Retrieved from http://www2.ed.gov/rschstat/research/pubs/risk25.html

CBL makes learning relevant by giving kids problems big enough so that they have to learn new ideas and tools to solve them, but immediate enough so that they care deeply that solutions are found. Young people want to solve real problems, and that is exactly what challenge based learning is designed to do — give students and teachers a framework that makes learning relevant, and then let them dive in.

CBL is an idea that is simple and powerful — and even better, it works. Over the course of two extensive, field-based studies, the efficacy of the approach has been demonstrated by student work and the shared perspectives of teachers and students. Consider these four overarching findings from the Challenge Based Learning Implementation (CBLi) Study:

- ***CBL builds 21st Century Skills.*** Ninety percent of teachers reported that 12 key skill areas improved significantly, including Leadership, Creativity, Media Literacy, Problem Solving, Critical Thinking, Flexibility, and Adaptability. Seventy percent of teachers reported some improvement in every area of the 21st Century Skills.
- ***CBL engages students in learning.*** Over three-quarters of students, across every age group, felt that they had learned more than what was required of them, were part of solving a big problem, and worked harder than they normally do.
- ***Teachers find CBL effective in engaging students and helping them master the material — and a good use of their limited time.*** Over 90% of teachers, across every grade level, felt that CBL was a good use of their limited time and would use it again. Over three-quarters of teachers, again across every grade level, felt that their students mastered the expected material and that their overall engagement increased.
- ***While broadly applicable across the range of learning environments, CBL is ideally suited to teaching in a technologically rich environment.*** CBL works in a variety of settings, from those with shared access to computers and the Internet, to those with 24/7 Internet access via a combination of school and home-based devices, to fully one-to-one 24/7 classrooms. The study found that today's teachers and students already have the computer and Internet skills needed to engage with CBL effectively.

The Case for New Ideas

The reality remains that 28 years after *A Nation at Risk,* high school achievement for American students has not improved.[4] Even in the first five years under No Child Left Behind (NCLB), American students showed no gains whatsoever in reading, and very small ones in math.[5] While students in other nations enjoy rising scores and better preparation for a global workforce, our students suffer under a system that is known to not support their needs, stifled by a crippling inertia that limits new ideas.

Further, American students have a lower graduation rate compared to students in other industrialized nations.[6] Any benefit that would be gleaned by remaining in school is lost to those who drop out.

4 Strong American Schools. (2008). *A Stagnant Nation: Why American Students Are Still at Risk.* Retrieved from http://www.strongamericanschools.org/a-stagnant-nation-why-american-students-are-still-risk

5 Sanchez, C. (2007). U.S. Test Results Show Growth in Math, Not Reading. *All Things Considered,* National Public Radio. See http://www.npr.org/templates/story/story.php?storyId=14698611

6 Op. cit. *A Stagnant Nation.*

According to the National Center for Education Statistics (NCES), the proportion of American students who leave school before completing their degrees is increasing — and in recent years, researchers have reported that the figures may have been even higher than suspected due to inconsistent measurements.

We're failing our students because we are failing to engage them, and the results of this are dire.[7] In *One Third of a Nation,* Paul Barton describes the situation as an underreported problem.[8] Although the situation has drawn considerable attention from political leaders in the United States, we are still losing 30% of our students; it was only recently that we could even agree how to count dropouts. Students are also leaving school earlier; the majority of dropouts leave high school between grades 9 and 10.[9]

The evidence shows that one of the main reasons students are leaving is because they are disengaging from school.[10] While some factors leading to disengagement are related to their home life and family issues, it is becoming clear that an important factor is that students feel very strongly that what they are learning in school is not relevant to their lives.[11] Surveys of students who have left school have revealed that a lack of perceived connection between the curriculum and their everyday life or future work was a key factor, and many former students felt that more could have been done to keep them engaged through the type of schoolwork they were asked to do.[12]

We need new ideas.

We need ideas that will engage students and keep them learning. We need ideas that will encourage students to want to understand the world around them, and to help them see the relevance of math and science to their own lives.

Relevance is key, but too often it is all but absent from educational curricula. At the same time, genuine challenges are easy to find, and young people see the world as a place rife with problems they will need to solve in their lifetimes. They want and expect their schooling to prepare them for it, and when it does, engagement has shown to increase dramatically.[13] Even young children are deeply aware that the world economy, for example, is in a fragile state, and they have a clear sense of what a collapse would mean — to themselves, their families and friends, and to people across the country and around the globe. They realize that the planet's temperature is climbing, slowly but perceptibly, and that they may see the effects of that change in their lifetime. They understand that their lifestyles are built upon nonrenewable energy sources and they know some of what that implies. And, they see desperate hunger and poverty, sometimes not even very far from home.

7 Op. Cit. (Barton, 2005), (NCES, 2008).

8 Barton, Paul. (2005). Barton also notes that this likely results in inflated graduation numbers as well as underreported dropout rates.

9 See Haney (2004). Haney and others interpret these findings to be an indication that more students are being flunked to repeat grade 9, possibly in an effort to avoid passing students who are not likely to score well on 10th grade accountability tests and to keep reported passing numbers higher.

10 See Alspaugh (1998); Hernandez Jozefowicz-Simbeni (2008); Neild et al. (2008).

11 United States General Accounting Office (2002).

12 See Bridgeland, et al. (2006), in which 71% of respondents reported losing interest in their freshman or sophomore year; 47% reported that they left school because the class work was uninteresting.

13 Op. Cit. *Challenge Based Learning: An Approach for Our Time* (2009). This study of six schools produced self-reported engagement rates from students of 90% and higher among 9th graders.

There are real problems that need solving, and young people understand that no less than adults do. They see these important issues taking the international stage and they know that school is not preparing them to address them. One in three makes the choice to leave.

What is needed is a new idea, one that engages students' curiosity and desire to learn. It must make the solving of real problems the center of the curriculum, give students access to digital age tools, and require them to work collaboratively and manage their own time. And, it must allow students to direct the course of their learning and engage teachers in a supportive, very necessary role as guides.

That new idea is challenge based learning.

Challenge Based Learning

Challenge based learning is a multidisciplinary approach to education that encourages students to leverage the technology they use in their daily lives to solve real world problems. By giving students the opportunity to focus on a challenge of global significance and apply themselves to developing local solutions, CBL creates a space where students can direct their own research and think critically about how to apply what they learn.

The result, as evidenced in the pilot and this current study, is increased engagement, extra time spent working on the challenge, creative application of technology, and more student satisfaction with schoolwork. Students mastered the subject-area content and their engagement with the material and with learning improved.[14] The concept is detailed in a white paper produced by Apple, Inc.:

> ***Challenge based learning is a collaborative learning experience in which teachers and students work together to learn about compelling issues, propose solutions to real problems, and take action. The approach asks students to reflect on their learning and the impact of their actions, and publish their solutions to a worldwide audience.***[15]

Challenge based learning builds on the practice of problem-based learning, in which students work on real world problems in collaborative teams, but with key distinctions that add a great deal of relevancy for students. At the center of challenge based learning is a call to action that inherently requires students to make something happen. They are compelled to research their topic, brainstorm strategies and solutions that are both credible and realistic in light of time and resources, and then develop and execute one of those solutions that addresses the challenge in ways both they themselves and others can see and measure.

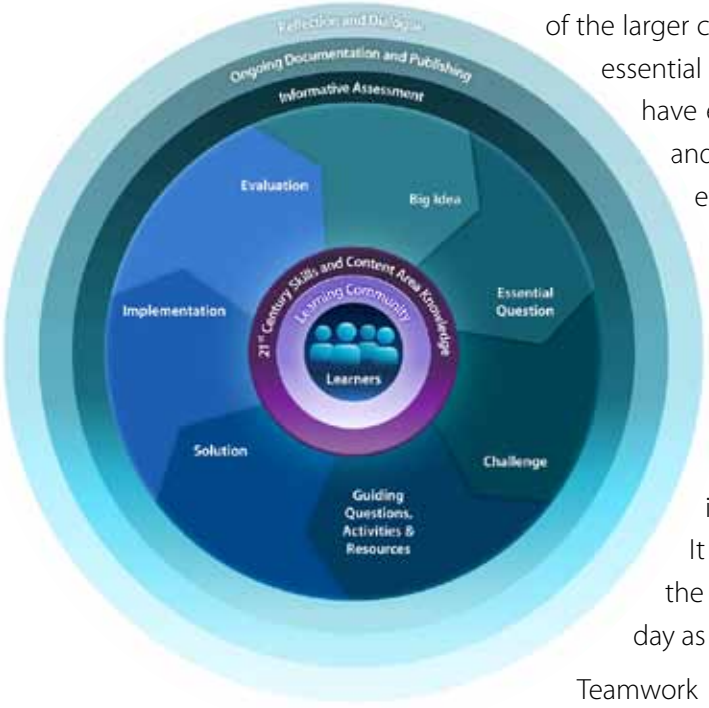
The challenge based learning model is a direct response to the growing concerns within the education and business communities that most high school graduates lack abstract thinking, problem solving, self-directed learning, the ability to work in groups.[16] Challenge based learning was designed to promote creativity and risk-taking within a framework that assures the students have both a fertile topic to explore those skills, as well as the freedom to do so.

14 In both the pilot and the implementation studies, more than three quarters of teachers, across every grade level represented, reported that their students mastered the expected material and that their overall engagement increased.

15 Op. Cit. Apple Education (2009). *Challenge based learning.*

16 See Ward and Lee, "Teaching Strategies for FCS: Student Achievement in Problem-Based Learning Versus Lecture-Based Instruction."

The essential elements are laid out in the accompanying figure. A big idea is a concept with far-reaching significance, such as biodiversity, strife, sustainability, or resilience. The essential question creates a more specific focus for the big idea and guides the students toward manageable aspects of the larger concept. The challenge is framed to bring the big idea and essential question home with a local call to action. Once students have engaged with the challenge, guiding questions, activities, and resources help them to craft a solution, implement, evaluate, and ultimately publish their results via the web and video.



Access to technology is an integral part of challenge based learning, and not only provides a means for students to explore as they begin to think more imaginatively, but also gives them tools to communicate their work. Challenge based learning is highly adaptable, and works in a wide variety of learning environments and situations. It is ideal in one-to-one settings, as 24/7 access to tools and the Internet only encourages students to extend the school day as they tackle the challenge.

Teamwork is another key ingredient of challenge based learning; working in groups allows students to hone many 21st Century Skills.[17] Working together, students are able to correlate research on their challenge to events taking place in their communities, ultimately strengthening the connection between what they learn in school and what they experience outside of it.

What was conveyed in the pilot study is now even more clear in the research and case studies from year two: the evidence indicates that challenge based learning motivates students to come to class and do well[18] — especially those students who may be seen as at-risk. This is a direct result of the increased level of engagement that CBL affords. Students can learn more flexibly, in an atmosphere where it is clear that a problem often has more than one solution, or more than one path to the optimal solution. They have more opportunities to showcase their personal skills and talents, and to act on their own ideas. All of these factors were shown to be positively related to engagement.

While the common thread of the challenges in this study remained the same as that of all CBL challenges — think globally, act locally[19] — the range of themes expanded considerably in the implementation project, from saving money to providing relief to natural disaster victims to finding ways to reduce waste in the community. Four case studies are presented as an appendix to this report to demonstrate that spectrum. The choice of schools for the cases reflects the diversity of the age groups and the challenges, and each includes a discussion of local student and teacher outcomes.

17 See http://www.21stcenturyskills.org/ for both the 21st Century Skills Framework and an excellent set of resources.

18 More than three quarters of teachers, across every grade level, felt that their students mastered the expected material and that their overall engagement increased. See the section on Major Findings for considerably more detail.

19 A wide range of challenges can be found at http://challengebasedlearning.org

The Challenge Based Learning Implementation Study

The purposes of the Challenge Based Learning Implementation Study (CBLi) were two-fold, and blended in some ways the long-standing boundaries between outcomes- and process-focused evaluation and more traditional educational research.

The first purpose was to determine if the outcomes and findings of the pilot could be replicated and extended beyond the purely high school focus of the pilot to other educational levels and settings, especially as they fall into four areas: the overall student experience; the overall teacher experience; the match of CBL learning outcomes (particularly informal learning outcomes) with key skills described in "Framework for 21st Century Learning";[20] and the learning goals for the time devoted to the work.

The second was to add additional understanding of several aspects of the school ecosystem that may influence the success of challenge based learning. Among these are the importance of training and support in the implementation of CBL; the impact of

SCHOOL/UNIVERSITY	LOCATION	CHALLENGE
Elementary Schools (grades 3-5; ages 8-11)		
Echo Horizon School	Culver City, CA	Improve quality or consumption of water in your community.
Jamestown Elementary School	Arlington, VA	Use creativity to solve a problem.
Startzville Elementary School	Canyon Lake, TX	Help me find my place.
Wildwood World Magnet	Chicago, IL	Feed the hungry.
Middle Schools (grades 6-8; ages 11-14)		
Culbreth Middle School	Chapel Hill, NC	Increase sensitivity!
Kamehameha Middle School	Honolulu, HI	Take care of the land.
LaGrange Highlands Middle School	LaGrange, IL	Reduce waste in your school or community.
Ocoee Middle School	Ocoee, FL	Actively participate in the political process.
High Schools (grades 9-12; ages 14-18)		
Arizona School for the Arts	Phoenix, AZ	Connect people.
Mercy High School	Farmington Hills, MI	Design a better cafeteria experience.
San Bernardino High School	San Bernardino, CA	Improve your wellness.
Toledo Central Catholic High School	Toledo, OH	Improve nutrition in your school and community.
Westside High School	Omaha, NE	Improve family dynamics.
Colleges/Universities (undergraduate; adult learners 18 and above)		
Full Sail University	Winter Park, FL	Foster community.
Houston Community College	Houston, TX	Find ways to save!
Ball State University	Muncie, IN	Inform and engage your community about fuel ethanol production.
Miami University	Oxford, OH	Make undergraduate education relevant!
International Schools (grades 5-8; ages 10-14)		
Calgary Science School	Calgary, Alberta Canada	Make more environmentally ethical food choices!
Ringwood North Primary School	Melbourne, Victoria Australia	Help a community recover from a disaster.

20 The Framework describes "21st century student outcomes" as the knowledge, skills and expertise students should master to succeed in work and life in the 21st century. The nine-page report can be downloaded at: http://www.p21.org/documents/P21_Framework_Definitions.pdf

student groups on outcomes; a greater understanding of the skills and resources needed for a teacher to successfully implement CBL; and a sense of if (and how) a CBL approach might extend learning to times and places outside the traditional classroom.

With these goals in mind, the CBLi project was launched in January 2011, with a meeting of the 56 teachers participating in the effort. The primary goal of the two-day workshop was to ensure the participants understood CBL well enough to implement it to a baseline standard, with the secondary goal of giving them dedicated time to identify a big idea for their school, tease out essential questions, and frame their challenges. The 19 schools and universities involved then worked to implement those challenges through late May 2011.

GRADE LEVEL	STUDENTS	PROPORTION
3rd Grade	23	2%
4th Grade	22	2%
5th Grade	134	11%
6th Grade	215	17%
7th Grade	242	20%
8th Grade	107	9%
9th Grade	144	12%
10th Grade	72	6%
11th Grade	108	9%
12th Grade	77	6%
Community College	40	3%
University	55	4%

The Schools

The participating schools were chosen against several criteria. The researchers were looking for schools that genuinely were interested in challenge based learning, and that would have sufficient support and resources to successfully implement the approach.

In addition, the group was selected so that a wide range of grade levels could be included. Thus, four elementary schools, four middle schools, five high schools, and four colleges and universities were selected, along with two international schools, one in Canada and one in Australia. In addition, a mix of public, private, and parochial schools was intended.

Demographics

The CBLi study included 1,239 students and 65 teachers and administrators. In terms of ethnicity and gender, the sample was less diverse and more female than the general population of school age persons.

STUDENT RACE/ETHNICITY/GENDER	ALL US	PROJECT SCHOOLS
White	51%	61%
Black	14%	6%
Hispanic	26%	9%
Asian/Pacific Islander	5%	10%
American Indian/ Alaska Native	1%	0%
Multi-Ethnic	—	7%
Unreported	—	6%
Male	52%	45%
Female	48%	55%

Teachers in the study were generally older, with the mean at about 37 years of age, and experience levels to match at about 8 years in the classroom. The teachers in the study were disproportionately male; just 30% of teachers across all levels are male in the US.

TEACHER GENDER/AGE	PROPORTION	TEACHER EXPERIENCE	PROPORTION
Male	67%	Less than 1 year	2%
Female	33%	1-3 years	13%
Younger than 25 years old	5%	4-6 years	12%
26-35 years old	30%	7-10 years	29%
36-45 years old	37%	More than 10 years	44%
46-55 years old	16%		
Older than 55 years old	13%		

Major Findings

The study included four major areas of principle focus, with the summative assessment of the effectiveness of CBL at the top of that list, followed by expanding the understanding of the teacher and student experience, and, finally, a closer look at four general areas thought to be mitigating factors in the success of a CBL implementation. These included teacher training and support; the impact of the composition of student groups on outcomes; needed skills and resources; and time and place changes in student learning practice.[21]

The major findings of the study are detailed below. Subsequent sections provide additional supporting information for these overarching findings, as well as other findings related to the student and teacher experience and the four mitigating factors that were examined.

1. CBL is effective in building 21st Century Skills

- ***90% of teachers reported these 12 key skill areas improved significantly (in rank order)***

Leadership	Creativity
Media Literacy	Problem Solving
Collaboration	Critical Thinking
Flexibility	Communication
Adaptability	Innovation
Responsibility	Initiative

- ***80% of teachers reported that these additional six key skill areas improved as well (in rank order)***

Productivity	Social Skills
Accountability	Self Direction
Information Literacy	Global Awareness

- ***70% of teachers reported some improvement in every area of the 21st Century Skills***

21 The notion of time and place changes in the ways learning happened is significant. We were specifically interested in whether or not the teacher and students were able to extend the classroom temporally or virtually in ways that have students working beyond the school day and/or interacting with experts in relevant fields.

2. CBL engages students in learning.

- ***Over three-quarters of students, across every age group, felt that they had learned more than expected, were part of solving a big problem, and worked harder than they normally do.***

STUDENT SUCCESS OUTCOME STATEMENTS	PROPORTION OF STUDENTS IN AGREEMENT
I learned a lot	79%
I helped to solve part of a big problem	76%
I worked harder on the CBL project than I normally work on my schoolwork	75%
I felt like I was doing something important	75%
I realized I could be a leader	73%

> *"I feel everyone partaking in this study is making a difference. The way we make a difference is by giving solutions to problems and fixing them. Even a kid can make a difference somehow."*
>
> ELEMENTARY SCHOOL STUDENT

3. Teachers find CBL effective in engaging students and helping them master the material — and a good use of their limited time.

- ***Over 90% of teachers, across every grade level, felt that CBL was a good use of their limited time and would use it again.***

> *"Even the 'failed' solutions or the solutions lacking creativity still took students through a problem solving, dynamic, group task where setting a schedule, being innovative, researching, amassing new knowledge and sharing it with others, and implementing an idea to pass on information to others ended up giving them useful real world experience."*
>
> HIGH SCHOOL TEACHER

- ***Over three-quarters of teachers, across every grade level, felt that their students mastered the expected material and that their overall engagement increased.***

INSTRUCTIONAL SUCCESS OUTCOME STATEMENTS	PROPORTION OF TEACHERS IN AGREEMENT
CBL was a good use of my class time and resources	93%
I intend to use CBL again	91%
My students mastered the expected material	79%
Overall engagement of my students increased during the project	75%

- ***Overall, teachers felt that CBL was a refreshing change.*** After just a single implementation cycle, 94% of teachers felt they understood CBL; 73% felt they understood it well, and they felt the approach made their role more responsive, coach-like, and individualized. Teachers reported deeper conversations with the students about their projects and what learning approaches were/were not working for them.

4. CBL is ideally suited to teaching in a technologically rich environment.

- ***While CBL is beneficial in many kinds of learning environments, it is particularly effective in classrooms where every student has 24/7 access to computing resources at home and at school.*** CBL creates an expectation from the first steps that students will use technology to research their topic, to collaborate among their group, capture reflections, present and publish their work, and more. Along the way, they reinforce digital media skills they may already have, and extend those

skills in areas such as music, video, and more. A related aspect is that students are expected to think critically about their message and the media used to convey it.

- ***Today's teachers and students already have the technical skills needed to engage with CBL effectively.*** Both students and teachers felt their computer, Internet, and digital media skills were sufficient to the demands of CBL. Teachers' technical skills did not rank among their top five concerns after the project, and technical skills improved for both teachers and students as a result of CBL. Video skills are somewhat of an exception: a significant number of teachers (34%) reported that they underestimated the importance of video skills in particular for their own needs and for those of students to a degree that it took time away from other tasks.

Summative Outcomes

For the CBLi study, success was defined on three levels, each progressively more important in the overall picture. The first was *Implementation Success,* which focused on the process of using CBL, how well that went for teachers and students, whether or not the challenge was completed, and how teachers and students perceived the impact of the solutions. The second was *Instructional Success,* which primarily focused on how well the approach worked with the required curricula, the teacher's own teaching goals, and how well CBL meshed with the ebb and flow of the classroom. The key outcome for this component is that the students learn what they need to, and at the levels they need to.

Ultimately, however, the success of challenge based learning is determined by how it spurs students to learn, and so the third and most critical component of the model is *Student Success.* Student success looks beyond the basic instructional goals to see what other things students learned. Did they develop or improve key 21st century skills such as media literacy, creativity, innovation, teamwork, collaboration, and critical thinking? Were they flexible and adaptable? Did they show leadership and assume responsibility? Did they effectively utilize technology? Did they learn more than was required? Did the solution impact their community?

Implementation Success. Operationally, CBL is a process, and the degree to which CBL was well implemented constitutes one level of success in our three-tiered model. Were all the components included? Did it present workable solutions? Did the effort reach its logical ending? Did it accomplish its stated goals? Understanding the answers to these questions revealed how the process worked, with implications for future implementations. For this study, implementation success was defined as the degree to which the CBL process was understood and implemented. In particular, this component of success included these questions:

- How well did the CBL process go for teachers and students?
- Was the challenge completed?
- What was the perceived impact of the solution for teachers and students?

Eighty-eight percent of teachers in the CBLi project characterized their implementation as successful. Students echoed this perception; 76% also rated their effort as successful. An analysis of the 270 comments left by those students who did not rate their project as successful, however, clearly shows that for them, operational success was associated with their perception of the project's impact, so it is likely that further analysis would indicate stronger agreement between teachers and students on this dimension.

There were recurring references to hurdles in the implementation of CBL, and 20% of teachers described their implementation experience as "very hard." In almost all cases, this was related to issues with producing video, which is a major component of CBL. Students, on the other hand, tended to refer to group process issues as the biggest obstacle for them.

Instructional Success. The middle tier of our success model looked at the teacher experience closely to see how the approach worked for students in grades three through 16. Teachers across all grade levels reported strong outcomes in this dimension. The aspects of instructional success that most interested us were:

- How well did the approach work with the required curricula?
- How well did the approach work with the teacher's own teaching goals?
- How well did CBL mesh with the ebb and flow of the classroom?
- Did the students learn what they needed to, and at the levels they needed to?

Most of the teachers in the study — well over 90% — were new to CBL. The fact that ratings about their intentions related to using CBL again were over 90%, and how it worked with time and resources even higher, indicates an optimism for the process that is significant.

INSTRUCTIONAL SUCCESS OUTCOME STATEMENTS	PROPORTION OF TEACHERS IN AGREEMENT
CBL was a good use of my class time and resources	93%
I intend to use CBL again	91%
My students mastered the expected material	79%
Overall engagement of my students increased during the project	75%

> ***"Instead of being teacher-centered in front of the classroom, this is much more of a student-centered approach… I'm in teaching because student education should be focused on the students. So in that regard you have to remove yourself to some extent and help students find the resources they need. We like to call it 'responsive teaching' because that's really what you're doing."***
>
> HIGH SCHOOL TEACHER

Student Success. Ultimately, any measure of success in teaching and learning must document what actually happens for students, and so the third component of the three-tiered model, student success, has been considered the most important from the earliest design, and the dimension that has received the most focus in the analysis components of the study to date. Among the key questions of interest were:

- Did individual students develop or improve key 21st Century Skills such as media literacy, creativity, innovation, teamwork, collaboration, and critical thinking?
- Did students demonstrate flexibility and adaptability?
- Did students show leadership and assume responsibility?
- Did students effectively utilize technology?
- Did students learn more than was required?
- Did the students' solutions impact their community?

"My joy comes from their joy, and now that they are on board as much as they are, I will say I'm just very grateful to be part of this process. Specifically because the learning is all being generated by the kids and they have a tremendous amount of ownership, which is the way it should be."

MIDDLE SCHOOL TEACHER

A strong correlation emerged between two aspects of the student experience and student success — when students perceived the problem as important, a host of other measures went up, including time on task, how much they learned, and more. Additionally, if they felt like their own work made a significant contribution, the same factors increased.

Overall, the following statements found strong student agreement among those who felt that their project was important, and for those who felt that their own work made a difference it was especially strong:

INSTRUCTIONAL SUCCESS OUTCOME STATEMENTS	PROPORTION OF STUDENTS IN AGREEMENT
I learned a lot	79%
I helped to solve part of a big problem	76%
I worked harder on the CBL project than I normally work on my schoolwork	75%
I felt like I was doing something important	75%
I realized I could be a leader	73%

Eighty percent or more of teachers rated all but five 21st Century skills as improved during the CBL project; if the bar were lowered to two-thirds of teachers, all of the 21st Century Skills improved as a result of CBL. Twelve of the key skills, including leadership, responsibility, creativity, communication, critical thinking, innovation, and others widely correlated with success in the workplace were rated highly by over 90% of teachers.

Students echoed this finding, although their ratings were in general somewhat lower than teachers. The most improved skills in the students' estimation were leadership, responsibility, productivity, flexibility and adaptability.

"I feel really good and it is a big experience for me because we are doing a lot to help our school and world… It is fun in a good way."

ELEMENTARY SCHOOL TEACHER

21ST CENTURY SKILLS RATED AS IMPROVED	IMPROVED AS ASSESSED BY 80% OR MORE OF TEACHERS	IMPROVED AS ASSESSED BY 80% OR MORE OF STUDENTS
Leadership	98%	86%
Media Literacy	96%	82%
Collaboration	95%	81%
Flexibility	94%	84%
Adaptability	94%	84%
Responsibility	94%	85%
Creativity	93%	83%
Problem Solving	93%	83%
Critical Thinking	92%	76%
Communication	91%	77%
Innovation	90%	81%
Initiative	90%	80%
Productivity	89%	85%
Accountability	89%	82%
Information Literacy	88%	81%
Social Skills	88%	82%
Self Direction	84%	82%
Global Awareness	83%	75%
Civic Literacy	77%	82%

The Student Experience

Probably the most unanticipated finding of the study was that there were no striking differences in the student experience between students at different grade levels and ages, other than those attributable to the dynamics of the student working groups within the classroom. (This particular dimension is covered in depth in a subsequent section.) On average, students devoted about 90 minutes a day to CBL at school; work outside of class occurred primarily at home and served to extend the learning day by an average of one hour. Both students and teachers commented on the noticeable increase in overall engagement of students in the work.

> ***"Probably the biggest thing that we've noticed is just how much more engaged the students are with the work that they're doing."***
>
> HIGH SCHOOL TEACHER

Interestingly, 80% of students felt that they did most of the work in their group, supporting the finding of strong engagement among the students around the group activities.

The most compelling finding related to the student experience was the strong shift that occurred in students' perceptions of how they might contribute to a group project over the term of the project. Fewer than 15% saw themselves in a role such as leader, creative contributor, or strategist before the project began, but by the end, most students listed all these and several other ways in which they contributed to the work of their groups.

STUDENT EXPERIENCE: WORKING IN GROUPS	PROPORTION OF STUDENTS IN AGREEMENT
I usually contribute by sharing ideas and strategies	95%
I like to be sure the group turns in good work	94%
I like to be the creative person in the group	88%
I am the one who usually does most of the work	80%
I like to be the group leader	79%

The tendency of students to increasingly see themselves as leaders was especially strong among minority groups in middle schools, which is an especially appropriate time to allow a young person to see themselves in roles they perceive as positive.

Eighty-four percent felt that their project was likely to impact the overall problem; nearly half felt that it definitely would. At the same time, student confidence in their ability to impact the overall problem diminished slightly, although significantly. Students proved to be good judges of their own contributions; there was virtually no difference in their assessment of whether the things they would do (pre-project) and did do (post-project) would make a difference in their group's efforts.

> ***"CBL has been a very different type of learning experience. It has required me to problem solve and think outside the box, which is both a challenge and a relief from the usual mundane subjects in school. CBL is a class in which I can learn more about what truly interests me and what will further me as not only a student in America, but a student in the world."***
>
> HIGH SCHOOL STUDENT

Students clearly enjoyed the feeling that they were "making a difference." An analysis of comments from 178 students in midterm interviews strongly underscored this; major themes that emerged from those comments were:

- Overall, there was an overwhelming sentiment from students that they were making a difference at their schools and in their communities, which added to their own engagement with the project.
- The younger students, especially, were very pleasantly surprised that they were able to make a community impact even though, as one elementary student put it, they were "just children, still in school."
- Students feel more connected both to their schools and to their communities.
- Many students want to continue to help their communities after CBL.

> ***"I feel I am making a difference because of this project in our community. We are going through with our solution [no matter the outcome]…"***
>
> HIGH SCHOOL STUDENT

Before the project began, students overall rated their own computer and Internet skills very highly ("strong" or "very strong") and even their video production skills at 3.84 on a five-point scale. Nonetheless, more than two-thirds reported these skills as improving over the term of the effort.

> ***"A lot of people have stepped up in other ways, too, not just with the projects they're working on but also by sharing skills. People who are good at computers help people who aren't. People who are good at filming help people who aren't. So we had a bunch of little sessions [where] the students actually taught other students needed skills."***
>
> HIGH SCHOOL TEACHER

> ***"It's been a chance [for the students] to use all the skills they've learned throughout their entire education and apply them in a real world setting."***
>
> HIGH SCHOOL TEACHER

Group Assignments and Student Outcomes

Teachers by and large became attuned to the notion of the effects of group assignments on student outcomes through the CBLi project; only 48% described themselves as attuned to the impact of group assignments on student outcomes initially, but by the end of the project, 96% described the group interactions among and between their students as important to the overall outcomes. Students concurred, and a great deal of the student commentary was devoted to the assignment of students to groups.

> ***"I am an independent person, so I usually feel that working in groups wastes a lot of time and sometimes it's not fair. I can complete a lot by myself. CBL has changed that because when I get to choose my group members, I choose ones that I know will work hard. I am happy that we got to work in groups because it gets things done faster."***
>
> MIDDLE SCHOOL STUDENT

The sentiment above was echoed throughout the student comments, both by those who felt their groups were appropriate and by those who did not. Concern about the composition of groups was strongest in grades seven through 10 — formative years when concerns about group and individual identity are paramount. To better understand this phenomenon, students were randomly selected for interviews at the approximate midpoint of the process and 178 students submitted written comments.

Five key themes emerged from those interviews related to group dynamics, including a number related to the ways students work together in a CBL project; the ways they prefer their groups to be chosen, and how groups handled conflict:

- Many students' opinions about working in groups changed over the course of the project enough for them to comment on the change; CBL was perceived to have brought about a heightened level of collaboration and positive group dynamics.
- Comments about group dynamics tended to be more positive when students were in charge of choosing their own CBL teammates
- The most positive comments came when the workload in the group was distributed according to the kinds of activities each student excelled at. Some handled digital media very smoothly, while others demonstrated talents for planning and presenting. Because of this, there was a marked increase in peer-to-peer learning as they taught each other new skills.
- Many students commented that they formed good relationships with their teammates that they would never have formed otherwise.
- Conflict caused setbacks, but when groups were able to pull through that, it became a source of pride.

Despite these positive comments, on average, students reported that they liked working in groups less after the CBL project completed. An analysis of student comments suggested that the dynamics within their groups was a major factor in this small but significant decline. The mean for student responses (on a five-point scale from "really dislike" to "really like") to a question of how much they liked or disliked working in groups was 3.93 (liked) before the project, and 3.72 after the project.

In contrast, large numbers of students seemed to view group work post-project in generally positive terms:

> ***"I usually despise working in groups but CBL has changed the way I approach group work. Through CBL I have found some new forms of compromise. But the most important thing that I've realized is that any effective and significant, challenging work you hope to do, 98% of the time cannot be done alone."***
>
> HIGH SCHOOL STUDENT

This perspective was echoed strongly in the student post-survey:

WORKING IN GROUPS (POST PROJECT PERCEPTIONS)	PROPORTION OF STUDENTS IN AGREEMENT
When a group works well together, they help each other do their best work	95%
Working in groups lets people develop new skills	94%
Group work is more fun because it is more social	88%
Groups are more exciting than the more individual kinds of school work	80%
In most groups, one or two people end up doing most of the work	79%

When students were asked to make a forced choice among the dimensions in the table above, 53% chose the first item, "When a group works well together, they help each other do their best work," while the next highest choice was just 17%, who selected "In most groups, one or two people end up doing all the work." The last result in the table above contrasts with the finding noted above that 80% of students were the person doing the most work in a group. More research is needed to understand this disparity.

Overall, these results tend to support the importance of the social dimensions of the classroom, especially as it relates to the assignment of groups. It seems clear, especially from the student comments, that who they are asked to work with is a very important factor in how students feel their group will work. At the same time, beyond that observation, it is clear that there is room for considerably more study of this area.

The Teacher Experience

Teachers overwhelmingly found CBL easy to learn and understand — after a single implementation cycle, 94% of teachers felt they understood CBL; nearly three-quarters felt they understood it well, while one-fourth felt they were expert enough at it to teach others.

> ***"I've taught for 22 years. I find it very stimulating to do something new with my students."***
>
> HIGH SCHOOL TEACHER

Nonetheless, teachers tended to underestimate the time that CBL would take to implement as a portion of their normal work day. Most teachers (98%) estimated that CBL would take only a modest amount of time away from other tasks. By the end of the project, 56% reported that it did, in fact, take time away from other important tasks. The primary reason, culled from a list of comments from a random sample of teachers, was that teachers underestimated the importance of video skills to both themselves and to students. Time pressure related to project deadlines took time away from other tasks to which they would normally have devoted themselves.

In other areas in which teachers anticipated issues, their perceptions were fairly accurate:

TOP FIVE CONCERNS	ANTICIPATED	ACTUAL
Time away from other tasks	52%	56%
Student skills	40%	38%
Time outside of school	40%	25%
Mastering CBL quickly enough	37%	25%
Adequate training / professional development in CBL	31%	12%
Access to needed equipment	19%	21%

> ***"I tend to be very organized, like I know what I'm teaching today and I know X,Y, and Z and that's where my comfort level is, or so I thought. But I am finding I am very comfortable letting the children decide the direction we're going in, which is kind of new for me."***
>
> **6TH GRADE TEACHER**

Fifteen of the 62 teachers were selected for mid-project interviews, which were conducted via telephone, and then transcribed and analyzed for recurring themes. Five themes emerged:

- Overall, teachers found it refreshing to step into a different role with CBL.
- Teachers felt their role was more responsive, coach-like, and individualized.
- Teachers began instigating deeper conversations with the students about their projects and what learning approaches were/were not working for them.
- Many teachers took a while to feel sure-footed about leading the CBL projects because it felt like a fairly big departure at first. They had to change their mindsets and become more trusting of their students, which was initially difficult.
- Finding ways to effectively communicate and present the CBL model and essential question to the students proved challenging; some teachers had to take a step back mid-process and re-present the project to their students in a different way. Teachers reported a lot of "learn-as-you-go" experiences.

Required Skills and Resources

Teachers identified five essential skills that found virtually universal agreement. Topping the list were the teacher's own digital skills, reflecting the strong connection of CBL to 21st Century Skills such as creativity and media literacy. Equally important were subject matter expertise and facility with CBL. While none of the teachers or students reported behavioral or other issues during the project, it is significant that 94% of teachers listed classroom management as an essential skill.

The ability to make students feel comfortable with the process and to work with them as they go through the open processes of brainstorming and working through the steps of challenge based learning are very much dependent on the atmosphere the teacher is able to create and maintain. Done well, it may not be obvious, but teachers agree that it is very important.

TEACHER PERCEPTION OF ESSENTIAL SKILLS	TEACHERS IN AGREEMENT
Digital media skills	99%
Internet skills	98%
Subject knowledge	98%
Understanding of CBL	98%
Classroom management skills	94%

Training and Support

A clear finding was that while teachers are able to learn CBL and implement it, the skills it requires are new to many of them. After the project ended, only 13% of teachers reported that they had all the skills and training they needed at the beginning of the effort. At the top of the list of recommendations they had for other teachers or schools was to provide training in the approach; 86% reported that the CBL training they received in Dallas at the project kick-off helped them to be successful. Three-quarters felt the online CBL community space was important to their ability to craft successful implementations.

Unsurprisingly, given the way the schools were selected, 98% felt they had sufficient administrative support; 94% felt they had sufficient technical support, as well.

While the teachers self-assessed their general computer skills at 4.02 out of five ("strong") and their general Internet skills at 4.17 (also "strong"), many of them found their digital media skills posed issues. Although almost all of them were able to learn the tools and techniques they needed, it took time away from other tasks to do so. Video and editing skills topped the list of activities in which they wished they had a stronger footing — a finding with clear implications for pre-service education.

WHAT DO YOU WISH YOUR PAST PROFESSIONAL DEVELOPMENT HAD INCLUDED BEFORE YOU BEGAN YOUR CBL PROJECT?	PROPORTION OF TEACHERS IN AGREEMENT
Video editing	50%
Audio editing	37%
Formal CBL training	33%
Image editing	19%

Time and Place Changes in Student Learning Practices

The researchers were able to document that CBL did effect time and place changes in the ways students learned, both inside and outside of class. On average, students devoted about 90 minutes a day to CBL at school; teacher and student comments indicate that this work involved more freedom and student choice in the manner they were able to approach their tasks and the resources they used. Work outside of class occurred primarily at home (64% of students) and served to extend the learning day by an average of one hour. This finding was true across all grade levels.

Related to this dimension were changes in the adults from whom students were learning. While the vast majority of students (88%) still listed their teacher as a key resource to them, 47% of students reported local experts as significant contributors to their learning; 36% called upon parents, and 32% noted that other family members were a significant help.

Technology

The students' and teachers' perceptions of technology, and their comfort with both the tools and their own skill sets were a key focus of the research, as the very nature of CBL presumes extensive access to technology. Indeed, CBL is a pedagogy that seems ideally suited to teaching in one-to-one classrooms, and especially where every student has access to an Internet-capable device at home and in school. Having such access allows students to continue to muse and reflect on their challenges, and as the previous section demonstrated, extends the school day and expands the classroom.

Teachers were asked to provide a great deal of specificity about the technological resources they used in their CBL projects, and of special interest were those in which teachers shared a broad agreement on their importance. This was explored both in terms of technology for their own use and for students.

TEACHER PERSPECTIVE OF THE IMPORTANCE OF KEY RESOURCES	FOR TEACHER USE	FOR STUDENT USE
Internet access in class	98%	100%
Personal laptop	94%	96%
Video camera	-	96%
Video editing tools	82%	94%
Audio capture and editing tools	-	94%
Digital still camera	-	94%
Internet access outside of class	98%	92%
Microphone	-	86%
Image editing tools	-	86%
Data projector	80%	-

Resources with less than 80% agreement on their importance are omitted.

Four Case Studies

Four representative schools, one from each level of institution — primary, middle school, high school, and university — were selected by the researchers for additional in-depth study. These case studies provide more information about how the schools actually approached their implementations, how educators worked with students, and what they accomplished.

Ringwood North Primary
Melbourne, Australia

Big Idea: *Resilience*

Question: *How can we better support each other during times of hardship?*

Challenge: *Help a community recover from a disaster.*

Overview: *Throughout history, the human race has continually been challenged by disasters. During these times of great adversity, communities need to come together and support one another. Australia's Ringwood North Primary School challenges you to make a difference for a community affected by a disaster.*

Technology: *Ringwood is a one-to-one iPad school*

Ringwood North Primary chose a very timely subject for their challenge based learning project. In the midst of their challenge, "Help a community recover from a disaster," Christchurch, New Zealand experienced a tragic earthquake and Japan was rocked by a giant tsunami. While the project was initially focused on helping communities in Australia affected by floods and cyclones, the challenge took on a more global perspective as graphic images of the devastation moved their students into taking action.

The participating students were fifth and sixth graders, ages 10 to 12 — a significantly younger age group than the challenge based learning pilot high schools. One of the missions underscoring their role in this study was to explore how CBL translates to the elementary school set. The children created a challenge without a concrete end, developing solutions that are highly transferrable to different scenarios. "The highlight of this project has been to see the students become aware that they are actually making a real difference to someone else, another community," shared Adam Brice, Assistant Principal of the school.

In order to effect change in another community, Ringwood North Primary organized the students into groups, where roles were divided up and solutions implemented. The collaborative nature of the project provided the opportunity for each student to share his or her particular talents and skills. This group dynamic, enhanced by readily available technology, including iPad devices, helped drive forward the challenge while keeping it exciting for the students. In traditional classroom situations, students do not get the same opportunities to switch gears and experiment with new roles.

"We are seeing an improvement in self-esteem and confidence, as our learners begin to experience more success with a medium which makes sense to them" said Brice. "We have promoted the notion that teachers are also learners, and as a result, we have our students willing to collaborate and share not only with one another, but their teachers. New ideas or learning are spread like wildfire and are celebrated during reflection."

What is also unique about Ringwood North Primary is that they embarked on a one-to-one learning trial in conjunction with their challenge based learning project — the group of 138 students had 24/7 access to iPad devices. Students took full advantage of this resource, setting up their own iTunes accounts and email accounts, as well as downloading helpful apps and videos. As such, iPad devices proved to be the key tool in their CBL activities, used for everything from research to communication to recording project reflections, which generally included creating movies and soundtracks. A combination of iMovie, Garageband, and ReelDirector made these movies come alive. Learning to use this vast assortment of tools and technologies afforded more opportunities for genuine critical thinking.

"The students are challenged to reflect upon their learning and revisit what worked, what didn't and why," Brice noted. "The notion that things don't always go according to plan has been celebrated and highlights the fact that there is always something we can learn from it."

Through these investigations, concepts have emerged which have allowed the teachers to seize new learning opportunities. From the ongoing development of news from newspapers to apps, to the exploration of hardship and its ability to be measured, students at Ringwood North Primary are directing and contributing to their own learning.

"We have students moving in and out of spaces and utilizing different learning areas as they need to," said Brice. "We just found that they've become more independent. They're really articulate." Solutions that the students brought to life included a bake sale to raise money to send stacks of books to a school library in Queensland to replace those damaged in the flood.

Other students have channeled their natural creativity to write a *Book Of Hope,* a collection of artwork and messages of support for the disaster victims. Tree plantings, concerts and donations to a Royal Society for the Prevention of Cruelty to Animals in Queensland were just some of the other solutions implemented by Ringwood North students. The overall sentiment of the participating students was a newfound feeling of making a real-world impact. "It's going great," one student shared. "It's a lot of fun, and without really knowing, we are learning!"

The educators at Ringwood North Primary have noted an improvement in student engagement, and not just in those children who typically perform best on standard tests or most easily comprehend lessons. "There are a lot of students who have really stepped up and demonstrated outstanding leadership skills," Brice revealed.

In addition to the students' positive responses to CBL for group interactions, the teachers are experiencing firsthand how new approaches to learning can transform student-teacher relationships. "There are a lot more quality opportunities for giving explicit feedback, whether that be individually or in small groups," said Brice. "We're finding that we've got the chance to really sit down with them and question what they're doing, have our students justify the decisions they're making and to elaborate on what they've already done."

Ocoee Middle School

Ocoee, Florida

Big Idea: *Politics*

Question: *What role do politicians play in everyday life?*

Challenge: *Actively participate in the political process*

Overview: *43.2 percent of Americans of voting age did not vote in the last election. With approximately half of US citizens not engaging in the political process, how then, can we not expect students to do the same? This challenge is designed to open students' eyes to the workings of state and local government and to show them that they can make a difference in society, even if they are not old enough to vote.*

Technology: *Ocoee is a one-to-one MacBook school during the school day; kids also used iPad and iPod touch devices*

The challenge that Ocoee Middle School undertook — "Actively participate in the political process" — is inherently complex because the participating students are all under the voting age. However, the exercise itself has provided the children a window into a process to which they will ultimately have the democratic right and social responsibility to contribute. To add another dimension, Ocoee is one of the first middle schools to join the challenge based learning study, offering a snapshot of how this learning approach works in a different age group, specifically 12 to 14 year-olds.

Among the goals the school set out to accomplish was strengthening group dynamics and communication skills. "We are absolutely thrilled with exactly the point of [CBL], which is the kids are working in groups," said Sharyn C. Gabriel, the principal at Ocoee Middle School. "They're doing authentic research. They're pushing themselves. They're coming up with creative solutions. It's an amazing process to watch." The combination of working in teams and utilizing emerging technologies provides the students with more real-world experience — a well-received departure from previous lesson plans focused on the same subject. "I have 12 and 13 year-olds interacting with senators and congressmen and going to commission meetings, whereas it used to be 'what are the three branches of government?'" Gabriel added.

The students are equally interested in this change in pace and teaching. "[CBL] explains it clearer than doing worksheets and other things," shared one student. While there was a definite enthusiasm for trying something new, staying on task proved to be an obstacle for the participants, in most cases due to conflicts that arose amidst the small, teacher-selected groups.

Feelings of success varied from group to group, revealing that challenge based learning may have a significantly different impact when the groups — like the challenges and solutions themselves — are entirely student-directed. Pre-set groups may be more appropriate for the elementary school set, who still rely heavily on teachers to help develop and navigate the social interactions of the classroom. Middle school is generally a time when kids are more assertive in building their social identities, and more cliques emerge.

"… It's hard to keep track of what everyone is doing and people always do what other people do …." said a student describing a challenge.

Students were mixed on the value of group work. "I would prefer if we got to choose our own groups," one student offered. Others took the opposite view, "Challenge based learning is a great way to communicate with each other. Four brains work better together than one. It's like a way to show/tell your opinion about that specific project," said another student.

Teachers at Ocoee also encountered some initial issues with students not fully grasping the meaning of the challenge. "The election process and political process are virtually synonymous with each other," said one teacher. "I don't think our 7th graders have been picking up on that." In order to circumvent this roadblock, the teachers worked together to create visual activities to connect both processes. "After that, the students seem to be more clear on the concept," the teacher confirmed. Though challenge based learning is student-centered, it has proved critical for teachers to selectively intervene and guide the students.

When it came to student engagement at an individual level, there was a more evenly dispersed sense of accomplishment that struck the educators at Ocoee. "You'd be surprised at those kids that are traditionally not successful, how good they are at presenting and how creative they are," Gabriel said. "We've had kids — and these are not your straight-A kind of kids — who are busting out the roof with test scores." This observation echoes the results of the challenge based learning pilot study, which conveyed stronger performances among more at-risk students.

The technology deployed in Ocoee's CBL project contributed to this student engagement. While facilitating one-to-one learning is not the norm for the school, they used a one-to-one approach for their project to create what Gabriel called "flexible digital learning environments." Each team of students had access during the school day to 30 desktop computers and a cart of MacBook computers, and iPod and iPad touch devices. Journaling and podcasting took place primarily on MacBook computers, and students used iPad devices to research everything they could about their local government, current laws, and commissioners' meetings. "The gamut ran from activities as simple as letter writing to creating Facebook pages for social awareness," Gabriel shared.

Accompanied by exploring new ways to use the available technologies, the students did work that is inherently difficult for their ages. In addition to attending government commission meetings, the students researched recently introduced local and state bills. To relate more authentically to the material, the challenge emphasized children having a voice in specific areas in which they are familiar, such as parks and libraries. Perhaps most importantly, the students found that the newfound knowledge and skills may stick with them as they continue their education after Ocoee Middle School. "The CBL thing is very challenging," one student admitted. "But, I got the hang of it and learned a lot about it. Challenge based learning can also help you when you get to high school."

Westside High School
Omaha, Nebraska

Big Idea: *Family*

Question: *What are the factors that affect families and impact their day-to-day activities?*

Challenge: *Improve Family Dynamics*

Overview: *Students at Westside High School in Omaha, Nebraska feel that families are the foundation of all societies. However, we feel that family relationships have deteriorated over time and are in a crisis. We challenge you to improve family dynamics.*

Technology: *Westside is a one-to-one MacBook school, and used GarageBand and iMovie extensively*

Challenge based learning provides students with opportunities to make positive impacts on their surrounding communities. Westside High School's challenge — "Improve Family Dynamics" — incorporated a different kind of community than other schools, but family relationships are arguably the most important driving factor in shaping peoples' outlooks and actions. Exploring their experiences with this type of project sheds light on how well challenge based learning translates to more immediate, personal communities.

At Westside, the students assumed a lot of control over the project, which proved surprising and refreshing for the participating faculty. "I think the biggest change over the last couple years has just been the mindset of trusting the kids and giving them the freedom to take the project how they want to a certain extent," shared Nathan Moseley, a 10th grade teacher. "There's a lot more freedom involved for them and they're in charge of their own learning in a lot of ways. So, the biggest change for me as a teacher is just letting go and letting them take control of that."

With this increase in freedom came more personal accountability for the students, and the groups they formed embodied this new sense of responsibility. "I usually do not like working in groups at all; I usually end up doing all of the work and get frustrated," revealed one student. "CBL was the best group experience that I've ever had. My group members were my friends and we all can count on each other. The work got done and people completed their portion of the project, which was very nice."

Many students echoed this sentiment, emphasizing how the positive group dynamics contributed to the overall success of the solutions they implemented together — even though some of the work was accomplished individually. "We all attended the support group, obviously, to do a test run of the support group," said another student. "We also all attended the interviews we conducted. Each of us wanted to be there for important parts of this project."

Together, students brainstormed and executed on solutions that they felt made a direct impact on family relationships in Omaha, including conducting support groups for children with divorced parents. Some students even stepped up to create keynote speeches for presentations about their challenge to other students, teachers, and a judging board, which is not something students typically experience before entering higher education institutions. "I feel I am making a difference because of this project in our community," one student shared. "We are going through with our solution no matter if we win or not, so the kids in our group at Loveland will benefit from our solution." The feeling of making a difference proved to be the most effective motivation for the Westside students.

Moseley cited the use of technology as a large factor in the outcome. "We are a one-to-one school," he explained. "Students [were] allowed to take their computers home with them each day and this helped with the implementation of the project."With the school-issued MacBooks, students developed websites, edited photos, designed informative flyers, and created keynote presentations about their project. Students also used digital cameras and camcorders to shoot movies, returning back to the MacBook computers to edit the videos and soundtracks in iMovie and create soundtracks in GarageBand.

The departure from more conventional high school curriculum also incited enthusiastic responses and even fostered a transformation in many of the students' ambitions. "CBL is a definite contrast from the typical classroom atmosphere, but I like it," said one student. "It's much more laidback, making it easier to concentrate and work, and I like that it allows me to manage my own time and make my own decisions on what I will accomplish for the day." The real world skill of effective time management is an increasingly invaluable outcome of challenge based learning.

Teachers felt that the impact students made on family dynamics in their community — and on their own personal growth — happened because they were given the chance. Moseley noted, "I think the biggest thing is seeing examples of what students have done and the process they went through, as well as getting the opportunity to carry it out by themselves."

Miami University
Oxford, Ohio

Big Idea: *Learning*

Question: *How can undergraduate education be more relevant?*

Challenge: *Make undergraduate education relevant!*

Overview: *Design a more relevant undergraduate learning experience. Is the current structure of university education effective in creating active citizens prepared to solve the challenges of the 21st century? How can a university education, both inside and outside of the classroom, become more innovative, adaptive and transformative to develop student portfolios that contribute to society?*

Technology: *Miami University is a one-to-one student owned laptop school, with MacBook and MacBook Pro computers. Garage Band and iMovie were used extensively, along with Adobe InDesign and Illustrator.*

The challenge that Miami University chose — "Make undergraduate education relevant!" — correlates with the overarching philosophy of challenge based learning to create learning experiences that transcend the boundaries of current, traditional education. The opportunity to see how students closest to entering the real world embraced the project is extremely valuable insight for advancing CBL. At the same time, the participating students here can be perceived as at a disadvantage compared to other cases; the K-12 years are much more formative, whereas students in higher education may be too accustomed to specific methods of learning.

"At first the students seemed to be…floating a little," shared Professor Peg Faimon at the beginning of CBL implementation. "I think some of the students in this class that we're teaching are used to a little bit more of a free form approach, a little less structure, a little more self-initiative, but some of them aren't. So, I think they're starting to get their legs under them in terms of feeling like they have a little more personal

direction and ownership of the problem." As the project progressed, it became increasingly clear that positive group dynamics motivated everyone to succeed.

"I feel that each of us are positively benefiting the project," said one student. "There is no single strong leader at this point, and we switch off in that role. I am making a difference in the group based on my technological skills and ideas."

As an added dimension to the challenge, the participating students were a hybrid of both regular and honor students from different disciplines and backgrounds, though that did not prove to be a hindrance. "Everyone is participating in their own way," a student asserted. "We each bring something different to the table with our different background and talents." In general, the students took a research-intensive approach to solving the challenge, interviewing college graduates at various stages in their careers, deploying student and faculty surveys, and finding engaging activities at other universities — even those online. The understanding was that the necessary change could only take place once the students were truly engaged in learning other peoples' and institutions' educational goals, as well as their perceptions of their learning experiences.

Laying the groundwork for implementing solutions may not have posed too many roadblocks for the students, but implementing solutions proved to be more challenging. "We have generated a lot of good ideas," said a student. "However, it is difficult to feasibly implement many of these good ideas."

Perhaps one of the most important benefits was that the experience of challenge based learning itself countered some of the disenchantment of traditional learning. "I do enjoy working on projects because they are extremely fulfilling when you have a finished project or have accomplished a goal," one student opined. "The fact that they require a deliberate effort over a more extended period of time than studying a few days in advance for a test, I feel much more accomplished after putting in the large amount of effort. Working for an end result is something that really motivates me."

The use of 21st century tools helped maintain this level of engagement throughout the project. Students learned and utilized a wide variety of tools on MacBook and MacBook Pro computers, including iMovie, GarageBand, InDesign, and Illustrator. In using this technology, students experimented in creative ways. "Several of the teams created printed materials as part of the solutions to the challenge," Faimon recounted. "One team created a visual mapping system to show how liberal education classes relate to one another. Another team created a brochure that identified different aspects of the many student organizations on campus. Another team created a promo piece for the Career Services Office."

Recommendations

We have learned a lot about challenge based learning after two major studies. Dozens of schools, nearly 100 teachers, and thousands of students have tried the approach successfully. Along the way, we've documented the efficacy of challenge based learning in a wide variety of settings — and we've seen best practices emerge that are already beginning to inform new implementations of CBL. This section of our report extends the research findings into eight recommendations for practitioners.

- **Prepare teachers by introducing them to challenge based learning in a professional development or workshop setting.** Use this time to answer questions about the process, share examples from this implementation and similar projects, and help teachers understand their role, which may be very different from what they are used to doing. Set expectations about what teachers will do and what students will be asked to do so that students hear a clear, consistent message throughout the project from everyone involved. A full-scale offsite retreat is not necessary; the key components are a dedicated time and place, someone to explain the process and answer questions, a chance for teachers to express their concerns and be heard, and an opportunity for them to collaborate on designing the challenges. This workshop should not only focus on the conceptual aspects of CBL, but also give participants the chance to practice the basic skills and tools they will need to help their students get the most from the experience.
- **Provide teachers with basic training in video, audio, and image editing.** Communication in today's world takes many forms, and it is increasingly clear that teachers need to be fluent in digital media. A strong case can be made for the inclusion of basic skills training even while teachers are in pre-service training. An even stronger case can be made for ongoing professional development for teachers around new tools and techniques with digital media, but there is no question that teachers contemplating using CBL will need solid basic understanding of how video, audio and images are captured, edited, and used to convey information. Half of the teachers involved in the CBLi study listed video as their top professional development need, above challenge based learning itself.
- **Frame the challenge in ways that deeply involve the students, and make it real.** The process in which the challenge is framed is critical in engaging students. It must be meaningful, relevant to their lives, allow for a wide range of solutions, and perceived by students as capable (and worthy) of generating positive actions in response. It is crucial for the challenge to actually relate to the real world and for it to have an impact on the students' families, local communities, or school. Student comments indicate excitement and engagement around the idea of being able to personally have an impact, and a majority of students both anticipated that they would be able to make a difference and

felt that they had afterward. It is also important that the size of the challenge is in line with the time and resources available for the project; if the challenge is too big, kids do not know where to start. The teacher's guidance is extremely important both in selecting appropriate challenges and in framing them in such a way that students can get their arms around what is being asked of them.

- **Allow teachers planning and preparation time, and ensure students have enough time to complete a meaningful solution.** The critical issues around time are to allocate it in proportion to the scope of the challenge, and to help students break down the overall project into reasonable segments. Enough time must be allowed for students to work through the big idea and brainstorm research questions, but there is a point of diminishing returns when brainstorming must end and research must begin. Likewise, students need plenty of time to do the research and brainstorm solutions, but then they must stop brainstorming and select one solution to develop. Finally, they need time to actualize their solution and to put it into practice. These points in the project are difficult for students to recognize, particularly if they are new to challenge based learning. Teachers must design the experience so that students understand how to move on at the right points.
- **Ensure students have the opportunity to act on their solutions.** The kind of learning that takes place in challenge based projects is reinforced by action, and students will learn much from the implementation of their own ideas. Part of the attraction of the projects to the students was the opportunity to persuade their peers and the adults in their life to take part in the activities they designed. In order for students to see that they can make a difference, they must be allowed to carry their solutions through to action. Implementation is accompanied by major outcomes in terms of the acquisition of 21st Century Skills such as communication, leadership, civic literacy, and social responsibility among many others.
- **Form workgroups with an eye toward the realities of group dynamics.** The number one issue with kids related to CBL, especially in grades seven to 10, is the composition of workgroups. Students want to be in groups that they perceive will be able to do a good job. An aspect of this is related to a core strength of challenge based learning — it provides a way for young people to engage with an idea they see as important to their lives. A natural and desired result is that they will be motivated to do their best work, and that motivation plays into why many students want a hand in group selection. At the same time, teachers should not give away the process of group formation. The key is to ensure that the assignment of students to groups is aligned in support of the group activities. Some conflict is a good thing when students are able to work past it, but more research is needed into effective ways to reduce friction within student workgroups.
- **Build 21st Century Skills into the project right from the start.** While nearly every skill identified by the Partnership for 21st Century Skills emerged naturally from the types of activities students engaged in as they worked on the challenges, it would be very easy to include them all. Teachers who are aware of the list of skills can incorporate specific project components to build on them. Skills such as financial and economic literacy are a natural fit for challenges related to the economy, but almost any topic could have a financial component. Teachers can plan final project requirements that incorporate subsets of the 21st Century Skills, or encourage exploration and research that helps students develop certain skills.

- **Practice, iterate, and improve the process.** It is a natural and predicable response for teachers to have some uncertainty at the outset of their first CBL project, but as this study shows, the vast majority of teachers are easily able to learn and implement CBL. Common sense would support the notion that the second and third times they implement a CBL project will be much smoother than the first one, and that skills developed along the way will not take time away from other tasks once learned. A common reflection heard at both the pilot and the CBLi workshops was that teachers were excited, but also a bit apprehensive about giving up control, worried that students would not pick up the reins and do the work. Students, too, tend to be nervous at the start; they were not sure how to act in a situation where they directed their own learning. Nonetheless, by the end of their projects, those concerns had virtually evaporated.

We began this report with the observation that the children in our schools today will inherit unprecedented problems that will need to be addressed in their lifetimes. We know that decades of reform have not given us hope that the erosion of skills in our youth will subside.

We know new ideas are needed — and challenge based learning is an effective one.

Fresh, new, relevant to today's issues, it is an approach that has been shown to effectively engage students at all levels of learning. The findings of the Challenge Based Learning Implementation Study are clear, and they are encouraging. They validate the findings of the pilot study, and solidly support further experimentation, further research, and further work in the field around robust new ideas.

More than that, these findings show that there is a better way to reach young people and engage them around important issues. We know we need to make learning relevant to the challenges youth will face in their lifetimes — and we know we can. Challenge based learning is a framework we can put into place today. Rich in activities that promote 21st Century Skills and rich in avenues for kids to direct their own learning and help their communities at the same time, challenge based learning is also scalable and easy for teachers to learn. It engages young people at every grade level, across a wide range of disciplines.

It is an idea whose time is now.

Methodology

The evaluation process drew on the principles of outcomes-based evaluation; various activities of the project were monitored via indicators to help the evaluators judge whether the project was unfolding as planned, or if adjustments were needed. Each activity was presumed to have needed inputs and expected outputs that would influence subsequent activities as part of a critical path. Taken as a whole, the activities of the project were presumed to have a causative relationship with the key outcomes of the project.

A combination of surveys, interviews, and background research, each keyed to the timing of the project itself, provided the data needed to monitor and analyze the project as it unfolded, as well as to document the overall outcomes across the study. All participating students (n=1203) and teachers (n=62) were asked to complete pre- and post-surveys that among other research aims, were used to determine changes in perspectives or behaviors. A random sample of teachers was chosen, and each were interviewed at approximately the midpoint of the project; similarly, students were asked to respond to a set of open-ended questions at the approximate midpoint. A separate instrument for teachers focused expressly on the group selection process in each class-level project, with the goal of providing insight into the relationship between group assignments and groups that produce successful projects.

The evaluation plan, developed by the NMC with assistance from an advisory group of educational researchers, is based on an open data model; the evaluation design, the instrumentation developed, and all of the data produced in the study will be made available to other researchers who may wish to mine it for additional materials.

Summative Assessment Model

The pilot study identified ten major outcomes that spanned overall class outcomes; changes in teacher perspectives; and changes in student behaviors and perspectives; the summative outcomes of this project are hypothesized to be similar, based on those findings, and are cast here as expected outcomes. The ten expected outcomes, five focused on students, and five related to teachers, were:

THE TEACHER EXPERIENCE	THE STUDENT EXPERIENCE
• Teachers will report that overall engagement of all students in the class increased • Teachers will report that students master the expected material across the class • Teachers will feel that their training and support allowed them to be successful • Teachers will report that they intend to use CBL again • Teachers will report that CBL is a good use of class time and resources	• Student self-reported learning will align with the 21st Century Skills framework • Students will report that their own work mattered in achieving the project outcome • Students will report that the project was relevant • Students will spend more time on task • Student attendance will improve

The summative assessment also included measures intended to provide ways to gauge the success of the CBL implementations. The notion of what constitutes a successful foray into the world of challenge based learning is complex, with important outcomes for the community, the school, the teacher, and most critically, the student.

Among the dimensions of success that interested us was how CBL fit with the school climate. Did it help the school accomplish its overall targets for the year? Did the approach work well for the teacher, and did it help convey the required curricula? Did it help to focus student interest, and increase motivation? Did students do the required work? Ultimately, these questions are all subservient to the most important one — did the students learn? What, and how well?

Formative Assessment Model

The formative assessment focused on three major phases of the project. The first was the teacher-training workshop that was held in Dallas. There are two possible outcomes for this activity, expressed at the simplest level — teachers either felt ready to implement their projects, or they did not. A number of concerns were anticipated based on the results of the pilot; these were assessed in the pre-project survey to be administered at the end of the workshop. This list is not complete, but among the variables to be monitored in Dallas were:

- Computer skills of the teacher
- Experience as a teacher
- Understanding of CBL
- Understanding of group dynamics
- Worries about time away from other tasks
- Confusion with similarly named approaches
- Uncertainty around on-campus support

The second critical phase of the project was the time period on campus when the project was being introduced and planned with students. Two key factors were monitored here. The first was the open-ended time when the kids brainstormed what they may do to address the "big idea." In the pilot, although it was not clearly established, it seemed intuitively obvious that if a class flounders at this key point, critical time may be lost that would be better spent on implementing the solution. An evaluation goal was to ensure that teachers understand how important it is to balance a wide-ranging exploration of ideas with the need to move to a focused solution that will drive the rest of the project. A second constraint that can impact the success of the project is a teacher's need to control students' choices for what they will do.

The third key phase was the on-campus implementation itself, which for the purposes of the evaluation started at the point the student solution is identified. This is when students began to work on the various tasks related to the solution. It is as this point that the political dimensions of the classroom are thought to be most influential on the overall engagement of the class. By asking teachers to reflect on the social graph of the class at this point, it was hypothesized that their choices for assigning groups might be influenced to include social and political dimensions in their choices. A "panic button" process was established so that teachers who found themselves in need of help at this (or any stage) could call on a group of mentors to assist them in their thinking.

Research Component

The CBL Research Advisory Group suggested four additional areas in which to conduct investigations. Questions designed to elicit useful data were included in the instrumentation prepared for the evaluation, thus extending the work in ways that will add to what we know about how CBL works and how it may impact the learning environment.

Training and Development. While some training was provided for participants, this dimension of the study was more aimed at understanding the previous preparations and experiences teachers have had. In particular, the correlation between training and experience was a focus. A related dimension was to better understand what aspects of a teacher's training and development were perceived as most critical, and what pieces they felt were missing from that preparation that might have been helpful. Questions were carefully designed to remove any technological bias so that aspects related to non-technical dimensions of preparation might surface.

Place and Time Changes. This dimension focused on understanding where students were doing the work required for CBL. Did this approach extend learning beyond the school day? Where did the work take place? Did students work at home or other non-school locations? Did their work extend to their social networks? These questions were incorporated into the mid-point and post student surveys.

Group Dynamics. How did the way students worked with each other in groups impact the outcomes of their projects, if at all? Were there any surprises teachers noticed? What were they? Such questions were included in the midterm teacher interviews, and teacher post interviews. A set of validating questions was included in the student post survey as well. A special instrument focused on the role of group dynamics in the teacher's selection of groups and was be compared to the outcomes for each group to see what kind of relationship existed between them.

Skills and Resources. Related to the dimension around training and development in some ways, this dimension focused more on the key skills needed in general to successfully implement a CBL project in a classroom, as well as the human and physical resources (tech support, access to video equipment and software, etc.) required.

Instrumentation and Data Collection

Four online surveys and two interview/narrative protocols were designed, along with a third protocol for eliciting the data on group selection. Additionally, secondary research documented school characteristics and demographics of the 19 participating institutions, using data from NCES and other sources.

Student Surveys and Reports. All students were asked to complete an online survey as the project began and again as it ended. The primary (but not exclusive) purpose of the surveys was to determine changes in student behavior or perspectives related to the following areas of interest:

- Time required (spent) on the project in and out of school time
- Places where the work will be (was) done
- Were family, friends, or other members of the student's social network outside school involved?
- Ability to influence the work and its outcomes
- Assessment of how the work will be (was) done in groups (eg, did all students participate?)

- Student affinity toward project-oriented schoolwork
- Student affinity toward working in groups
- The degree to which student learning aligned with 21st Century Skills
- Group dynamics — who were the idea people? Who went the extra mile? Were these easy to predict?

A mid-project random sample of students was asked to contribute a written narrative of their experience in response to a set of prompts as a way to validate the survey responses.

Teacher Surveys and Interviews. All teachers completed an online survey as the project began and again as it ended. The primary (but not exclusive) purpose of the surveys was to determine changes in teacher expectations or perspectives related to the following areas of interest:

- Time required (spent) on the project in and out of school time (before/after)
- Skills they perceived to be critical in implementing CBL (before/after)
- Equipment and other resources required by the teacher (before/after)
- Equipment and other resources required by students (before/after)
- Student skills critical to completing a successful project (before/after)
- The value of their past professional development for CBL (before/after)
- What was missing from their past professional development vis-a-vis CBL (before/after)
- Their top three concerns (going in, and in retrospect)
- Their top three challenges they expect to (did) face implementing CBL
- The degree to which they will be (were) supported on campus
- The degree to which they will be (were) supported by the CBL community
- How hard will it be (was it) to implement CBL
- What were the most important roles they played as they used CBL

A mid-project random sample of teachers was interviewed based on a set of prompts as a way to validate the survey responses, as well as to surface any surprises they might have been noticing in the ways students were engaging in the material, the process, and with each other. Teachers were also asked to submit a short report assessing the social graph of their class via a narrative about two-thirds of the way through the project.

Video Interviews. While video interviews were not part of the formal evaluation, they were part of the overall communications effort and all relevant video interviews from the project were available to the evaluation team. These videos were examined for additional insights from teacher and/or student commentaries, and used as appropriate.

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