

DECEMBER 18, 2014



The Process of Innovation at Oakton High School

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Abstract

This project studied the implementation of 21st century teaching and learning within a leading progressive Virginia high school. The study incorporated literature research, observational studies, interviews, surveys of teachers, and dialogue with administrators and other institutions. Overall, we found widespread acceptance of 21st century principles and learning outcomes within the institution because of their alignment with established values. Faculty exhibited strong comfort levels within their own academic subjects and were likely to collaborate with those within their own or similar disciplines. Constraints included diverse conceptions of projects, perceptions of constraints imposed by standardized testing, and the need for updated technology.

Acknowledgements

We would like to thank the following:

- The Fairfax County Public School System and Oakton High School for allowing us to observe and perceive 21st century pedagogies within a secondary institution. These institutions gave us the opportunity to cultivate our awareness and understanding of 21st century teaching and learning.
- Our liaison, Colleen Eddy, and outside affiliates, Kirsten Kunkler and Fredrick Rucker, for guiding us through our project, connecting us with the Oakton community, taking the time to collaborate with us, and providing cooperative feedback and guidance
- Administrative Secretary, Pamela Burke, for assisting us with administrative needs
- Oakton's faculty for allowing us to gain valuable insight about instructional teachings through in-class observations, interviews, and surveys
- Worcester Polytechnic Institute for this unique opportunity to fulfill our Interactive Qualifying Project requirement in Washington, D.C.
- Advisors, James Hanlan and Paul Davis, for giving us support and input towards our project

Executive Summary

With the United States facing one of the highest secondary education dropout rates in the world ("K-12 Reforms: Strategic Initiatives to Foster Real Change," 2013), acquiring a comprehensive skill set is crucial for students of this generation. Commonly referred to as 21st century skills, this set incorporates skills such as critical thinking, communication, collaboration, and creativity. When attempting to integrate 21st century learning, an innovative teaching method that stimulates educational outcomes through student-centered learning, these skills become significant in attaining underlying principles.

Recognizing the benefits of 21st century pedagogies and the effects they have on the future of students, Oakton High School (OHS) requested students of Worcester Polytechnic Institute (WPI) to analyze the steps they have taken towards the implementation of innovative teaching methods in order to provide insight for areas of improvement. By assessing the perspectives of students, teachers, and administrators in this secondary institution, we aimed to:

1. Identify where 21st century teaching has been integrated within Oakton High School.
2. Accumulate data from other institutions where 21st century pedagogies have been implemented and assess which steps employed by these institutions were most effective for integration.
3. Propose recommendations through a deliverable that examines the areas where innovation can be improved within Oakton High School.

Oakton High School has aspired to incorporate innovative teaching within its classrooms and has addressed this aspiration by sending members of its faculty and administration to the Buck Institute of Education's conference on innovative teaching. Drawing upon the conference experience, Oakton's administrators and teachers took the initiative to promote such 21st century methods within their institution.

We perceived that organizational collaboration among faculty and administrators within Oakton already illustrated a strong foundation. However, to further strengthen this foundation we found that recognizing the alignment of the educational outcomes of the institution with the core expectations of 21st century pedagogies was an important step towards additional innovation within classrooms. We also found value in highlighting the high comfort levels of Oakton

educators with collaboration within their departments, an asset that could help to expand the ideas of 21st teaching and learning within the school.

In addition to the institution's shared values and collaboration, teachers expressed some dissatisfaction with Oakton High School's technology. From interviews, 64% of teachers believed that technological upgrades would significantly aid them in strengthening new teaching methods. Additionally, faculty survey responses indicated concerns such as the institution's "outdated software, lack of interactive materials/curriculum and horrible network upload speeds" and that "everything is [operating at] viral [speed] now and teachers need to keep up with students". Through our findings, we noted that technology is pertinent to 21st century teaching and learning and further aids innovation within classroom settings.

We also found that standardized testing is perceived to inhibit innovation within Oakton High School. In our survey of faculty, we asked questions such as "To what extent does standardized testing influence your teaching?" and "In what ways does standardized testing influence your teaching?" in order to gain an understanding of the diverse faculty perceptions. Out of all the teacher respondents, 81% believed that standardized testing, in one way or another, is inhibiting their integration of 21st century methods. Some reasons behind this hesitation were personal pressures to maintain student grades and the need to teach all curriculum topics.

Some differences in perceptions were determined to be areas of concern, too. Interview and survey responses reflected variations in attitudes towards project-oriented assignments and standardized testing. In addition to hesitance towards innovation due to standardized testing, various perspectives on the instructional priority of standardized tests were found. For example, one teacher stated that "standardized testing drives the pacing and exacting nature of what is taught. We can go beyond the requirements, just not below. The quick pace demanded can lead to breadth and lack of depth, unfortunately." In addition to standardized testing, the teacher survey portrayed contrasting views on elements and organization of projects. Across all disciplines, the duration and frequency of projects varied, indicating different manners of execution. In-class observations revealed an array of activities for projects, ranging from handouts to group collaboration on current events relative to the course's material.

From our findings, we have concluded the following:

1. Oakton's teachers and administrators exhibit strong collaboration which can be leveraged to further strengthen shared perceptions and values within the organization.
2. Integrating 21st century teaching within the mandates of standardized testing is generating faculty hesitance with innovation.
3. The skills promoted within the classrooms of Oakton High School are consistent with the concepts of 21st century teaching.
4. Upgraded technology would assist faculty in strengthening 21st century skills within their classrooms.

In order to provide Oakton High School with a better understanding in the areas of improvement, we recommended that the Oakton community:

1. Focus on the unification of diverse perceptions within the organization to further strengthen collaboration.
2. Emphasize techniques that incorporate standardized testing themes within 21st century teaching methods.
3. Promote awareness of the educational values that are widely shared throughout the school.
4. Begin upgrading the most utilized technological devices.

To continue easing Oakton with their transition towards 21st century innovation, one possible step could be to increase collaboration among all faculty and administrators through their diverse perceptions on institutional priorities, standardized testing, and project-oriented work. Research has shown that increased collaboration can be accomplished through open dialogue when all parties are present, as increased comfort with organizational change is far more successful when all stakeholders are involved in developing the goals and ideas of that change (Miller, 2003). This open dialogue could also aid in establishing a uniform understanding of the institution's ideals between educators and administrators.

With regards to the integration of 21st century pedagogies with standardized testing, we have recommended a few ways to promote teacher success and ease hesitation. For example, when designing a project, a teacher could focus on "embedding standardized test stems and

questions, making sure the project hits frequently targeted standards or learnings upon which the standardized tests are based, and only incorporating the project where it fits” (Miller, 2012). By utilizing these tips, a teacher can provide students with in-depth learning while also meeting state requirements. This will hopefully alleviate some of the stress and concerns faculty express towards standardized testing.

The awareness of shared values is important to Oakton’s implementation process as it could connect the skills teachers incorporate within their classroom to the learning outcomes of 21st century teaching and learning. To promote this aspect, Oakton could express shared values through announcements and cross disciplinary teacher collaboration and colloquia. The institution could also illuminate this commonality through a discovery exercise where teachers reflect on their goals for their students and correlate them to the learning outcomes of innovative teaching. A third party facilitator could orchestrate this discovery activity along with other relative topics centered around shared values in order to ensure honest perspectives.

Finally, we recommend that Oakton begins focusing on upgrading its most utilized technological devices, laptops and projectors. We found such an upgrade to be essential as technology is becoming more and more pertinent to not only 21st century pedagogies but also to students of this generation. A suggestion Oakton may consider is to explore grant options such as those of the Digital Wish Grants Foundation or the Technology Donors Program which would aid in funding new technology for teachers. Through these grants Oakton can slowly integrate technology in specific areas within its organization, thus providing a more collaborative and interactive environment for students.

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Chapter 1: Introduction

21st century teaching is an array of interactive and progressive pedagogical tools typically adopted by secondary and collegiate educational institutions. These techniques embody 21st century skills such as collaboration, critical thinking, creativity, communication, and digital literacy (Abbott, “21st Century Skills Definition”). The ideals behind 21st century teaching focus on the integration of real-world problems often presented through project-oriented assignments. As these methods gain attention in the field of modern education, they have become a guiding point for institutions aiming to better prepare their students for a more enriching future (Thomas, 2000). Many schools, such as Oakton High School (OHS), find themselves shifting to this model as they realize students within a curriculum based on 21st century principles, including project-based methods, acquire valuable skills and experience opportunities that can better prepare them for their future careers.

Oakton High School, located in Vienna, Virginia, is one of twenty-seven public high schools within Fairfax County and under the jurisdiction of the Virginia Department of Education (VDOE). The institution prided itself on achieving high academic achievement when using conventional teaching techniques. Some of these techniques include strategies for taking standardized tests, using lectures to present classroom topics, fostering classroom discussions, and developing reading comprehension. However, after realizing some of the limitations of traditional approaches, the OHS’s administration posed the question, “What does it mean to be an Oakton High School graduate?” From this single question, the institution began the process of creating a more collaborative and interactive environment for its students. Through the introduction of new teaching pedagogies, Oakton strives to cultivate students as “communicators, collaborators, ethical and global citizens, creative and critical thinkers, and goal-directed and resilient individuals” (Schools, 2014b).

Oakton High School has already started the process of expanding innovation within its curriculum. The institution began by sending a group of teachers and administrators to attend a conference hosted by the Buck Institute for Education (BIE), widely known for its work with 21st century teaching and learning. The conference promoted the benefits and outcomes of these pedagogies, specifically focusing on project-based learning (PBL). Following the conference, Oakton High School’s administration went on to promote the skills associated with 21st century

teaching and project-based learning as an effective foundation for innovation within the school. Since then, Oakton has been looking for places where innovation could further advance.

The goal of our project was to explore the utilization of 21st century teaching and learning within Oakton's current curriculum and identify areas of improvement in the innovation process.

To accomplish this goal we achieved the following objectives:

1. Identify where 21st century teaching has been integrated within Oakton High School
2. Accumulate data from other institutions where 21st century pedagogies have been implemented and assess which steps employed by these institutions were most effective for integration
3. Propose recommendations through a deliverable that examines the areas where innovation can be improved within Oakton High School

Upon completion of these objectives, resources and recommendations were given to Oakton faculty and administrators to assist in driving their innovation process forwards.

Chapter 2: Background

Implementing organization change within education is a challenging endeavor. It is important to understand the organization's interworking, the type of change the organization would like to make, and the effects this change could have. This chapter discusses background information of Oakton High School, OHS' instructional motivation, the ideals of 21st century pedagogies, and aspects of project-based learning. Furthermore, this chapter includes information on organization change and standardized testing. This chapter concludes with a set of case studies that examine organization behavior, the implementation process of 21st century teaching, and situations where innovation was successfully accomplished within a school setting.

2.1 Project Setting: Oakton High School's Progress

Oakton High School, located in Vienna, Virginia, educates ninth through twelfth grade students within Fairfax County. Fairfax is one of fourteen counties under Region 4 (Figure 1) of the Virginia Department of Education.

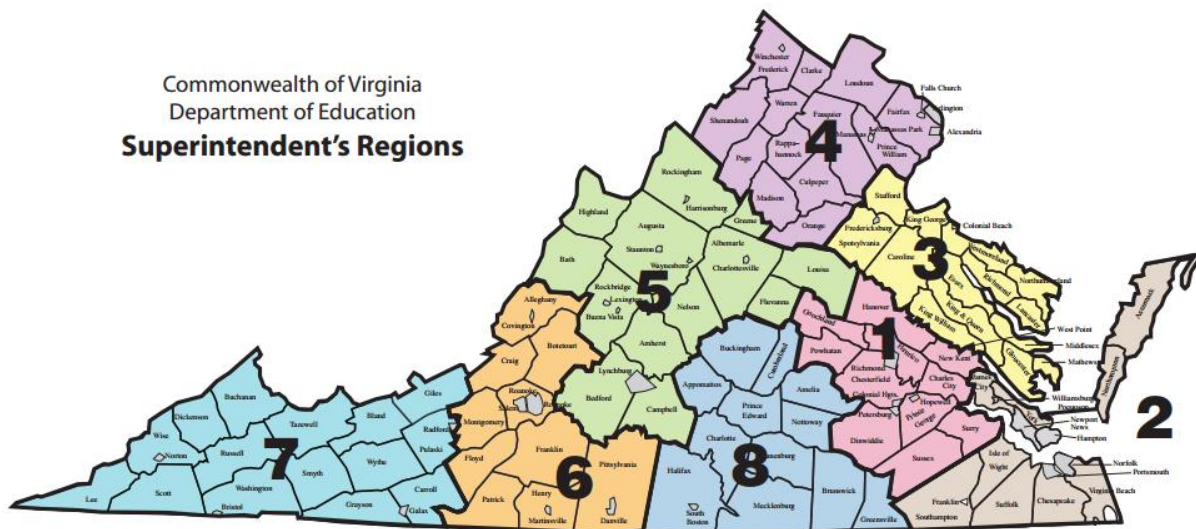


Figure 1 Commonwealth of Virginia Department of Education: Superintendent's Region

With a population of approximately 2,200 students, 58.52% Caucasian, 8.79% Hispanic, 4.58% African American, and 23.25% Asian (Schools, 2014b), Oakton educates a diverse body of students.

Oakton administrators and faculty began the process of innovating their teaching methods with the question; “What does it mean to be an Oakton High School graduate?” As described by the Fairfax County Public School System (FCPS), a graduate will have the necessary skills “for success... in this rapidly changing, increasingly diverse, and interconnected world” (Schools, 2014a) by being a “communicator, collaborator, ethical and global citizen, creative and critical thinker, and goal-directed and resilient individual” (Schools, 2014a). Oakton used the FCPS’s “Portrait of a Graduate” as well as ideas from teacher leaders to formulate their process of innovation. The institution received a license to explore innovative teaching techniques. This license allowed a group of teachers and administrators of Oakton High School to attend a conference hosted by the Buck Institute for Education. The conference promoted the benefits and outcomes of project-based learning. The administration of Oakton High School adopted 21st century methods and skills from project-based learning to build a foundation for innovation within their school.

2.2 Principles of 21st Century Teaching and Other Innovative Methods Relevant to Oakton High School

Since Oakton High School’s shift towards 21st century teaching, it is pertinent to understand the ideals and principles of this pedagogy and the tools used to foster innovation. Oakton faculty and administration has utilized one method of incorporating 21st century teaching through project-based learning and is continuing to explore other methods. Understanding 21st century teaching and project-based learning are vital for our assessment on Oakton’s current curriculum and are described in this section.

2.2.1 21st Century Teaching

Societal advancements towards globalization, technological diversity, and emphasis on hard science education have promoted the evolution of teaching (Saavedra & Opfer, 2012). This evolution sparked the creation of 21st century learning. “21st century learning is about dialectical interactions between theory and practice, individuals and communities, formal and informal learning, learners and meta-cognitive brokers” (Lee & Hung, 2012). 21st century learning provokes curiosity and thinking through the alignment of subject material with the interests of students using technology. This teaching method encompasses several pedagogies that enrich

student learning through a combination of in-depth inquiry, lower and higher levels of thinking, and collaboration.

From 21st century learning, students master content material and develop comprehensive skills that can be applied interchangeably throughout their careers. These skills have been a “component of human progress throughout history, from the development of early tools to agricultural advancements” (Rotherham & Willingham, 2009). Tony Wagner, author of *The Global Achievement Gap: Why Even Our Best Schools Don't Teach the New Survival Skills Our Children Need And What We Can Do About It*, believes the most important skills for today's learners are collaboration and leadership, critical thinking and problem solving, agility and adaptability, effective oral and written communication, initiative and entrepreneurialism, curiosity and imagination, and accessing and analyzing information (Wagner, 2009). These skills along with an array of others are referred as 21st century skills.

2.2.2 Project-Based Learning

Project-based learning is “a teaching technique in which students learn by doing, engaging in activities that lead to the creation of products based on their own experiences” (Ravitch, 2007) and focuses upon student-centered learning. The projects are often multi-disciplinary and carefully devised to make real-world connections.

According to the BIE there are eight essentials for the implementation of project-based learning within an institution's curriculum. Each essential serves its own purpose. The eight essentials are: significant content, a need to know, a driving question, student voice and choice, 21st century skills, inquiry and innovation, feedback and revision, publicly presented product (Larmer & Mergendoller, 2014). Through these aspects students are able to cater to their own independent learning styles (Edutopia, 2014), define the scope of their project, research independently and collaboratively, and investigate hypotheses. During the process students team up to find a possible solution to an open-ended question through research, prediction, analysis, and evaluation. Although PBL is very student-centered, teachers act as mentors throughout the process. As mentors, teachers advise students by “asking and refining questions, debating ideas, making predictions, designing plans, and collecting and analyzing data” (Coffey, 2014).

2.3 Oakton High School, Standardized Testing, and Projects

2.3.1 Virginia High Schools and Standardized Testing

Standardized testing mandates accountability on one hand and imposes certain constraints upon curriculum on the other. These constraints cause teachers to focus on covering information in the Standard of Learning (SOL) agenda, which is the minimum expectations a student should meet at the end of his or her year in the subjects of English, Mathematics, Science, and History.

To address the challenge of achieving success on standardized testing, Virginia schools explored the possibility of starting the school year earlier like neighboring Maryland and the District of Columbia. However, state legislation requires schools to follow the Kings Dominion Law which states that every Virginia public institution must commence its school year after Labor Day (Assembly). This law was challenged in 2012 by Governor Robert McDonnell on the argument that the law creates a disadvantage for students preparing for Advanced Placement (AP) exams. After consideration, the Virginia Senate ruled in favor of the Kings Dominion Law as beginning a school year prior to the holiday weekend “would hurt the industry at a time when it could ill afford to lose revenue” (Vozzella, 2012). Since the unsuccessful attempt of starting the school year earlier to help teachers prepare students for the SOL and AP exams, Oakton has been looking for a strategy to combine innovating teaching with standardized testing.

2.3.2 Project-Based Learning and Standardized Testing

Andrew Miller, an educational consultant and online educator, wrote *PBL and Standardized Tests? It Can Work!* an article that emphasizes merging standardized testing with teaching methods in PBL. He stated “PBL’s intent is to drive new learning, to engage students in learning critical content that is leveraged and tested” (Miller, 2012). Miller urged teachers to make the push forward in incorporating the values of project-based learning rather than ‘waiting till testing season is over’, a common response he received. He reasoned that “...tests will keep happening. Whether a yearly course assessment, a six-week benchmark exam or a state-level competency test, teachers and students are inundated with testing” (Miller, 2012) and that “If you say this, you are defeating the purpose of PBL” (Miller, 2012). Miller offered a few tips; the first focused on classroom learning targets and expressed that “when you design a PBL project, make

sure it hits those frequently targeted standards or learnings [of which the standardized tests are based on]" (Miller, 2012). An example would be:

“If you know Linear Equations are tested the most often or weighted more in the state test, then use PBL to ensure that students walk away not only knowing their linear equations inside out, but also being able to think critically and make relevant connections” (Miller, 2012).

Miller’s second tip presented the idea of embedding test determinants and questions into a PBL project. By fusing these test criteria with project-based learning, Miller believes that the test question can either be used in the project or to inspire project ideas (Miller, 2012).

Miller advised the emphasis of educators incorporating PBL where they see fit. He shared that “we’ve all been in that place of ‘trying too hard’ to make the project work” (Miller, 2012) and not to “try to fit a square peg through a round hole” (Miller, 2012). With this, Miller concluded that educators should utilize established structures and find opportunities for in-depth inquiry through project-based learning instead of forcing PBL where it does not fit. Overall if institutions begin to transition to project-based teaching, faculty should not let the pressures of standardized testing hold them back from providing what they know works best for students. Through proper embedment and a suitable framework teachers can engage students with authentic work.

2.4 Organizational Behavior in the Face of Change

2.4.1 Organizational Dimensions

Before an organizational change, it is essential for institutions to consider all aspects and the effects of the change on the organization. An organization can be defined by twelve dimensions according to W. Warner Burke of Columbia University and George Litwin of The Graduate Center. These twelve elements refer to Burke’s and Litwin’s model of organizational

performance and change (Figure 2).

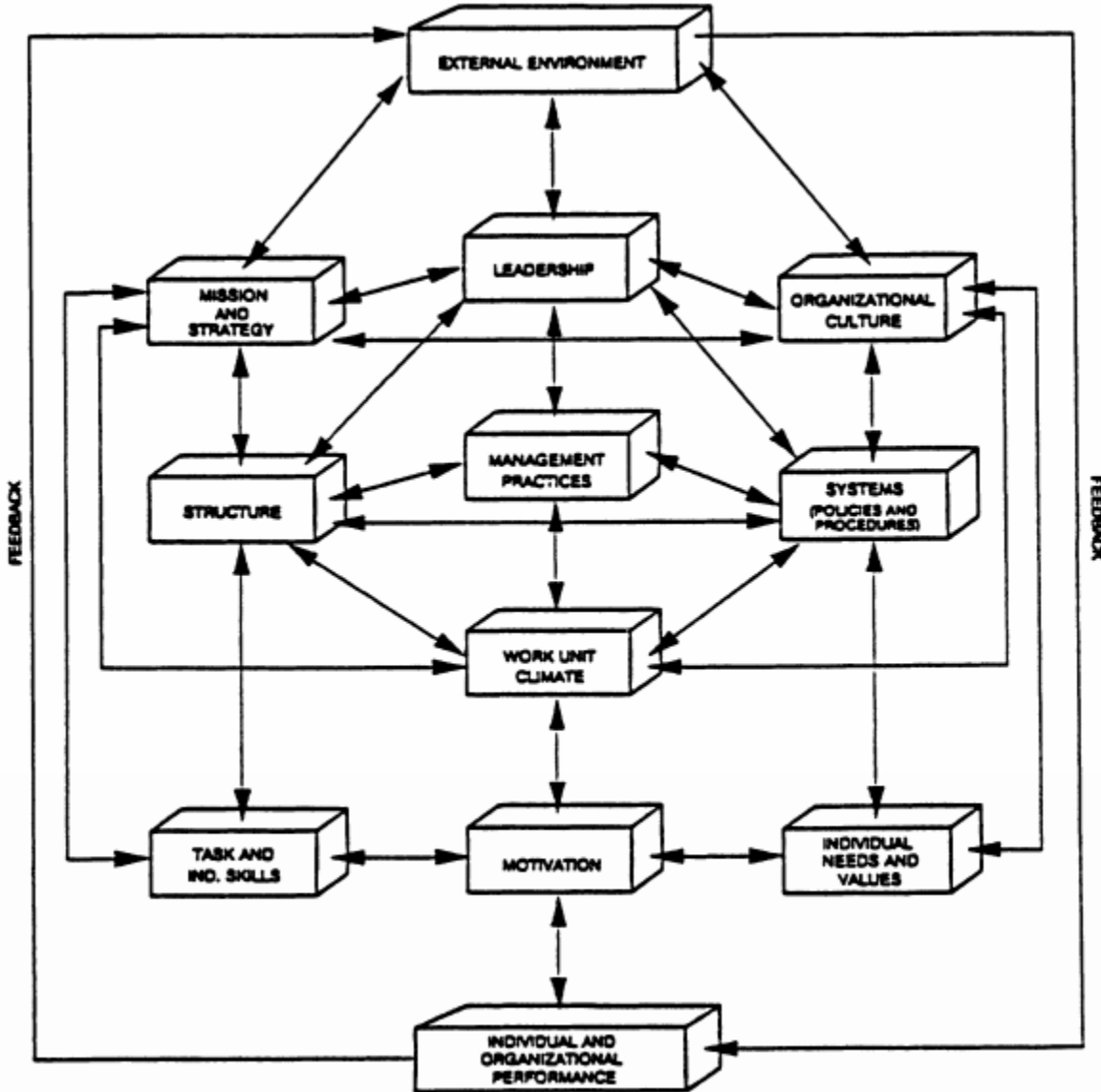


Figure 2 Burke & Litwin Model of Organizational Performance and Change

This model represents organizational relationships on “how performance is affected by internal and external factors. It provides a framework to assess organizational and environmental dimensions that are keys to successful change” (“A Causal Model of Organizational Performance & Change (Burke & Litwin Model),” 2014). The Burke and Litwin model blends both the climate and culture of an organization. Climate is the perceptions individuals possess, while culture refers to the values and beliefs individuals have developed. Within the model, the ‘External Environment’ refers to the input that is connected to the various aspects of an

organization. This relationship ends with a feedback loop that relates the input to the output, ‘Individual and Organizational Performance’. This feedback loop is bidirectional and represents a direct relationship between external factors and performance.

The Burke and Litwin model is divided into two distinct dynamics, transformational and transactional. Transformational represents the relationship between mission and strategy, leadership, organizational culture, individual and organizational performance, and external environment (Figure 3).

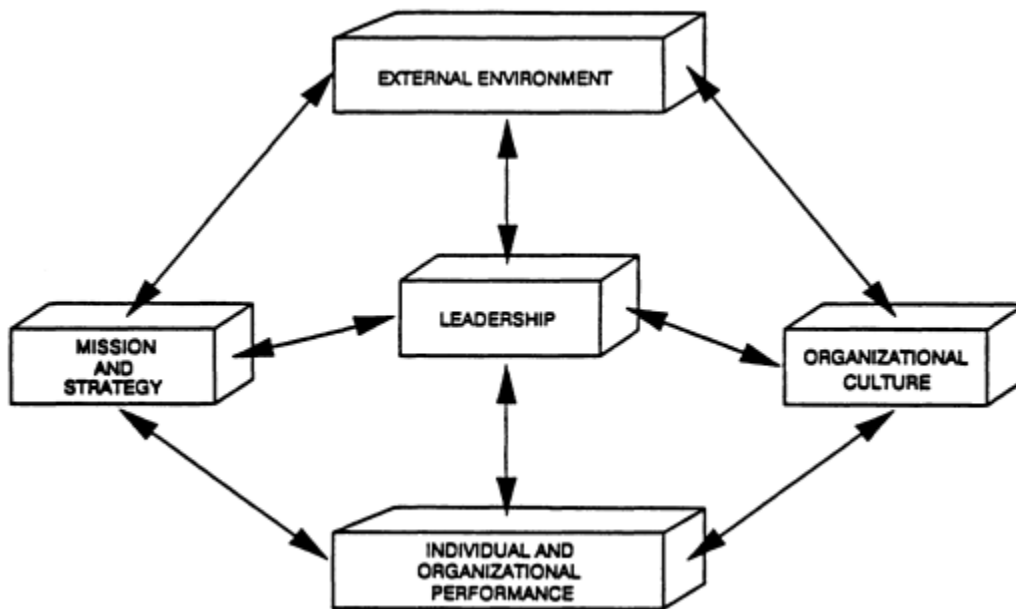


Figure 3 Transformational Dynamic of Burke & Litwin Model

During organizational change, these aspects require a new set of behavior or approach as they are all influenced by the output. It summarizes the cultural impact a change may have with respect to the other dimensions of this dynamic. The transformational dynamic emphasizes the organization as a whole. Conversely transactional elements (Figure 4) represents variables personifying climate in terms of reciprocal gain. These elements personifies qualities individuals within an organization may be affected by or how these individuals can affect change.

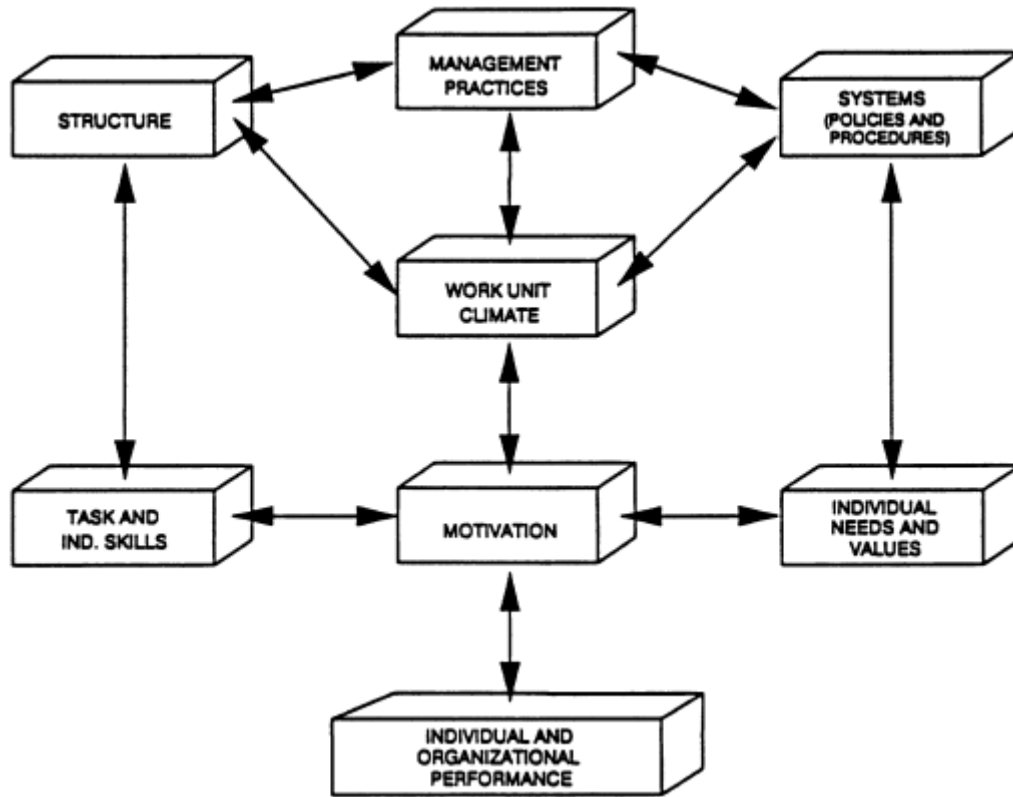


Figure 4 Transactional Dynamic of Burke & Litwin Model

Through these dynamics, climate and culture are essential to understanding and approaching organizational change as the success of one is dependent on the other. Burke and Litwin believe that “for major organizational change to occur, the top transformational boxes represent the primary and significant levels for that change” (“A Causal Model of Organizational Performance & Change (Burke & Litwin Model),” 2014).

2.4.2 Organizational Behavior

Understanding how the organization functions and what the change will do are key to our project. Organizational culture refers to “the patterns of beliefs, values, and learned ways of coping with experience that have developed during the course of an organization’s history, and which tend to be manifested in its material arrangements and in the behaviors of its members” (Sun, 2008). Within organizational culture there are four perceptions of culture: learned entity, belief system, strategy, and mental programming. The learned entity of organizational culture emphasizes how individuals behave. The behavior of an individual is rooted within their belief system. The belief system then defines standards and rules for individuals to use when

determining actions. Similarly, these four perceptions of culture can be seen through organizations as a whole. Because values and beliefs affect decision making, the strategies or changes developed by an organization should be viewed as a cultural change that may affect areas within an institution. As a perception of mental programming, the culture of an organization can result in ritualistic routines and structure that may dictate attitudes towards change. Because routines can influence socialization of group members, innovation, and decision making, there is a direct correlation between habitual actions and organizational performance (Johnson Jr. & Fauske, 2005). Overall, organizational culture is driven by shared values between individuals and the organization which in turn affects reactions to organizational change.

Shared values are the focal point of an organizational dynamics model, 7S Framework. This model was founded by Tom Peters and Robert Walters consultants of McKinsey & Company ("The McKinsey 7S Framework: Ensuring That All Parts of Your Organization Work in Harmony," 2014) and was used to develop the Burke and Litwin model mentioned previously. The 7S Framework diagrams the relationship of seven key aspects of an organization (Figure 5).

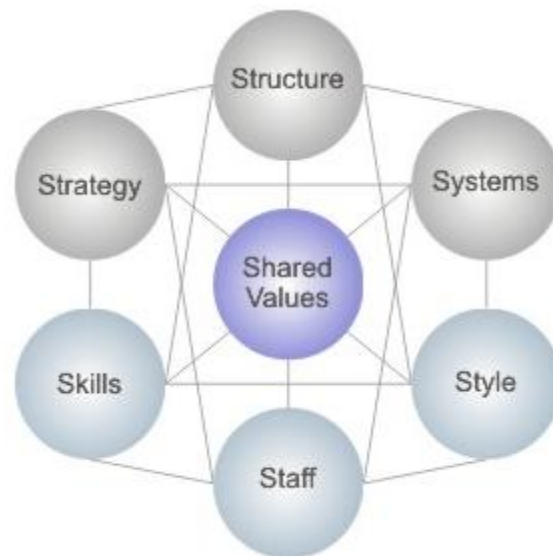


Figure 5 7S Framework

This model can be used to address a variety of situations including performance, implementation of new methods, and inter-organization alignment. The model can also be used to identify organizational patterns which are highlighted through the relationships each element has with each other.

The seven elements can be categorized into two types: hard or soft. Hard elements include strategy, structure, and systems which are easily measurable when compared to soft elements. Soft elements are more difficult to define and assess as they are qualitative aspects of an organization that are dependent on personal aspirations. The soft elements are shared values, skills, style, and staff. Because the model represents a dependent relationship amongst all seven elements, the change or neglect of an aspect can have varying effects on other elements. During organizational change the alignment of all elements especially the shared values amongst individuals and the organization is key.

2.4.3 Maslow's Theory of Need

Abraham Maslow, one of the founders of humanistic psychology, developed extensive knowledge on human behavior and need that resulted in his theory of a hierarchy of needs.

Maslow's theory states:

- “Each individual's needs must be satisfied at the lower levels before they progress to the higher, more complex levels.
- When low-level needs are satisfied, individuals are no longer motivated by them.
- As each level of need is met, individuals progress to higher level motivators.
- All the needs are always present.” (Harrington, 2008)

The theory of hierarchy need provides a basis of the needs an organization should consider prior to an organizational change. These needs are primarily described on a physical and emotional scale, which can be adapted toward the needs of Oakton. Through the illustration of hierarchal requirements of an organization, an adapted model (Figure 6) is as follows:

1. Purpose & Mission (Lowest Level)
2. Culture & Relationships (Second Lowest Level)
3. Policies & Structure (Middle Level)
4. Instruction & Assessment (Second Highest Level)
5. Student Achievement (Highest Level)



Figure 6 Adapted Maslow's Hierarchy of Need for OHS

From previous research conducted by Oakton High School, the first two levels, identifying the purpose for their innovation and cultivating relations between individuals within their department, have been met.

2.5 Comparative Case Studies

The following case studies contain information on: overcoming resistance to change, alternative approaches to teaching, learning and assessing mathematics, Sammamish High School, and team-teaching models for practicing project-based learning in high school. These studies emphasize areas of knowledge we will draw from throughout our paper.

Study 1: Overcoming Resistance to Change.

Darcy Miller and Tariq Akmal, professors of Washington State University, studied the process of revision and renewal in an American University's secondary education teacher-preparation program (STPP). Their study focused on administrative and individual responses toward resistance to change in higher education (Akmal, T. & Miller 2004). The focus on administrative and individual responses were important because it illustrated strategies to overcome resistance in an educational setting. This opposition is similar to Oakton High School's current situation. Miller and Akmal used a descriptive case study model emphasizing the "how, what, and why" of change and renewal (Akmal, T. & Miller 2004). The professors

used interviews, observations, and documented reviews obtained before beginning their study (Akmal, T. & Miller 2004).

The American University Miller and Akmal studied was starting a four-phased renewal and revision process meant to completely change the curriculum for students within the STPP. The four phase program was developed by faculty within the program. The faculty broke down into two distinct sections: content area faculty and department faculty. Together they developed four phases: an educative phase, a collaborative construction phase, a summative phase, and a recursive phase (Akmal, T. & Miller 2004). The faculty strived to design these phases to educate all the faculty, enhance cross-discipline collaboration, and allow for constant revision and examination of the program (Akmal, T. & Miller 2004).

The educative phase focused intently on the building of awareness for all faculty involved with the project. Miller discovered that awareness of the reform was most needed by the teacher found within the content area faculty. Through constant educational conferences and presentations the necessity for change was accepted. This allowed for progressive discussions of “how” to operate the change (Akmal, T. & Miller 2004). The next phase dealt with collaboration and construction. This phase focused on collaboration between faculties across multiple disciplines to design different models of teacher preparation. Through discussion and evaluation eight models were submitted at the end of the collaborative-construction phase. In the summative phase one of the eight models would be chosen for implementation. By choosing one model, it eased the approval progress within the university (Akmal, T. & Miller 2004). Through this phase the faculty created a full curriculum for students to follow that promoted their new ideals towards education. Finally, the last phase was an ongoing recursive phase that allows the faculty to evaluate the effectiveness of the program on students (Akmal, T. & Miller 2004).

During all four phases they witnessed pockets of resistance throughout the faculty. Dual responsibility over the students created conflict over who was in control of the subjects. This issue was resolved only when the department chair stepped in to compromise, reminding both ends of their importance to student development. However, through the conflict over control awoke a deeper issue about mistrust of the College of Education. Content area faculty opposed any changes by the College of Education because of this mistrust. Halting the renewal effort, the department faculty and content area faculty had to agree on the necessity of programmatic change (Akmal, T. & Miller 2004). Support was only gained once the content area faculty

“understood that state education reform forced them to change and that they did not have a clear grasp of what was expected” (Akmal, T. & Miller 2004, p. 417). Once both sides formed a working relationship the opposition turned into constructive decision-making. Miller stated “we did not intend to provide a specific strategy to follow in the restructuring of undergraduate teachers’ preparation program.” (Akmal, T. & Miller 2004, p. 419). Miller and Akmal did intend however, to provide insight to organizations trying to perform an effort to renew their system. Miller and Akmal illustrated techniques around resistance to change, which can be applied to Oakton’s curriculum change. Through these techniques we can produce our own strategies around the resistance facing Oakton High School.

Study 2: Alternative Approaches to Teaching, Learning and Assessing Mathematics

Jo Boaler, a mathematics professor at Stanford Graduate School of Education, studied the effectiveness of two different models of teaching mathematics within the English school system. Her hypothesis was that the formalization of the mathematical curriculum was lowering the effectiveness of a student’s capabilities in real-world experiences. Boaler devised a three-year experiment to evaluate “the effectiveness of traditional teaching compared to progressive teaching” (Boaler, 1998). She also planned to use the reflections of the students regarding their knowledge both in and out of the school setting. She described traditional mathematical teaching in England as “commonly consisting of a teacher demonstrating abstract mathematical procedures at the front of class, followed by students practicing the procedure in short, textbook questions” (Boaler, 1998). Education systems similar to the one Boaler described, began to promote a variety of approaches in teaching. The variation of teaching permitted students to learn standard procedures in an abstract decontextualized way (Boaler, 1998). Boaler believed this method would encourage the use of what was learned within a school setting on problems encountered outside of the classroom.

The study evaluated students from two different schools, Amber Hill School and Phoenix Park School. The students were monitored from year nine through year eleven. This time period was chosen because students from both institutions received the same mathematics background for years seven and eight. During year nine the implementation of very different teaching structures were incorporated. In one institution, students were taught in a very formal manner

while the other students followed a project-based model. Boaler explained that “both schools were situated in mainly white, working class areas and there were no significant differences in the cohorts of students in term of sex, ethnicity or social class” (Boaler, 1998). Amber Hill School’s group for Boaler’s experiment contained approximately 200 students while Phoenix Park’s experimental group contained 110. Over this three-year study, Boaler observed numerous one-hour lessons from each institution, interviewed teachers at the beginning and end of her study, and sampled student responses each year of their education. Most importantly however, Boaler assigned mathematical assessments to gather student understanding of the material.

These assessments varied between applied tasks and short written tests. The tests were then compared viewing individual performance on the applied activity with the performances on a written test. Similarly, a long-term learning outcome was obtained by the orchestration of various testing parameters that illustrated the project-based learning curriculum allowed for students to retain their knowledge of mathematics for longer periods of time compared to the traditional learning technique. However, the traditional learning technique did promote the learning of more material because students could acquire knowledge and quickly memorize it for an examination before moving on to other topics.

Boaler’s research is critical to our understanding. Her assessment that project-based learning can be a beneficial approach to teaching illustrates that, when done correctly, project-based methods can be “central to the development of ‘real world’ capabilities, amongst researchers, as well as industrialists” (Boaler, 1998).

Study 3: Sammamish High School

Sammamish High School is a public school located in Bellevue, WA. The school is currently in the transition of transforming the school into a 21st century-based institution through the implementation of project-based learning within the curriculum. In 2010, Sammamish High School applied for an Investing in Innovation (i3) grant from the Department of Education and went to acquire the grant later that same year. This grant allowed the school to move towards a more interactive learning experience through PBL and gave teachers the motivation to uphold a better learning environment for their students. Sammamish teachers wanted their students to be passionate about the work they were accomplishing. With this in mind, faculty members went on to develop new ways to connect subject material to their students' interests.

Tom Duenwald, principal of Sammamish High School, has experienced the school's transformation so far and stated, "High schools have been very resistant to change" (Edutopia, 2013). Duenwald wanted to overcome this challenge with the intention to change over 30 courses, which would affect over 70 teachers (Edutopia, 2014). The administration of Sammamish went on to devise different strategies to ease this transition of shifting to a more innovative practice. The school offered a five day summer seminar before the start of the academic year to help teachers understand PBL, teach them how to engage students in projects, and explain to them on how to define a project. During the academic year, teachers met weekly to discuss different projects they could use to assess their students, how project-based learning could be utilized within their classroom environment through examples, and how to implement the pedagogical tool. In addition to the weekly meetings, teachers were also given the opportunity to design projects for their courses at the end of the school day. These projects were based on how they perceived PBL's applicability within their discipline. Once a week students were released a class period early in order to provide teachers with this window. During these sessions faculty members collaborated to assess how projects could incorporate multiple disciplines and teachings.

For example, after working with project-based learning, Alicia Kallay, a pro-PBL English teacher, believed the English department struggles "to find a way to inject PBL" while keeping the study of literature (Edutopia, 2014). As a result, a group of instructors gathered to find the best possible solution. Kallay knew that a different approach was needed to engage classroom text other than the traditional essay. Before, students would just read a novel; however, the English department brainstormed the idea to instead have them examine the literature through the eyes of the author. Teachers took this concept and with it incorporated PBL through a project about Elie Wiesel's, *Night*. For the project teachers asked students to explore the consequences of remaining quiet during the Holocaust and to find other groups or individuals that were silenced in some way. Below is an account from a student who experienced project-based learning in one of these classes:

"I think using PBL in English class or any other class really kind of changes your perspective on what that subject is and what that subject entails. You really see how the subjects you are learning at 15 years old, how you can use them for your future and for the rest of your life." (Edutopia, 2014).

Similar to the English Department, the Mathematics Department had trouble grasping project-based learning and how to incorporate it within classroom teachings. The department met to discuss their success and failure with PBL and the steps they could take to apply the pedagogical method more effectively. As the meeting concluded, the mathematics teachers realized that every subject will need their own approach in order to allow for good project-based learning. They also realized that if a universal approach across all disciplines would not be feasible as each subject has specific content to cover. From this, their impressions of PBL were quite positive as they knew this practice is used to help engage students who would not otherwise participate. In their observations teachers noticed that students who had trouble with the material taught, learned more through PBL. A teacher recounts that “especially in science and math... the subject can get a bit overwhelming and that’s why” projects are favorable as they go a step at a time (Edutopia, 2013)

Based on the numerous ways PBL had been implemented within Sammamish’s curriculum students seemed to have acquired an overall positive response to this practice. Some students said that project-based learning is a good tool. For example, when asked about project-based learning a student stated,

“At first I thought project-based learning was a plan by the government to increase the class sizes so one teacher could teach more students. But after I worked with it I realized it was a way for students to connect with the material and understand the material in our own way” (Edutopia, 2013).

In addition, these students believed that tests were not the best way to apply what they learned because many of them would memorize and forget the material. Some students believed that the application of their knowledge through PBL helped them retain more information than Sammamish’s previous teaching methods. However, there remained a part of the student population that felt indifferent toward PBL. Due to these students’ feelings, teachers brainstormed ideas to assist in promoting a more positive attitude towards PBL. One idea was to have students analyze a condensed version of a real-world problem currently being assessed. After completing their project, a professional in a related field would then evaluate the students’ presentation and present them critiques.

Overall, Sammamish High School has been working progressively to implement project-based learning given the time sensitivity of the Investing in Innovation (i3) grant. The institution is providing teachers with the necessary time and professional development they need in order to continue working successfully. Teachers are working together to brainstorm ideas and come up with strategies to implement PBL in places where it was thought to be challenging. Based on the opinions of students and Sammamish statistics it seemed to show that overall, project-based learning is working. Statistically, there has been a 15% increase in students passing a reading proficiency exam, as well as a 118% increase of students passing the algebra 2 final exam.

Study 4: A Team-Teaching Model for Practicing Project-Based Learning in High School: Collaboration between Computer and Subject Teachers

Ling-Chian Chang, a graduate from the Graduate Institute of Information and Computer Education of National Taiwan Normal University, and Greg Lee, professor from the Department of Computer Science and Information Engineering of National Taiwan Normal University, conducted a two-year study in a Taiwanese high school to test the feasibility of project-based learning. Because of the National Subject-Competency Test (NSCT) many Asian education systems including Taiwan have an intense test-driven learning environment (Chang & Lee, 2010). The National Subject-Competency Test is the determining factor of what universities high school graduates may attend; similar to the Scholastic Aptitude Test (SAT). Unlike the previous methods the institution has seen, PBL promotes interactive learners through exploration and self-motivation. Chang and Lee explored PBL within the high school through team-teaching which “involves two or more teachers sharing teaching expertise in the classroom and engaging in reflective dialogue with each other” (Chang & Lee, 2010). This approach has many advantages as it gives teachers the opportunity to collaborate, gain multiple perspectives, and reduces the amount of redundancy (Chang & Lee, 2010). The study observed first year students (10th grade) and had a computer science teacher with previous PBL experience working with non-PBL geography and English teachers. Through these teachers, Chang and Lee hoped to answer “how feasible and effective is the proposed team-teaching model under the current test-driven educational environment” and “how do the participants of the study, both the teachers and the students, embrace PBL in terms of continuing participation in future classes” (Chang & Lee, 2010).

Through the team-teaching model, the computer science (CS) teacher laid the foundation to project-based learning during the first year of the study. The CS teacher taught all the students the basic content of the course prior to assigning various group projects. Once the foundation was established, projects were incorporated into the class. These projects provoked students' interest and resulted in the development of fundamental research skills, how to utilize search engines and Microsoft applications, and how to write a final report. After the conclusion of the first year, Chang and Lee established a controlled and experimental group of students for both the geography and English teachers. The groups contained the same number of students, 89 geography students and 42 English students, but were taught differently. The control group was taught using traditional teaching methods while the experimental group was taught through project-based learning. With the expertise of the CS teacher, the English and geography teachers devised their lesson plans to ensure that the students would cover the same content of the course. Because these students experienced projects during their first year computer science course, the English and geography teachers could ease into the year using technology and projects for their experimental group.

At the conclusion of the study, Chang and Lee interviewed and surveyed the students, interviewed the teachers, and compared assessment results. From the survey results, Chang and Lee found that student participation was higher (74% of English students and 51% of geography students) and very few students disapproved using project-based learning activities in the future (Chang & Lee, 2010). The student interviews found that those who experienced PBL learned more than they have previously with lecture and textbook based classes. They also found that students enjoyed learning the material through finding the information for themselves and thought it was easier because they knew what to do from the computer science class. From the teachers' perspective, they believed that project-based learning was successful, but the execution required revision (Chang & Lee, 2010). Because the computer science teacher built the foundation of PBL with the students, it required additional time to teach the students how to find reliable resources and write final reports. The English and geography teachers felt that project-based learning enhanced student learning and saw students retaining more information. Both teachers found PBL easy to implement because students had previous knowledge on how to approach projects and how to use resources.

Overall the study showed positive reactions from both students and teachers with no PBL experience and showed the feasibility of project-based learning in a very test-driven learning environment. Although the study was successful and showed significantly higher test scores, recommendations for further research were suggested especially for the first year PBL experience. For example increase the involvement of the English teacher during the first year because students struggled with finding reliable resources and writing the final report. Chang's and Lee's study on project-based learning through a team-teaching approach is significant to our research because it provides evidence that teacher collaboration aides the implementation of PBL within an institution and project-based learning is feasible in a test-driven learning environment. The study also demonstrates the ability to successfully implement PBL with no prior background. The findings of this study aides our understanding of different implementation approaches and provides a possible solution to overcoming roadblocks teachers face when asked to incorporate project-based learning into their classrooms.

Chapter 3: Methodology

The goal of this project was to explore the utilization of 21st century teaching and learning within Oakton High School's current curriculum. Our objectives were:

1. Identify where 21st century teaching has been integrated within Oakton High School
2. Accumulate data from other institutions where 21st century pedagogies have been implemented and assess which steps employed by these institutions were most effective for integration
3. Propose recommendations through a deliverable that examines the areas where innovation can be improved within Oakton High School

This chapter presents the techniques we used to collect data.

3.1 Objective 1: Identify the Integration of 21st Century Teaching

Our first objective was to identify the integration of 21st century teaching within Oakton's current curriculum. To do this, we conducted in-class observations, open-ended interviews, and online surveys with the teachers of Oakton High School. Our observational studies intended to observe both the students and teachers within their classrooms, focusing on the teachers' methods of teaching as well as the students' responses to the material. Each of us observed eight courses within separate grade levels in order to gain a deeper understanding of the correlation between different grade levels and their exposure to 21st century teaching. This gave us a total of thirty-two classroom observations. Once in the classroom, we observed the following:

- Language and behavior of each student
- How students were situated within the classroom
- Student attitude towards the teacher and subject
- Moments of disconnect when a student halts attention to the teacher (i.e. cellular phone usage, window gazing, etc.)

Observations were then recorded in notebooks by each observer, formatted in a way that suited personal preference. Any assignments or assessments given to the students were also taken by

the observer for further comprehension of teacher expectations and teaching styles. The observations were then discussed by all project members to detect trends seen in student behaviors within the classroom (O'Brien, M, 2010). Throughout this time we worked and consulted with students on their thoughts and feelings towards their courses, too. The responses we obtained from students were not documented. However, they were utilized to reflect upon as a way to further understand what it was like to be an Oakton High School student. While our in-class observations provided a good source for data, it would have been more beneficial if we had an extended timeframe. The observations we made took place during the end of the term which may or may not have had an effect on our results.

Our second method of gathering data was open-ended interviews. We randomly interviewed two teachers from each discipline for a total of fourteen interviews. Through this method we gathered a deeper comprehension of faculty emotions with regards to 21st century teaching. We chose open-ended interviews because “even though the questions can be scripted, the interviewer usually doesn't know what the contents of the response will be” and “they focus more on the participant's thoughts, feelings, experiences, knowledge, skills, ideas and preferences” (Thibodeaux, 2014). The interviews were also semi-constructive, meaning that “the interviewer uses a general outline of issues or questions, but can use other questions generated spontaneously or go to other topics based on the responses of the participant” (Thibodeaux, 2014). This provided us with the ability to guide the interview while still allowing teachers to speak freely. Interview questions (Appendix B) were carefully devised to reflect our interview objectives. The objectives for the interviews were to understand a teacher's personal conception of what allows and inhibits the utilization of new educational techniques, such as project-based learning, within a classroom. Questions such as, "What are the three most significant skills you promote within your classroom?" and "What teaching style do you believe is best in aiding the future of students, and why?" were asked. These questions aided our understanding of teacher's impression of new teaching methods and helped us identify areas of further research. Overall, these interviews revealed insightful knowledge the adversities teachers faced from the hardships expressed. Using this data, we researched other institutions that have implemented 21st century methods and compared these situations with that of Oakton.

Our final method of gathering information was through an online survey which was distributed to Oakton teachers. According to the National Science Foundation, surveys are “an

efficient method for systematically collecting data from a broad spectrum of individuals and educational settings” (Schutt, 2011, p.160). The survey was generated through Qualtrics, an online survey software that allows users to easily gather and organize survey feedback. Survey questions (Appendix E) consisted of a variety of questions that touched upon themes such as standardized testing, technology, and 21st century skills. Through this method a greater assessment on teachers’ perceptions and workload was gained. The purpose of the survey was to obtain information on areas we identified as possible obstacles teachers faced during our interviews. The survey was also used to identify trends with respect to different teacher demographics. Additionally, previously obtained data through interviews and classroom observations were utilized to assist in identifying these trends. Specific demographics were also processed to understand how teachers were affected by certain criteria such as years as an educational professional and years worked at Oakton High School. Through these surveys allowed for data to be collected from a larger pool of people that we could not achieve solely through observations and interviews.

3.2 Objective 2: Accumulate and Utilize Outside Data

Our second objective was to accumulate data from other institutions where 21st century pedagogies have been implemented and assess which steps employed by these institutions were most effective for integration (Appendix G). From these consultations, we looked for how institutions implemented 21st century methods, the obstacles those institutions faced, and what measures they took to address their challenges. To do this, we performed an initial search of 21st century high schools and researched background information on each. This background information provided us with the following data:

- Type of institution (teaching methods)
- How long the institution had been implementing 21st century methods
- What actions the institution took to incorporate these methods within its school

We then chose potential candidates and eliminated the rest. Institutions were eliminated based on if it was a charter or private high school, intended to become a complete 21st century institution, and/or had less than two years of experience with 21st century teaching and learning.

Before contacting institutions, we researched as much additional information pertaining to the institution's curriculum, progress and accomplishments with innovation, and intentions with 21st century pedagogies. We also extracted information from our interviews with Oakton High School teachers to pinpoint areas for discussion. During the interviews we confirmed basic information about the institution to ensure accuracy and followed with questions about the common hardships they faced with innovation and how they overcame them. Overall, these interviews gave us pertinent information about overcoming obstacles and addressing concerns of respective parties.

Once these interviews were completed, we extracted the information we found and categorized the data by the type of challenge faced, how the challenge was addressed, how long it took to see the results, and if the solution resolved the situation successfully. Based on our observational studies and interviews with the OHS faculty, an assessment was done to determine the plausibility of other institutions' solutions within Oakton High School. Through our research, we learned about 21st century method-innovation experiences and formulated strategies for Oakton to perform.

3.3 Objective 3: Propose Recommendations

Our third objective was to propose recommendations through a deliverable that examines the areas where innovation can be improved within Oakton High School. In order to create this deliverable, we compared our data with the data of other institutions facing similar challenges with the implementation of 21st century pedagogies. We then analyzed the steps utilized by outside institutions in overcoming the challenges they faced. With a strategic plan, these measures can be used to alleviate discrepancies towards 21st century teaching and learning within Oakton.

Chapter 4: Findings

In this chapter we provided the major findings we collected from data on prior surveys conducted by Oakton’s administration, our observational studies of teachers and students, our interviews of faculty, and our own survey of faculty. These findings were based around the following themes:

1. Collaboration and Perceptions
2. The Integration of 21st Century Teaching with Standardized Testing
3. 21st Century Skills
4. Technology

4.1 Collaboration and Perceptions

Analyzing previous data provided by Oakton, we discovered strong collaboration within individual departments. Figure 7 shows the distribution of comfort levels in regards to collaboration within departments, with other departments, and with administrators.

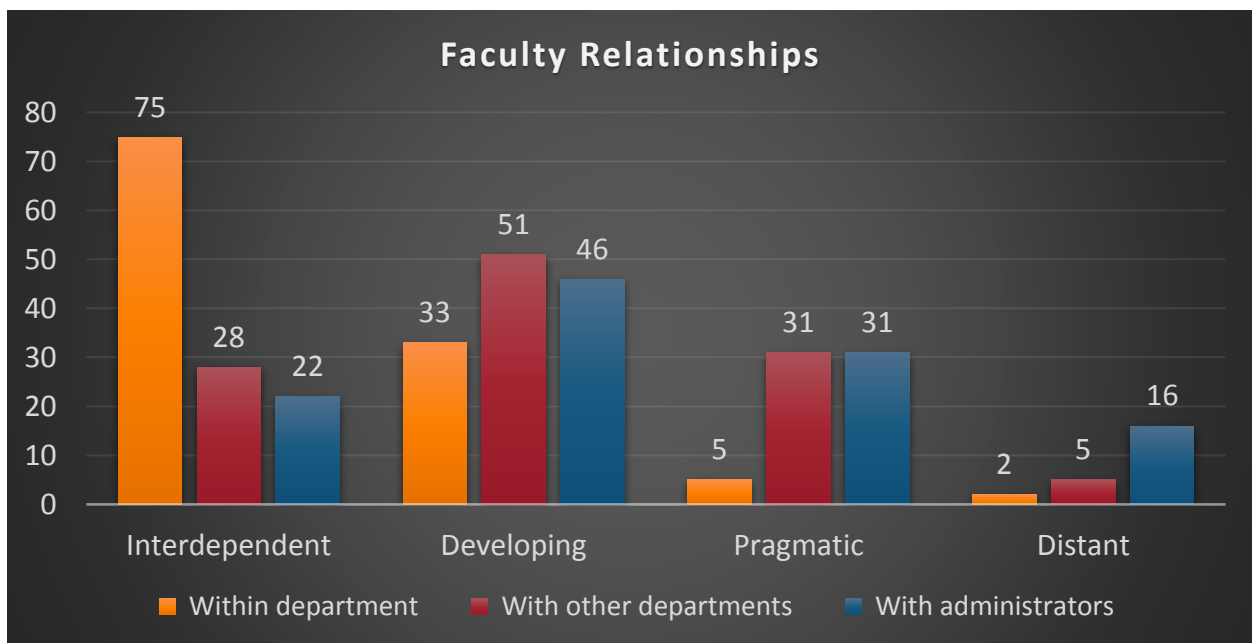


Figure 7 Faculty Relationships

The breakdown of comfort levels is as follows:

- **Interdependent:** I consistently work hand-in-hand with... to benefit student learning,
- **Developing:** I willingly engage with... to benefit student learning,
- **Pragmatic:** I engage with... when required,
- **Distant:** I do not interact much with...

Based on the 2014-2015 OHS Baseline Data Survey 94% of the teachers consistently or willingly engaged within their department, 69% of the teachers with other departments, and 59% with administrators. When identifying locations where innovation could be improved, we prioritized furthering the collaboration efforts between departments and administrators. We identified two locations that could further assist the collaboration process.

From our survey responses we found that there were shared perceptions on the elements that structure a project between different subjects. We found that 56% of teachers stated that projects were group assignments. This similar definition was shared evenly between five subjects: English, ESOL, Social Studies, Career & Technical Education, and Special Education. Additionally, 27% of teachers identified projects as individual assignments and 17% defined projects as both individual and group assignments. These definitions appeared within the Special Education, Social Studies, and Science departments. Furthermore, from every department, teachers required that projects consist of some aspect of 21st century teaching. We identified these shared values as locations for collaboration that could be further strengthen among teachers of different departments.

Another aspect we established as a location of possible collaboration was the attitudes towards the proper length of a project (Figure 8). Survey results showed that one week and one month were the most popular durations of a project.

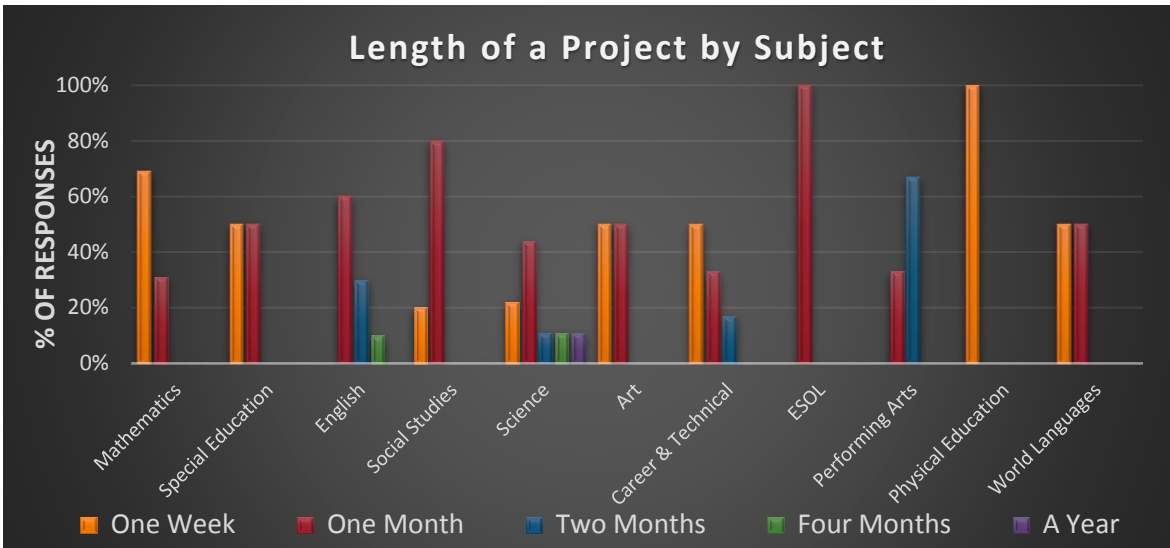


Figure 8 Length of a Project by Subject

Equally, project frequency could be another location of collaboration. Figure 9 illustrates the responses on project frequency.

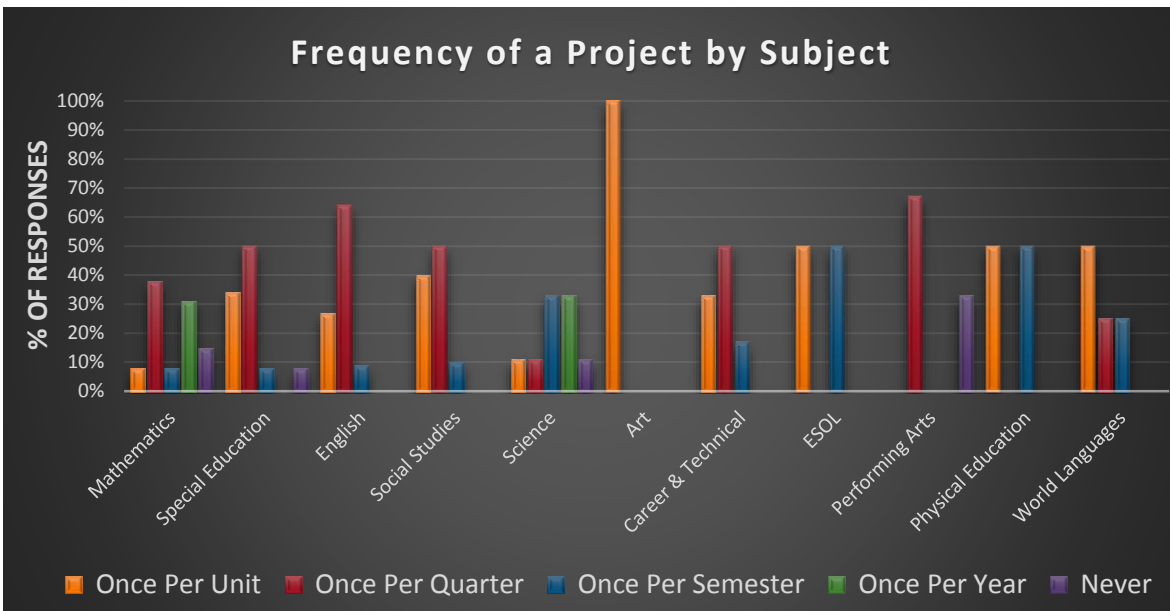


Figure 9 Frequency of a Project by Subject

Finally, from the 2014-2015 OHS Baseline Data Survey, we identified some shared values between teachers. Faculty were asked to choose their top two topics of interest for professional learning. Out of thirteen themes, three of the top four chosen were pertinent to 21st century teaching. They were as follows:

1. Critical & Creative Thinking = 36.52%
2. Social & Emotional Health of Student Body = 30.43%
3. Problem and Project-Based Learning = 21.74%
4. 21st Century Learning in General = 19.13%

The pressures of standardized testing creates teacher hesitation when integrating 21st century teaching. We found that 79% of the teachers that responded to our survey said that standardized testing influenced their teaching in some way. Figure 10 shows the breakdown of how teacher are affected by standardized testing.

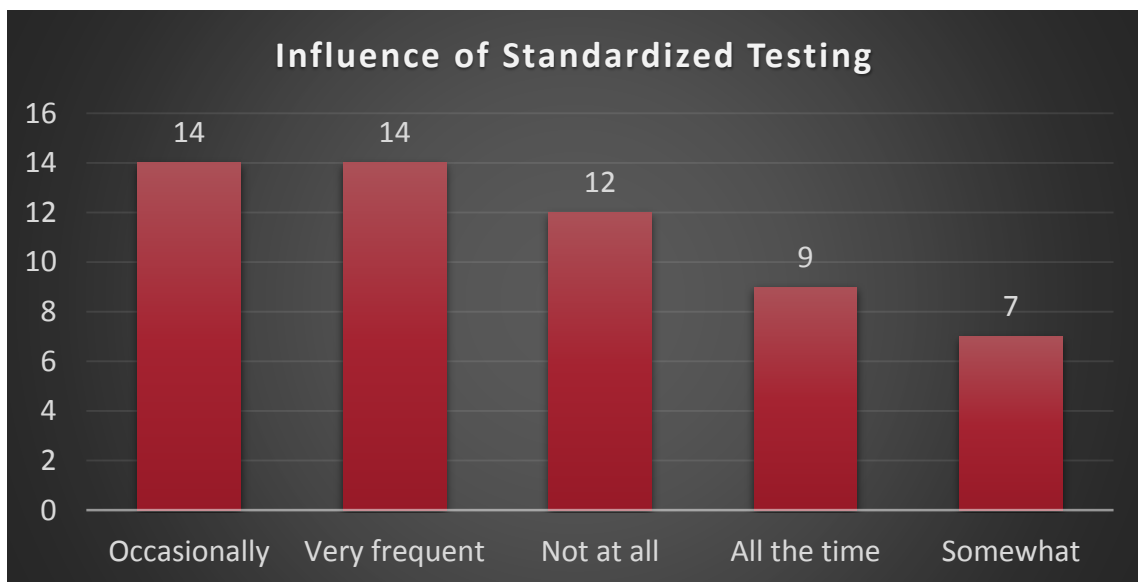


Figure 10 Influence of Standardized Testing

From this data we concluded that a large percentage of teachers were affected by standardized testing. To further understand how standardized testing affected teachers, we requested teachers to identify specifically the ways standardized tests drove curriculum. Here we have presented a few of the responses:

“Standardized testing drives the pacing and exacting nature of what is taught. We can go beyond the requirements, just not below. The quick pace demanded can lead to breadth and lack of depth, unfortunately. I would like to have the opportunity to really delve into matters in a more natural way, as students' interests and needs demand, rather than be concerned with ‘pacing’ and ‘coverage’ of tested material to the extent that we are.”

“As a teacher, I feel compelled to expose students to problems that are similar to the state tests, and (of course) to teach all the content that will be tested completely. Both of these take time in [subject] and don't necessarily reflect how we teachers would prefer to teach the students or to what extent we would spend time on certain topics. I think the most efficient way to change how we teach (i.e. performance assessments, more PBL, etc.) is to change the way the state assessments look.”

From our open ended survey responses, 70% of teachers suggested that standardized testing guided the curriculum's class pacing, content coverage and content students learned. 39% of responses suggested that standardized testing inhibited some elements of 21st century teaching such as: in-depth content, creativity, collaboration, projects, vocational training and personal interest.

4.2 The Integration of 21st Century Teaching with Standardized Testing

The integration of 21st century skills and standardized testing is a difficult task for some members of the Oakton faculty. We analyzed a two previous surveys that asked teachers their comfort levels with the eight essentials for PBL. In Figure 11, the data showed that from 2013 to 2014, there was a 19% increase of teachers who are very comfortable with project-based learning. However, we focused on the percent of teachers who understood the eight essentials but did not know how to practice them within their classrooms.

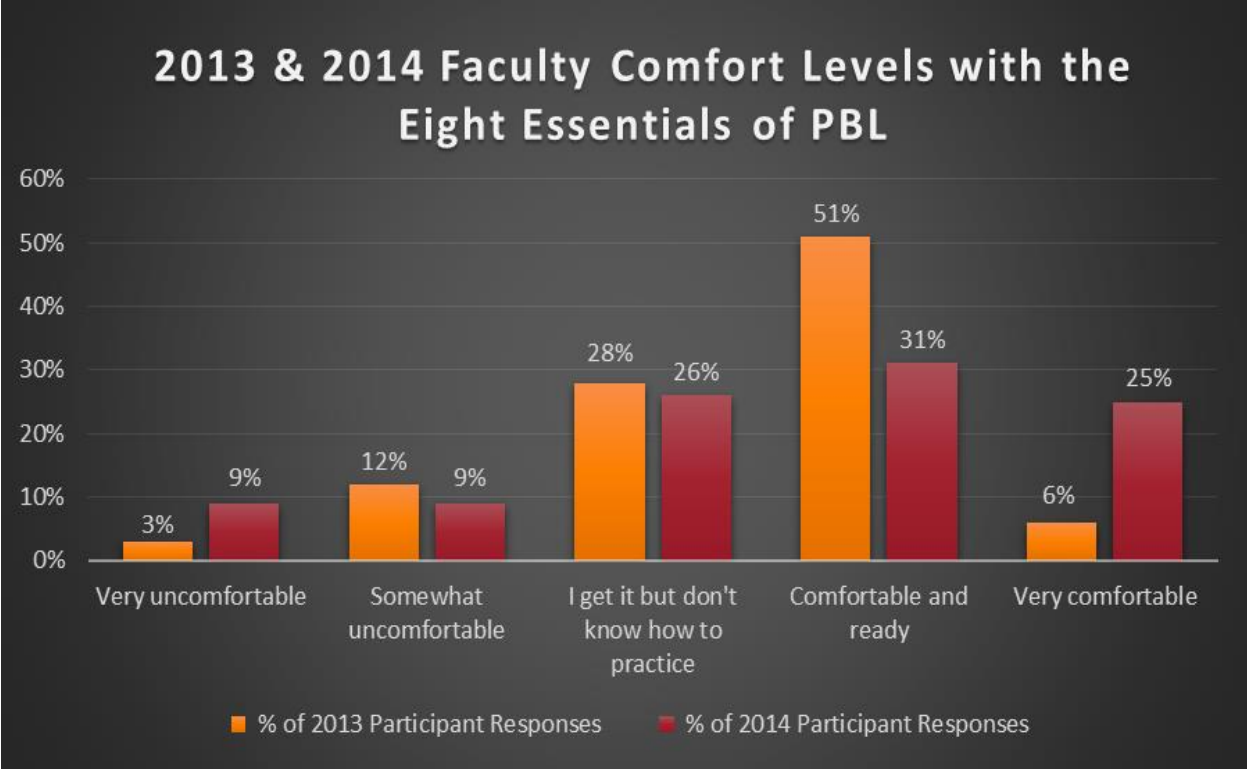


Figure 11 2013 & 2014 Faculty Comfort Levels with the Eight Essentials of PBL

We found that these survey responses implied that teachers did not know how to incorporate 21st century teaching with standardized testing. One response stated standardized testing:

“Restricts the relevance of what/how we teach. We try to link all content to real-life situations but sometimes this is difficult. Also on some topics we don’t go into much depth in things that students enjoy learning about. I would like to be able to run with how the students responded. If they are enjoying something then let it continue.”

The responses we gathered and data from old surveys allowed us to conclude that integrating 21st century teaching with the mandates of standardized testing is generating faculty hesitance with innovation.

4.3 21st Century Skills

Through our surveys and interviews we tried to get an understanding of which skills teachers find important to promote within their classroom. In Figure 12, we can see the skills teachers promote in their classroom according to our surveys and Figure 13 shows the same thing but from our surveys.

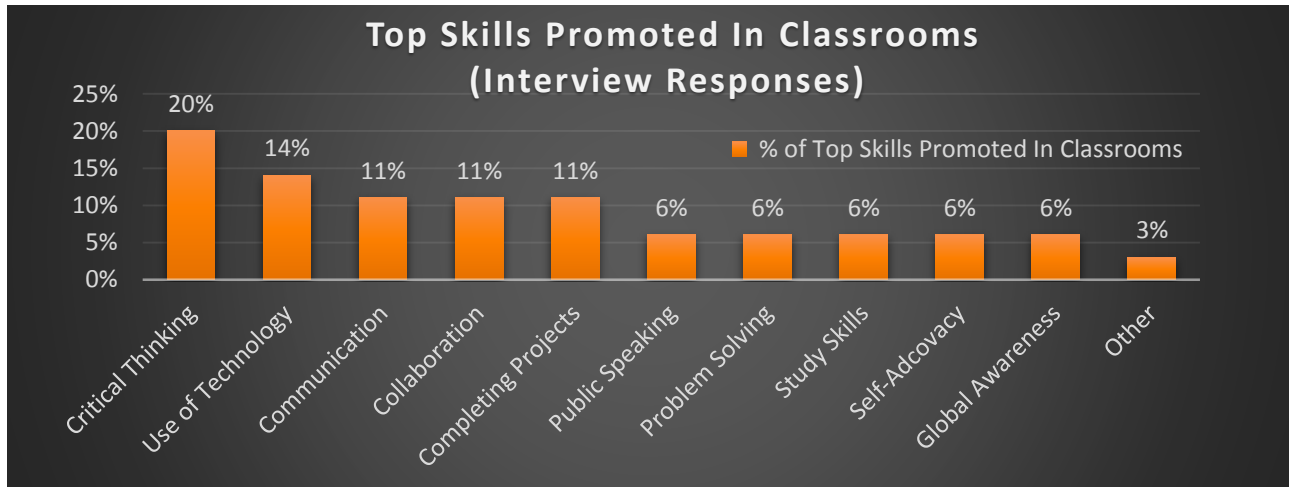


Figure 12 Top Skills Promoted In Classrooms (Interview Responses)

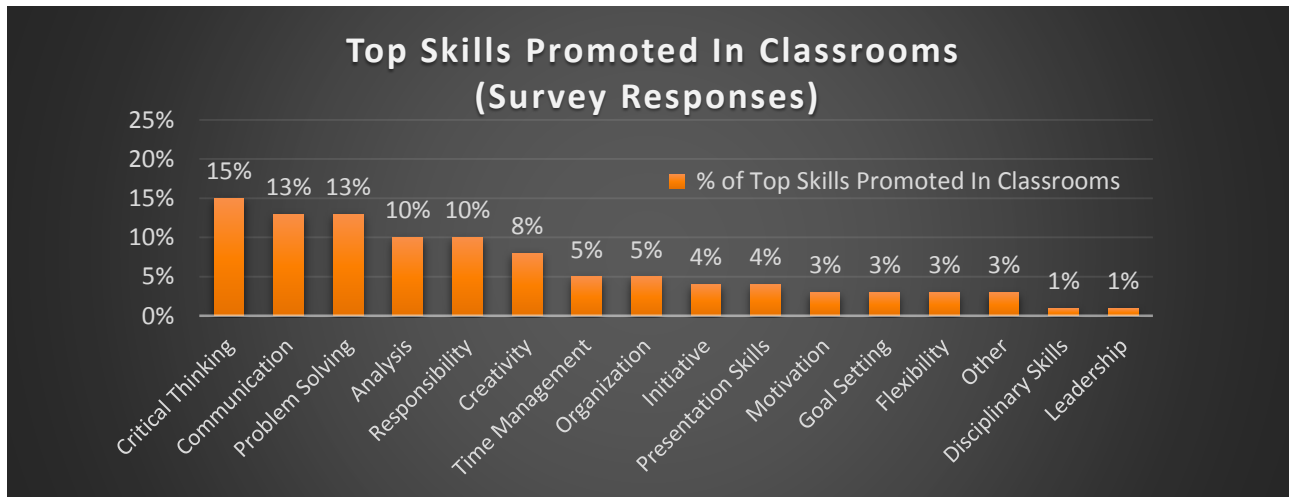


Figure 13 Top Skills Promoted In Classrooms (Survey Responses)

These graphs demonstrate the skills that teacher’s promote within their classroom are consistent with 21st century skills along with important parts of the Portrait of a Graduate. While we found through our surveys and interviews that teachers promote 21st century skills within their classroom, our observations show that the promotion of these skills were more prominent in

the higher grade levels (11th and 12th) than in the lower grade levels (9th and 10th). Figure 14 shows the distribution of 21st century learning we observed during classroom observations.

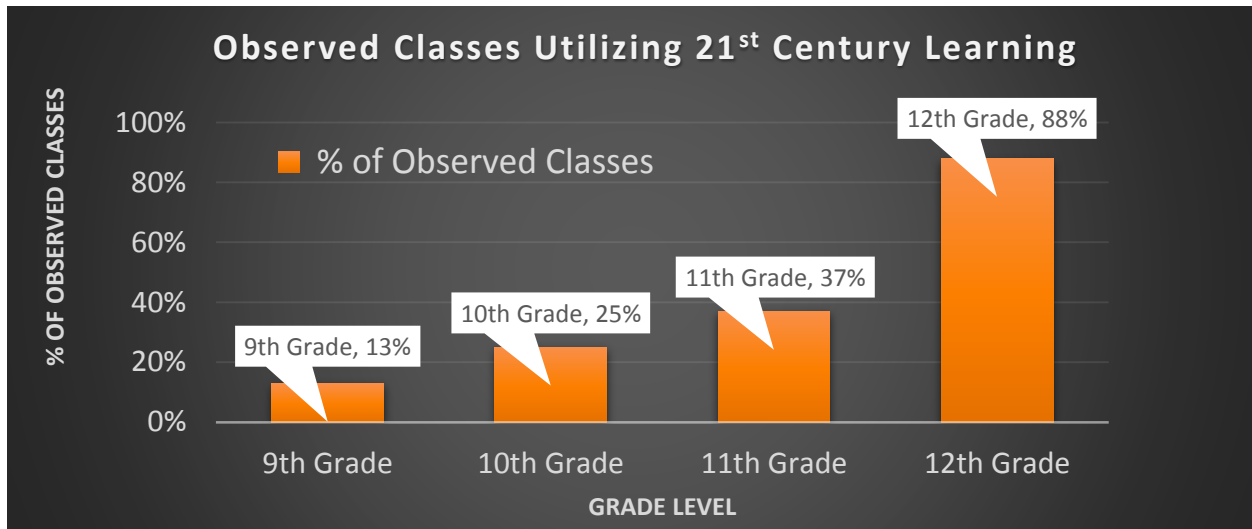


Figure 14 Observed Classes Utilizing 21st Century Learning

From observational studies and conversations with teachers we believe this distribution is accurate due to the lack of 21st century skills incoming students possess. Teachers have also stated students lack the knowledge to utilize 21st century skills. To address the lack of knowledge, teachers focus their classes on building a foundation of these 21st century skills. Even though it's not as prevalent in lower grade levels, skills promoted within the classrooms of Oakton High School are consistent with the concepts of 21st century teaching.

4.4 Technology

Technology plays a big role for teachers when trying to innovate within their classroom. We discovered that 64% of responses stated better technology would alleviate hesitation with the process of innovation within classrooms. Figure 15 shows the breakdown of different forms of technology utilized within classrooms.

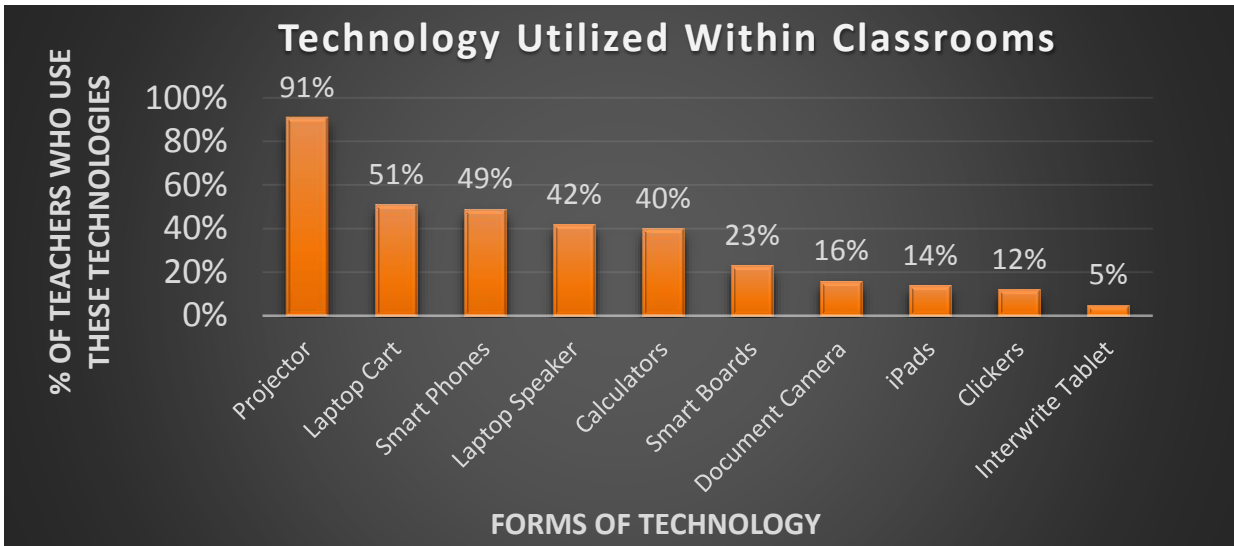


Figure 15 Technology Utilized Within Classrooms

From this data we recognized projectors and laptop carts are the two most utilized technologies provided by Oakton. However, open responses in our survey expressed deficiencies in those tools.

“The laptops in the laptop carts are old and unreliable--and there aren't enough laptop carts.”

“The projector takes up teaching space and the way that my room is arranged almost depends on how the projector will fit in the middle of it.”

These statements, along with others we received, provided a basis for our claim that the technology provided within the classroom was preventing innovation within the classroom. Similarly, we asked teachers if they were satisfied with the technology provided to them. Illustrated in Figure 16 illustrates, the majority of subjects were unsatisfied with the technology provided.

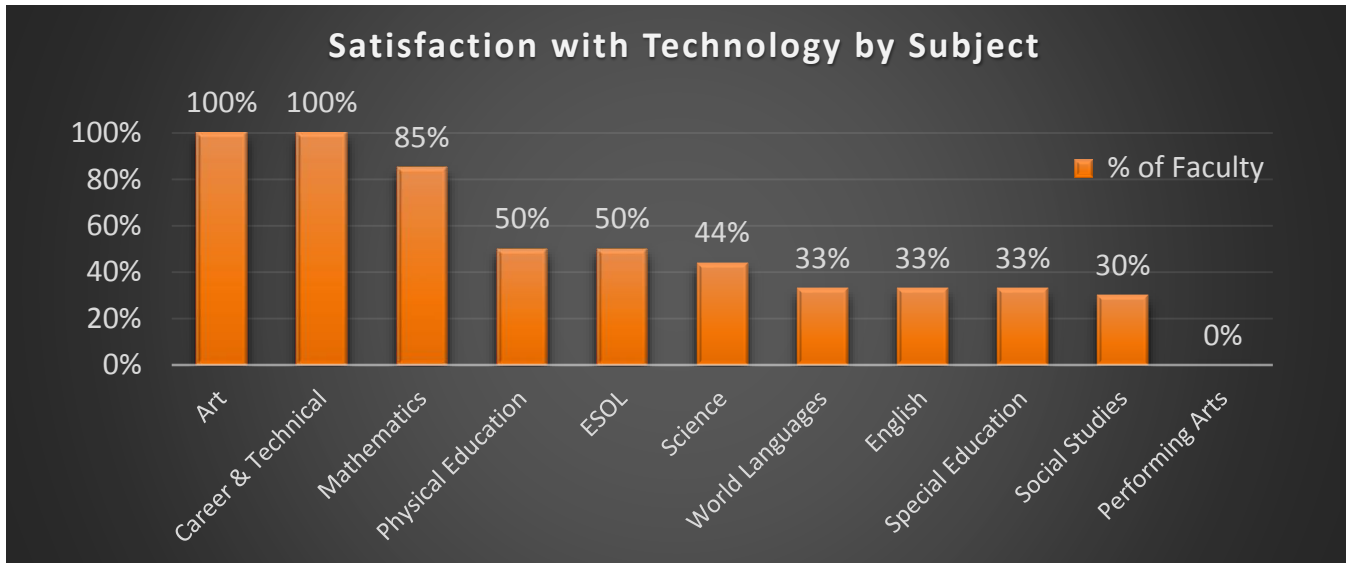


Figure 16 Satisfaction with Technology by Subject

Our surveys found that 33% of respondents, specifically from the subjects of English, Social Studies, and the Languages, stated that smart boards would be helpful to innovate within the classroom. Additionally, we found that 39% of respondents from the subjects of Math, Science, and Career and Technical Education stated iPad or tablets would be helpful. From the data we collected on technology, we concluded that Oakton High School should start the process of updating their technology as it would assist faculty in cultivating 21st century skills within their classrooms.

Chapter 5: Conclusions & Recommendations

Through extensive research and data analysis, we have developed four conclusions:

1. Oakton's teachers and administrators exhibit strong collaboration which can be leveraged to further strengthen shared perceptions and values within the organization.
2. Integrating 21st century teaching within the mandates of standardized testing is generating faculty hesitance with innovation
3. The skills promoted within the classrooms of Oakton High School are consistent with the concepts of 21st century teaching
4. Upgraded technology would assist faculty in strengthening 21st century skills within their classrooms

5.1 Collaboration

Our first conclusion was that 'Oakton's teachers and administrators exhibit strong collaboration which can be leveraged to further strengthen shared perceptions and values within the organization.' From our additional data findings we noted previously that Oakton presents a strong foundation for collaboration with over 90% of faculty willingly or consistently engaging within their departments. These data findings reiterate Oakton faculty's strong collaboration, thus focusing our attention towards other aspects. Based on Washington State University Professors Darcy Miller and Tariq Akmal's study (Section 2.5, Study 1) on observed opposition among faculty and department heads, we found that difference in perceptions played a significant role in inhibiting the process of organizational change. Miller and Akmal concluded that "Only once both sides formed a working relationship, could the opposition turn into constructive decision-making" (Akmal, T. & Miller 2004, p. 419).

Based on their study, we redirected our focus towards the diverse perceptions throughout Oakton's organization. Different attitudes towards elements of a project and standardized testing were most prominent. For project duration and frequency 'one week' and 'one month', and 'one per unit' and 'one per quarter' were the most common responses respectively. With respect to standardized testing, there were different views on its instructional priority. Through dialogue with administrators we acquired the impression that teachers were advised that standardized

testing should not be a driving factor on how they teach, however, teachers felt that standardized testing guides the curriculum in some aspect.

We recommended that Oakton focuses on the unification of diverse perceptions to further strengthen organizational collaboration. Based on our conclusions, we believe that Oakton High School can accomplish the same. To do this, we provided the following list of steps:

1. Utilize the strong collaboration already presented within departments as a foundation for positive environments
2. Locate which departments may work best in collaborating with each other based on the data we presented
3. Take baby steps to increase teacher engagement from ‘within departments’ to ‘with other departments’ to ‘with administrators’

5.2 Integration

Our second conclusion was ‘Integrating 21st century teaching within the mandates of standardized testing is generating faculty hesitance with innovation.’ From our survey findings we discovered that teachers were influenced by standardized testing. Additionally, we found that if standardized testing was not a factor, teachers would change their teaching methods. Based off of these responses and the 2013 and 2014 Faculty Comfort Levels with the Eight Essentials of PBL we discovered discomfort with regards to the incorporation of 21st century teaching and standardized testing. We recommend that Oakton emphasizes techniques that incorporate these two themes. For example, Andrew Miller, member of the National Faculty team for the Buck Institute for Education and the Association for Supervision and Curriculum Development (ASCD), states that if designing a project one could concentrate on:

1. Embedding standardized test stems and questions
2. Making sure the project hits frequently targeted standards or learnings of which the standardized tests are based on
3. Only incorporating the project where it fits (Miller, 2012)

Through techniques like Miller's, teachers have the ability to overcome hesitance and progress towards a more interactive and collaborative environment for their students.

5.3 Skills

Our third conclusion was 'the skills promoted within the classrooms of Oakton High School are consistent with the concepts of 21st century teaching'. We discovered that Oakton teachers did have the aspiration to incorporate innovative teaching methods within their classrooms through the utilization of 21st century skills. From our findings, we noted that core 21st century skills such as critical thinking, use of technology, communication, collaboration, and public speaking, were promoted by the majority of teachers within Oakton and illustrated across all disciplines. From this, we recommend that Oakton promotes the awareness of widespread shared values throughout its school. Values are the basis of goal directed behavior and guide the actions and decisions individuals make. Promoting these values could result in newfound connections that can inspire new teaching.

To accomplish this, we suggest Oakton begin by highlighting the teachers' similar interests across all disciplines. From there, the institution can connect and illuminate those who have successfully innovated 21st century pedagogies within their classrooms to promote support and widespread interest. This realization may ignite the utilization of new teaching methods among teachers. We also suggest that Oakton expresses these shared values through meetings, announcements, and staff development days which may lead to intra-disciplinary and cross-disciplinary collaboration. Discovery exercises present a beneficial technique, too. Through a discovery exercise participants can learn more about themselves, others, and the organization. With respect to Oakton, the discovery exercise would begin with teachers reflecting on their values and the skills they expect for their students. Then in an open forum, teachers would discuss these values and skills to uncover commonalities and develop connections among disciplines. These connections could result in newfound collaboration within or with other departments. Finally, we suggest that Oakton brings in an outside party to act as an "organizational change" facilitator and promote the positivity with regards to the institution's current progress with 21st century pedagogies.

5.4 Technology

Our fourth conclusion was ‘upgraded technology would assist faculty in strengthening 21st century skills within their classrooms’. We discovered that the majority of teachers were not satisfied with the technology within their classrooms. Additionally, we found that laptops and projectors were the two most utilized forms of technology within the classroom. These devices were directly related to the satisfaction level of teachers with their classroom technology. Teachers’ primary locations of frustration branched from the slow nature of the laptops and the inconvenience of maneuvering projectors around the classroom. When faculty were asked what technology would be helpful within their classroom, certain subjects responded with ‘smart boards’ while others responded that ‘iPads or tablets’ would significantly assist their process of innovation.

As technology becomes a more pertinent aspect with both students of this generation and 21st century teaching, we recommend that Oakton High School begins focusing on the process of upgrading its most utilized technology, laptops and projectors. To accomplish this, we first suggest the Bring Your Own Device (BYOD) strategy. This would aid in conserving money while also providing students with up-to-date technology to utilize. Also, as Oakton begins its process of renovation, we propose that factors such as a sufficient amount of outlets and space are taken into consideration to assist teachers in innovating 21st century pedagogies.

Finally, we advocate that Oakton explores grant options such as the Digital Wish Grants Foundation or the Technology Donors Program. The Digital Wish Grants Foundation assists teachers in receiving funding for technology to be used in their classroom. Teachers that submit a lesson plan to the Digital Wish Grants Foundation are automatically qualified to win up to fifty technology grants, averaging roughly around \$4000-\$6000 with a maximum value of \$10,000. These grants range from the STEM Innovation Grant, designed for the expansion and innovation within science, technology, engineering, and math to the Best Buy Community Grant that provides teenagers with access to opportunities through technology to help succeed in school through developing 21st century skills.

The Technology Donors Program pairs teachers with possible donors. Much like a wedding registry, teachers assemble a wish list of technology for their classroom within a “classroom profile”. This “classroom profile” allows teachers to post classroom stories and experiences that can in turn attract possible donors. Once a donor gains interest they can then

choose whether they want to purchase an item off the list for the teacher or simply make a donation. Also, if a donor chooses to purchase an item the Digital Wish Grants Foundation will give the school 2-10% cashback for aid for their next technological reinvasion. To conclude, we reiterate that technology is not a playing factor for cultivating 21st century pedagogies but rather for strengthening them, as New Tech Network's Director of Curriculum, Paul Curtis, expresses "Only once the foundation of 21st century skills is formulated can a school then begin to prioritize the process of updating its technology". With this, we advise for Oakton High School to not prioritize this challenge but instead keep it in mind for future adoption.

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Appendix

Appendix A: Observational Notes

NINTH GRADE COURSES				
	Student Engagement	Teaching Methods	Student-Teacher Interaction	Student Comprehension of 21 st Century Skills
Class A	<ul style="list-style-type: none"> ✓ Active participation in discussions ✓ Frequently asked and answered questions ✓ Excitement and interest in subject content 	<ul style="list-style-type: none"> ✓ Independent and group assignments ✓ Group collaboration ✓ Open class discussions ✓ Peer teaching and learning 	<ul style="list-style-type: none"> ✓ Positive ✓ Students felt comfortable to ask questions and seek help ✓ Similar to mentoring 	<ul style="list-style-type: none"> ✓ Collaboration ✓ Critical Thinking ✓ Creativity ✓ Problem-Solving ✓ Decision Making ✓ Communication
Class B	<ul style="list-style-type: none"> ✓ Half the class participated ✓ Some were uninterested and used cell phones ✓ Students showed more excitement during interactive exercises ✓ Some students lack motivation 	<ul style="list-style-type: none"> ✓ Independent handouts and whiteboards ✓ Peer work on word problems ✓ Energetic and trying to get students active ✓ Demonstration on board on how to use technology 	<ul style="list-style-type: none"> ✓ Positive, exerted authority when needed ✓ Mutual respect ✓ Students felt comfortable asking questions ✓ Teacher was very engaging 	<ul style="list-style-type: none"> ✓ Problem-Solving ✓ Communication ✓ Real-world Connection ✓ Group work / Collaboration
Class C	<ul style="list-style-type: none"> ✓ Technology driven course – student were not interacting with the class, but with neighbors ✓ Students used cell phones, recreational internet use, talked to peers 	<ul style="list-style-type: none"> ✓ Solely independent work with occasional mentoring ✓ Students worked at their own pace – given more responsibility for their own work 	<ul style="list-style-type: none"> ✓ Minimal interaction ✓ Interactions seemed positive and teacher gave helpful tips 	<ul style="list-style-type: none"> ✓ Use of technology ✓ Creativity ✓ Design ✓ Critical Thinking
Class D	<ul style="list-style-type: none"> ✓ Students were not motivated to be in the classroom ✓ Constant distracts and side conversations 	<ul style="list-style-type: none"> ✓ Open discussion ✓ Reading comprehension ✓ Group work on creating a poster that represents a chapter the students read 	<ul style="list-style-type: none"> ✓ Dynamic and positives ✓ Students can be disrespectful sometimes 	<ul style="list-style-type: none"> ✓ Collaboration ✓ Communication ✓ Making connections ✓ Critical thinking ✓ Creativity ✓ Organization ✓ Public speaking

	<ul style="list-style-type: none"> ✓ Students were excited to do hand-on activities 			
Class E	<ul style="list-style-type: none"> ✓ Some students showed excitement when answering questions ✓ Attentive to the teacher's lecture ✓ Some students were distracted by cell phones 	<ul style="list-style-type: none"> ✓ Lecturing and note taking ✓ Relating posters, classroom objects to the lesson plan ✓ Teacher tried to connect with students using these relative to student interest 	<ul style="list-style-type: none"> ✓ Teacher's authority was known by students ✓ Students showed respect for the teacher and classroom ✓ Students were not to ask questions or ask unrelated questions 	<ul style="list-style-type: none"> ✓ Organization ✓ Communication / Self-advocate
Class F	<ul style="list-style-type: none"> ✓ No results – test day and poster presentation day 	<ul style="list-style-type: none"> ✓ No results – test day and poster presentation 	<ul style="list-style-type: none"> ✓ Positive relationship shown through a comfortable classroom environment (i.e. During presentations students weren't afraid of saying something wrong because the teacher helped students when they were stuck) ✓ Teacher wanted students to learn and show what they learned 	<ul style="list-style-type: none"> ✓ Presentation day – public speaking ✓ Communication ✓ Prior to presentation – research, creativity to design posters
Class G	<ul style="list-style-type: none"> ✓ Students were enthusiastic and had fun learning / doing work ✓ Minimal cell phone use ✓ Students were focused to the lecture material 	<ul style="list-style-type: none"> ✓ Lecturing and note taking ✓ Group work on designing a dream house ✓ Practice sentence structure and grammar ✓ Peer review / edit 	<ul style="list-style-type: none"> ✓ Teacher engaged students through questions and walking around ✓ Students had a positive attitude toward the teacher and subject 	<ul style="list-style-type: none"> ✓ Collaboration ✓ Communication ✓ Public speaking ✓ Creativity ✓ Research skills ✓ Real-world connection

TENTH GRADE COURSES

	Student Engagement	Teaching Methods	Student-Teacher Interaction	Student Comprehension of 21st Century Skills
Class H	<ul style="list-style-type: none"> ✓ Not much engage due to final papers and projects 	<ul style="list-style-type: none"> ✓ Assigned work ✓ Teacher walked around to help students 	<ul style="list-style-type: none"> ✓ Students received teacher's help but other than that little to no interaction 	<ul style="list-style-type: none"> ✓ Past project with collaboration ✓ Public speaking ✓ Critical thinking ✓ Creativity
Class I	<ul style="list-style-type: none"> ✓ Quiz was going on so not much engagement ✓ After quiz students and teacher went over homework 	<ul style="list-style-type: none"> ✓ Very traditional textbook method 	<ul style="list-style-type: none"> ✓ Interaction when going over homework problems 	N/A
Class J	<ul style="list-style-type: none"> ✓ Very interactive ✓ Student finished big project so team evaluations were going on 	N/A	<ul style="list-style-type: none"> ✓ Students and teachers did their own thing 	<ul style="list-style-type: none"> ✓ Collaboration ✓ Communication
Class K	<ul style="list-style-type: none"> ✓ Teacher was very engaging and sparked student interest 	<ul style="list-style-type: none"> ✓ Standard lectures with interaction and authenticity 	<ul style="list-style-type: none"> ✓ Teacher watched movies then discussed relating info to current events 	<ul style="list-style-type: none"> ✓ Collaboration ✓ Public speaking ✓ Critical thinking
Class L	<ul style="list-style-type: none"> ✓ Very engaging class ✓ Students held discussions while teacher overlooked 	<ul style="list-style-type: none"> ✓ Laid back and open floor 	<ul style="list-style-type: none"> ✓ Teacher only interacted when students needed to get back on track 	<ul style="list-style-type: none"> ✓ Collaboration ✓ Public speaking ✓ Critical thinking ✓ Creativity
Class M	<ul style="list-style-type: none"> ✓ Students were well engaged 	<ul style="list-style-type: none"> ✓ Traditional structure of teacher speaking to students but with good interaction 	<ul style="list-style-type: none"> ✓ Teacher asked students to go up to the board, post homework answers, and then everyone went over them together 	<ul style="list-style-type: none"> ✓ Collaboration ✓ Public speaking
Class N	<ul style="list-style-type: none"> ✓ Engaging among students only 	<ul style="list-style-type: none"> ✓ Very traditional teaching 	<ul style="list-style-type: none"> ✓ Teacher did labs and went over homework with students but gave answers 	<ul style="list-style-type: none"> ✓ Collaboration

ELEVENTH GRADE COURSES

	Student Engagement	Teaching Methods	Student-Teacher Interaction	Student Comprehension of 21st Century Skills
Class O	<ul style="list-style-type: none"> ✓ Students engaged each other during independent work ✓ Peer review and learning 	<ul style="list-style-type: none"> ✓ Independent work that fostered students going about the work at their own comfort level ✓ Technology driven 	<ul style="list-style-type: none"> ✓ Teacher was helpful and gave students advice on a problem / technical aspect ✓ Students were encouraged to ask questions and look to the teacher and peers for help ✓ Promoted a relaxed atmosphere 	<ul style="list-style-type: none"> ✓ Use of technology ✓ Communication ✓ Problem-solving ✓ Creativity
Class P	<ul style="list-style-type: none"> ✓ Students were excited to learn and be in the class ✓ Students were focused 	<ul style="list-style-type: none"> ✓ Group collaboration on assignments ✓ Individual assessments ✓ Class participation 	<ul style="list-style-type: none"> ✓ Teacher was very engaged and dynamic ✓ Encouraged students to ask questions 	<ul style="list-style-type: none"> ✓ Collaboration ✓ Communication
Class Q	<ul style="list-style-type: none"> ✓ Students were easily distracted, but when given the opportunity to use laptops – students were very engaged 	<ul style="list-style-type: none"> ✓ Handouts ✓ Group work within the library 	<ul style="list-style-type: none"> ✓ Not much teacher student interaction 	<ul style="list-style-type: none"> ✓ Students collaborated together ✓ We didn't get to see presentation day unfortunately
Class R	<ul style="list-style-type: none"> ✓ Substitute Teacher, not much student engagement 	<ul style="list-style-type: none"> ✓ Made students act out scenes from a play ✓ Time to reflect within notebooks 	<ul style="list-style-type: none"> ✓ Teacher lectured and students listened. ✓ Not much one on one interaction 	<ul style="list-style-type: none"> ✓ Communication
Class S	<ul style="list-style-type: none"> ✓ Students were very engaged ✓ Worked in pairs to answer questions teacher posed to class 	<ul style="list-style-type: none"> ✓ Utilized handout ✓ White Boards for each student group to write problems upon and participate ✓ Lab work on computers in pairs 	<ul style="list-style-type: none"> ✓ Teacher was very active with the students ✓ Teacher took the time with each group pairings 	<ul style="list-style-type: none"> ✓ Students collaborated well ✓ Communicated with each other and the teacher well ✓ Presented their findings well
Class T	<ul style="list-style-type: none"> ✓ Students were very engaged 	<ul style="list-style-type: none"> ✓ Videos ✓ Handouts ✓ Open Discussion 	<ul style="list-style-type: none"> ✓ The teacher promoted a large amount of 	<ul style="list-style-type: none"> ✓ Great collaboration

	<ul style="list-style-type: none"> ✓ Teacher made student put their phone in a box ✓ Mandated student engagement 	<ul style="list-style-type: none"> ✓ Student voice 	<ul style="list-style-type: none"> integration with the students ✓ Discussions between teachers and students were on the same level 	
Class U	<ul style="list-style-type: none"> ✓ Students were not very engaged 	<ul style="list-style-type: none"> ✓ Handouts ✓ White Boarding answers 	<ul style="list-style-type: none"> ✓ Teacher walked the room to interact with each student and check the progression of the handout 	<ul style="list-style-type: none"> ✓ None viewed during the time allotted

TWELFTH GRADE COURSES

	Student Engagement	Teaching Methods	Student-Teacher Interaction	Student Comprehension of 21st Century Skills
Class V	<ul style="list-style-type: none"> ✓ Students were very engaged constantly asking questions 	<ul style="list-style-type: none"> ✓ Assign activity ✓ Walk around interact with students asking them questions 	<ul style="list-style-type: none"> ✓ Students received the teachers help well 	<ul style="list-style-type: none"> ✓ Collaboration ✓ Critical thinking ✓ Communication ✓ Creativity ✓ Research skills ✓ Real-world connections
Class W	<ul style="list-style-type: none"> ✓ Seminar ✓ Students would engage with one another ✓ Challenging each other 	<ul style="list-style-type: none"> ✓ Teacher proposed question and students would argue points about the question through their findings 	<ul style="list-style-type: none"> ✓ Not too much ✓ Teacher tried not to step in and allow the students to learn from one another 	<ul style="list-style-type: none"> ✓ Communication ✓ Critical thinking ✓ Research skills
Class X	<ul style="list-style-type: none"> ✓ Students were slightly distracted in a larger classroom ✓ However when the teacher gave an assignment they all instantly were engaged in their work 	<ul style="list-style-type: none"> ✓ Teacher gave slight instructions for students then walked around to help students who were stuck on the assignment 	<ul style="list-style-type: none"> ✓ Good relationship ✓ Students were happy to ask questions and get help 	<ul style="list-style-type: none"> ✓ Research skills ✓ Real-world connections ✓ Collaboration ✓ Presentation
Class Y	<ul style="list-style-type: none"> ✓ This was a big class so there were a variety of student engagement ✓ Some who were really excited 	<ul style="list-style-type: none"> ✓ Some lecture giving the students the necessary knowledge to then apply it to other places 	<ul style="list-style-type: none"> ✓ Teacher would go around asking students questions to help the students think more about their work 	<ul style="list-style-type: none"> ✓ Collaboration ✓ Creative thinking ✓ Research skills ✓ Real-world connections

	about the assignments and other who would talk with friends			
Class Z	<ul style="list-style-type: none"> ✓ Students worked diligently on assignments that they missed or were in complete 	<ul style="list-style-type: none"> ✓ The teacher had many different stations set around the classroom for the students to use for their assignments ✓ Would go around making sure students were working and assisting them where it was needed 	<ul style="list-style-type: none"> ✓ Students had good relationship with teacher ✓ They comfortably asked questions 	<ul style="list-style-type: none"> ✓ Real-world connections ✓ Critical thinking ✓ Use of technology
Class A1	<ul style="list-style-type: none"> ✓ The teacher would really push the students to figure out the answer instead of teacher giving it to them 	<ul style="list-style-type: none"> ✓ Teacher would explain something and then ask the student to explain it for themselves 	<ul style="list-style-type: none"> ✓ Students respected teacher while still having a fun and relaxing learning environment 	<ul style="list-style-type: none"> ✓ Critical Thinking

Appendix B: Interview Questions

1. What are the three most significant skills you promote within your classroom?
(Depending on response we can state the connection between the skills they names to 21st century skills if applicable)
 - a.) How do you incorporate these skills in your teaching?
 - b.) From your observations, are your students effectively applying these skills? If so, where and how?

2. Based on your own opinion, are the ideals of the Portrait of the Graduate fine where they stand?
 - a.) If yes, could you tell us what you feel are the three most important features of the Portrait of the Graduate?
 - b.) If no, do you have any suggested modifications?

3. What teaching style do you believe is best in aiding the future of today's students, and why?
 - a.) What significant knowledge, skills, or attributes should an Oakton graduate possess?

4. Are there sufficient resources available to support the implementation of new teaching styles at OHS?
 - a.) What resources have proven most/least helpful to you?
 - b.) What new resources would you like to see made available, if any?

5. Could you identify, in your own words, the instructional priorities of OHS?
 - a.) How do you feel about these priorities?

Appendix C: Interview Responses

<i>Teacher</i>	Q1	Q2	Q3	Q4	Q5
<i>A</i>	<ol style="list-style-type: none"> 1. Collaboration 2. Public speaking 3. Use of technology 	<ul style="list-style-type: none"> • Fine where it stands • Produce a well-rounded member of society 	<ul style="list-style-type: none"> • Loose and comfortable <ol style="list-style-type: none"> 1. Collaboration 2. Public speaking 	<ul style="list-style-type: none"> • Yes, faculty meetings (CSI) = creativity • School should provide google/google docs 	<p>Collaboration among teachers and students</p> <p>Students are productive members of society</p>
<i>B</i>	<ol style="list-style-type: none"> 1. See projects from start to finish 2. How to design 3. Group work 4. How to use tools correctly and safety 	<ul style="list-style-type: none"> • Yes, technical areas already implements features asked of the Portrait of a Graduate 	<ul style="list-style-type: none"> • Very laid back <ol style="list-style-type: none"> 1. Critical thinking 2. Big picture problem solving 3. Not being afraid to work with your hands 4. Time management 	<ul style="list-style-type: none"> • Yes, but could have more if budgeting was not an issue - technology specialist Mike Hale is a great resource and money to ensure enough material for class 	<ul style="list-style-type: none"> • OHS is test driven to meet SOL or AP exams however Oakton is trying to mix up the classroom, but isn't sure if it is actually working/ people are doing it
<i>C</i>	<ol style="list-style-type: none"> 1. Collaboration 2. Study skills 	<ul style="list-style-type: none"> • Good for parents. • Too vague to actually apply to students. • Useless in practice 	<ol style="list-style-type: none"> 1. Presentation skills(eye contact, speech) 2. Core writing skills 3. Read books 	<ul style="list-style-type: none"> • Yes, teachers at OHS are here to be innovators and challenge convention • However, they need to downsize their ambitions 	<ul style="list-style-type: none"> • Want every student to be above average, which isn't a possibility but it's what parents expect and administration promotes.
<i>D</i>	<ol style="list-style-type: none"> 1. Critical thinking 2. Self-motivation 3. Self-advocacy <ul style="list-style-type: none"> • Social studies teachers try to work collaboratively • Mix of students applying these skills 	<ul style="list-style-type: none"> • Good idea but not the implementation. • Feels that if SOL / scores weren't a factor is would be easier/more comfortable to promote the ideals. No modifications if no sol 	<ul style="list-style-type: none"> • Student-centered learning <ol style="list-style-type: none"> 1. Motivation 2. Critical thinking 3. Responsibility 	<ul style="list-style-type: none"> • Technology - no, it is not up to par/can't even use • Admin support is great - pushing teachers to innovative and provides resources to innovative (staff development, physical content, etc.) 	<ul style="list-style-type: none"> • Prepare students for the future, however feels that the regulations at Oakton hinders students from learning skills needed for college and careers

<i>E</i>	<ol style="list-style-type: none"> 1. Communicate ideas 2. Critically evaluate 3. Look at world while learning 	<ul style="list-style-type: none"> • Yes, over time they will need to be changed but they are reasonable 	<ul style="list-style-type: none"> • Teacher is coach <ol style="list-style-type: none"> 1. Kids have more responsibility 2. Weaker students still benefit 	<ul style="list-style-type: none"> • There is support present but it's hard to innovate still with the sol fear. Biggest road block is not enough collaboration time and the time expense. 	<ul style="list-style-type: none"> • Communicate clearly and demonstrate 21st century skills
<i>F</i>	<ol style="list-style-type: none"> 1. Thinking 2. Use of evidence 3. Public speaking 4. Media literacy - quality resources <ul style="list-style-type: none"> • Student learning by doing • Socratic seminars • Think, pair, share 	<ul style="list-style-type: none"> • Yes <ol style="list-style-type: none"> 1. Global citizen - important for students to know that they are a part of something bigger 2. Communicator 	<ul style="list-style-type: none"> • Learning by doing / learning by failure 	<ul style="list-style-type: none"> • Technology is something that should be improved - i.e. Having computers that can print • Less students to help promote more authentic PBL 	<ul style="list-style-type: none"> • Honor, lifelong student learners
<i>G</i>	<ol style="list-style-type: none"> 1. Communication 2. Knowledge (and how to use it) 3. Use of technology 	<ol style="list-style-type: none"> 1. Standard answers 2. Learn how to deal with problems 3. Collaboration 	<ul style="list-style-type: none"> • Depends on how motivated student are. A lot of good strategies but some are very time consuming and you can't always just use one. 	<ul style="list-style-type: none"> • A lot of support from teachers and administration. • Technology would be very helpful in class. 	<ul style="list-style-type: none"> • Interested in giving the students a mentality to make them successful as adults.
<i>H</i>	<ol style="list-style-type: none"> 1. Problem solving 2. Connection making 3. Critical reading skills 	<ul style="list-style-type: none"> • Yes (ideals are okay but language is not) <ol style="list-style-type: none"> 1. Creates good presentation skills 2. Creates good people skills 	<ul style="list-style-type: none"> • Having some connections between student lives and education & students and teachers (comfort level) <ol style="list-style-type: none"> 1. Confidence in own abilities and ability to speak mind 2. Base level of general knowledge 	<ul style="list-style-type: none"> • Good support for most part but computers are slow and outdated • Good support: working technology and other teachers within similar departments 	<ul style="list-style-type: none"> • Priorities in order: <ol style="list-style-type: none"> 1. Student safety 2. Standardized testing 3. Student grades 4. Showing 21st century teaching styles 5. Student learning

			3. Basic writing skills (communicate effectively and appropriately)		
<i>I</i>	<ol style="list-style-type: none"> 1. Communication - open dialog 2. Critical thinking - thinking about different perspectives 3. Problem solving 4. Respect 	<ul style="list-style-type: none"> • Yes - it is very forward thinking, aligns with his teaching , something Oakton has already been doing <ol style="list-style-type: none"> 1.Communication 2.Collaboration 3.Global citizen 4.Community service 	<ul style="list-style-type: none"> • Engaged for the future, doesn't have to be traditional <ol style="list-style-type: none"> 1. Flexible thinkers, learners 2. Communication 3. Collaboration 4. Active learners 5. Ownership of their own education 	<ul style="list-style-type: none"> • Yes, but could always use more • Love to have freedom of the rule (county, state) and more one-on-one time • Least - textbooks 	<ul style="list-style-type: none"> • Be successful, demonstrate knowledge, skill set
<i>J</i>	<ol style="list-style-type: none"> 1. Self-avocation (be able to work and research on own) 2. Use of technology 3. Global awareness (applying knowledge to real-world situations) <ul style="list-style-type: none"> • Incorporates through PowerPoints, lesson plans (videos, current events, researching on own) • Mixed bag (academically driven students vs students who will abuse freedom) 	<ul style="list-style-type: none"> • Portrait of a Graduate is always changing (thinks OHS should revert back to old school textbook learning but world is changing so students need to too) • Tough to keep up (students should be well oriented but sols setback) 	<ul style="list-style-type: none"> • Mix it up (independent and group work) <ol style="list-style-type: none"> 1.Work independently/in a group 2.Time management 3.Reliability and dependability 	<ul style="list-style-type: none"> • OHS is open to ideas (teacher development days) • Likes fellow teachers to bounce ideas off of • Would like to see more options of different courses that students could take 	<ul style="list-style-type: none"> • Trying to get students successful in life (in general), aware of environment • Hard push on academics however
<i>K</i>	<ol style="list-style-type: none"> 1. Making connections 2. Comprehension of the material 	<ul style="list-style-type: none"> • Needs modifications • Pros: focuses on students as a whole, 	<ul style="list-style-type: none"> • Teachers need to be entertainers and get students attention 	<ul style="list-style-type: none"> • Yes Fairfax county does provide a lot of supplies and 	<ul style="list-style-type: none"> • Independent, creative, critical thinkers

	<ul style="list-style-type: none"> • Hands-on activities • Multiple activities • Projects 	<p>greater variety, different skill set, helpful for college</p> <ul style="list-style-type: none"> • Cons: over extends students, sometimes an added pressure on students, students don't understand the value of it 	<ul style="list-style-type: none"> • Delivery of the material is important <ol style="list-style-type: none"> 1. Time management 2. Public speaking 3. Break down a project 4. Group work 5. Community service 	<p>technology compared to other schools</p> <ul style="list-style-type: none"> • Request of resources is easy - they trust that the resources needed are that the teacher needs • Least helpful: new method books • New: iPads - to make a more interactive learning and see things from other cultures 	<ul style="list-style-type: none"> • Community • Tremendous push for PBL - being able to produce something of what you learned and being able to work with a group
<i>L</i>	<ol style="list-style-type: none"> 1. Critical thinking / reasoning 2. Study skills (be able to read ahead and check homework before hand-in) <ul style="list-style-type: none"> • How do students come to an answer & using non-textbook questions • Assigned and checked reading guides & organization • Half & half (improving): more questions being asked & coming in after school with questions ready 	<ul style="list-style-type: none"> • Ahead of the curb (alleviate stress) <ol style="list-style-type: none"> 1. Collaboration 2. Community outreach 	<ul style="list-style-type: none"> • Depends on what one's teaching • PBL is future though (allows more focus) <ol style="list-style-type: none"> 1. Collaboration 2. Critical thinking 3. Resilience 	<ul style="list-style-type: none"> • Support is there but tough with space and technology (best in current situation however) • Space (students need to walk around more instead of having to go in the parking lot for projects) • Technology advancements (3d modeling programs) 	<ul style="list-style-type: none"> • Project-based learning
<i>M</i>	<ol style="list-style-type: none"> 1. Critical thinking (thinking outside the box) 2. Social skills 	<ul style="list-style-type: none"> • Yes, but there's always room for improvement (might not be realistic) 	<ul style="list-style-type: none"> • Technology incorporation <ol style="list-style-type: none"> 1. Good citizen/morals 	<ul style="list-style-type: none"> • Yes (every 5 years teachers renew license / teacher workshops are held) 	<ul style="list-style-type: none"> • OHS wants students to take at least 1-2 AP courses to prepare for college

	<p>3. Empathy</p> <ul style="list-style-type: none"> • Applying real world examples through lessons and homework problems • Depends (not all the time but they are practicing which is important) 	<p>however) - not every individual is the same</p>	<p>2. Basic skills (note taking and social skills)</p>	<ul style="list-style-type: none"> • MH: use of internet and technology • LH: textbooks, homework, worksheets (everything is viral now and teachers need to keep up with students) • B.) Good for now (in lower level math however, more technology is definitely needed to interact and aid students better) 	
<i>N</i>	<p>1. Organization 2. Timeliness (on time to class and work) 3. Work ethic</p> <ul style="list-style-type: none"> • Same routine, warmups, practice assessments • Yes, the students who use all three (^) do very well, but a lot of students don't have a strong work ethic 	<ul style="list-style-type: none"> • For the most part she thinks they are good where they stand. They are geared towards making students better people. <p>1. Communication is the most important</p>	<ul style="list-style-type: none"> • You need to hit all learning styles, but overall students should be active. <p>1. Communication and work ethic</p>	<p>There are good recourses available.</p> <p>A. The algebra 2 team is the most helpful (4 teachers)</p> <p>B. Smart board is a huge help. Some teaching games would be helpful. (Special ed.)</p>	<ul style="list-style-type: none"> • Oakton want the students to master what they are learning.

Appendix D: Additional Interview Responses

- Teacher A:
 - STEM courses are formula-based while Humanities/Social Studies are more open-ended
 - Students come from three middle schools so they are not comfortable with each other in earlier grade levels
 - Re-takes aren't productive with student learning (afraid colleges might find out Oakton re-tests)
 - Possible solution: $> 75\%$ = no re-take and $< 75\%$ = re-take
 - Uses group work every other day, presentations, text responses, twitter, and video clips
 - Class revolved around real-world events and public speaking
- Teacher B:
 - Very into group work and group dynamics, wants student to know how to deal with students who don't do enough work and students who do too much
 - Believes his/her students should be treated like adults in the classroom if they deserved it
 - Thinks even in his/her heavy project based class there are times when lecture is needed
 - Really big on life skills
 - New initiatives are implemented one year and aren't followed through after a few years have passed
 - Believes teachers should have input on County decisions on innovation
 - Hard to measure student progress qualitatively vs quantitative (SOL test)
- Teacher C:
 - ESOL Students require a whole different type of learning.
 - Have to hold the students hand (figuratively) when teaching them new material
 - Formative, ongoing assignments that focus on the skills learned rather than the content taught
 - Education to all faculty about the experience and needs of ESOL students have within their program
 - AVID program, look into it
 - Oakton wants all their students to be above average- illogical
 - Oakton parents want their students to be above average- illogical
- Teacher D:
 - Feels strongly on fixing the reassessment policy and SOL
 - Believes parents are very proactive about his/her students, however not the same for lower level classes - where it is more important to get those students more help

- Opposed to the Fairfax County Opt-in policy, where students can choose whatever class and level they want
 - Pressure from parents and wanting to be with friends - however doesn't help the student
- Reassessments aren't an accurate way for students to learn - doing quiz corrections helps students focus on the content they have missed and learn that content
- Sometimes difficult to innovate with the lack of technology -- some students would have laptops that could be very helpful for activities but because of the lack of working laptops the school offers it makes it harder for these students to learn the technology aspect
- Fairfax / OHS push for creating a less stressful environment and the reassessment policy is detrimental to teachers and students
 - Students become unmotivated and teachers have changed their assessment process to be easier in order to make reassessing easier
 - Can only work if the teachers and students are both on board and will to do his/her
 - Teachers need to learn to not be as hands on while students need to be more responsible for their own learning / finding the information on their own
- Teacher E:
 - Likes reassessment
 - However some students use it as a crutch
 - Special education teachers have been doing this/her forever
 - No bad contact with parents
 - Very open to their criticism
 - Promotes "cheating", allows students to help one another so students can learn through helping
 - Wants to get students thinking about more than just themselves
 - "Fear of the SOL"- worried to try new things or do interesting hands on projects because the students need to know a certain amount to pass
- Teacher F:
 - Likes the idea of reassessment if used the right way
 - For students to learn or understand concepts that they didn't grasp
 - Not for students who are only trying to get an A
 - Likes being able to talk to parents
 - Believes it makes his/her a better teacher
 - There has been a negative connotation with parents so teachers have this/her attitude of not wanting to talk to parents
 - Parents are very supportive but concerned about grades because they want their kids to go to college

- Scheduling / grading system inhibits authentic learning
- Teacher G:
 - Doesn't like reassessment but for a different reason than most teachers say
 - Says that it's not a huge time commitment for his/her but for his/her students (she is part time keep in mind)
 - Some students have jobs after work and it's not reasonable for them to have to hand in every assignment in order to reassess
 - He/ She says she learns important things from talking to parents
 - Important to be a good role model and make the students aware that they are here to help the student learn (easier said than done)
 - Some students motivated by grades some aren't and the struggles is getting both interested at the same time
- Teacher H:
 - Likes idea of having real life application (have students know where they're going with learned info)
 - Ex. Acting out Shakespeare and relating it to the modern world
 - Ex. Students who went to Japan use skills
 - Students don't understand what they are trying to do (dense/academic language)
 - Some disconnect between what students are asked to do vs what Oakton wants
 - Reassessment is good idea but not the way it's currently implemented
 - Students need to go back and learn the info
 - Increased student stress (they always feel like they can do better)
 - Drives to grade-based rather than learning
 - Good interactions with parents
- Teacher I:
 - Doesn't believe anything is new or has changed in terms of 21st century teaching - it was already something he has been doing and others in Oakton as well
 - Reassessment is good
 - No problems with it so far, however has heard of it not being helpful for other teachers
 - Students who are struggle don't get the chance to learn more / do well
 - Provides an in-depth knowledge of content
 - Parents have been overall positive
 - The teacher-parent relationship is always learning from each other
 - Sometimes teachers struggle with parent conversations -- mentorship program?
- Teacher J:
 - Mixed feelings on reassessment
 - Helps students correct mistakes and learn info better

- Students use it as a crutch however
 - Parents are good (some parents seem over concerned at times and pressure teachers)
 - Overall strong parental support
- Teacher K:
 - Fewer major projects might make more sense so students can understand the value of it and what it actually means
 - Sometimes teachers feel like it an experimental stage and that feeling seems to be put on to the students
 - Students and teachers are both overwhelmed
 - Reassessment
 - In favor of reassessing, however not DNS (50%)
 - Put a burden on teachers
 - Some limits need to be established, but is okay about reassessing
 - DNS - inflation of grades
 - If you cheat, do not submit - you get 50%
 - Fear that students might not get into college, because colleges will hesitate about the students grades
 - Colleges don't know who is a good student or who just got by
 - Parents
 - Mixed
 - Wonderful and challenging
 - Warm and encouraging, extremely welcoming - positive feedback
 - Sometime parents have an entitled behavior - students aren't getting an A
 - Pressuring teachers - a lot of it feels like 'I need my child to get into college'
 - Not as overwhelming as a private school might be
- Teacher L:
 - Mixed opinions on reassessment policy
 - Good that it gives students a 2nd chance
 - Hard to make kids used to reassessment when it comes to college
 - Overall positive experience with parents
 - Welcoming and respectful/supportive
 - Parents are very driven (can put pressure on students)
- Teacher M:
 - Doesn't like reassessment policy
 - A lot of work for students and teachers
 - Kids don't try as hard which leads to procrastination (students will be leaving all tests until the end of the week)
 - Stressing students a lot
 - Students will hit college and realize they can't retake
 - Could be helpful in regular classes but not honors/AP

- 80% + should not retake
 - Parents are very involved
 - Communication is a must
- Teacher N:
 - Likes reassessment policy.
 - It motivates the students to do their work and helps them understand the material more.
 - Is more work for teachers
 - If they are going to take the reassessment, they need to show me they put more effort into learning the material
 - Overall interaction with parents is good
 - Mostly through email

Appendix E: Survey Questions



WPI

Thank you in advance for participating in this survey!

First and foremost, we as WPI (Worcester Polytechnic Institute) students hold **NO AFFILIATION** with Oakton's administration or faculty. We want to emphasize that all responses will be analyzed by us (the WPI Students). Similarly, all individual responses are **ANONYMOUS**. We are working on a 14 week project for our school which is a collaborative project-based learning experience hosted by Oakton High School.

We will analyze individual responses and present aggregate conclusions to administrators and department chairs

As a requirement of WPI, our final report including analysis of the data collected through your responses will be published. **However, no names or individual responses will be released.**

>>

What department are you a part of? (Check all that apply)

- Art
- Career & Technical Education
- English
- ESOL
- Mathematics
- Performing Arts
- Physical Education
- Science
- Social Studies
- Special Education
- World Languages

How many years have you taught at Oakton High School?

- 0 - 2 years
- 3 - 5 years
- 6 - 10 years
- 10+ years

How long have you been actively involved as a teaching professional?

- 0 - 3 years
- 4 - 7 years
- 7+ years

Rank (in order) five of the following skills that you believe you promote within your classroom? (1 being greatest, 5 being least important of your top 5). If a skill is not listed below, please select "Other" and specify in the following question.

- Critical Thinking
- Communication
- Analysis
- Creative Thinking
- Time Management
- Goal Setting
- Presentation Skills
- Leadership
- Initiative
- Responsibility
- Flexibility
- Organization
- Motivation
- Problem Solving
- Disciplinary Skills
- Other

If you selected "Other" in the previous question, please state and rank the skill(s) below.

Which of the following forms of technology do you regularly employ in your teaching? (Check all that apply)

- Laptop Cart
- Laptop Speaker
- Interwrite Tablet
- iPad
- Projector
- Clickers
- Calculators
- Smart Boards
- Document Camera
- Smart Phones

What other forms of technology would you employ if they were made available to you?

Are you satisfied with the technology in your classroom?

- Yes
- No

Please describe any issues or concerns you have with the technology in your classroom.

In your own words, what is your definition of a project?

Do you utilize projects within your classroom?

- Yes
- No

When designing a project, which of the following criteria do you use? (Check all that apply)

- In-depth Inquiry
- Driving Question
- Student Voice and Choice
- 21st Century Skills
- Critique and Revision
- A Need to Know
- Significant Content
- Public Presentations
- None of the above
- Not applicable

Please state any additional criteria you use that were not mentioned in the previous question.

How often do you assign projects?

- Never
- Once per year
- Once per semester
- Once per quarter
- Once per unit

How long should a project in your discipline take?

- One week
- One month
- Two months
- Four months
- Entire school year

To what extent does standardized testing influence your teaching?

- Not at all
- Somewhat
- Occasionally
- Very frequent
- All the time

If standardized testing was not a factor, would this change your teaching methods?

- Yes
- No

In what ways does standardized testing influence your teaching?

How often do you interact with parents?

Never Less than Once a Month Once a Month 2-3 Times a Month Once a Week 2-3 Times a Week Daily

What are the common themes in the conversations you have with parents? (IE. Grades, Assignments, Behavior, etc.)

How would you generally characterize your interactions with parents?

Stressful Unsatisfactory Satisfactory Excellent Delightful

As a reminder, we as WPI student hold **NO AFFILIATION** with Oakton's administration or faculty. We want to emphasize that all responses will be analyzed by us (the WPI Students). We will analyze individual responses and present aggregate conclusions to administrators and department chairs.

All individual responses are ANONYMOUS.

If you have any other information you would like to share, please comment below.

Thank you for participating in our survey! We appreciate your time to respond to these questions!

We will contact the winners of the raffle directly via email upon completion of our survey polling.

Thank you again!

>>

Appendix F: Survey Responses

1. What department are you a part of? (Check all that apply)				
#	Answer		Response	%
5	Mathematics		10	18%
10	Special Education		10	18%
8	Science		9	16%
9	Social Studies		9	16%
3	English		8	14%
2	Career & Technical Education		6	11%
11	World Languages		3	5%
6	Performing Arts		2	4%
4	ESOL		2	4%
1	Art		2	4%
7	Physical Education		1	2%

2. How many years have you taught at Oakton High School?				
#	Answer		Response	%
1	0 - 2 years		19	34%
2	3 - 5 years		15	27%
3	6 - 10 years		12	21%
4	10+ years		10	18%
	Total		56	100%

3. How many years have you been actively involved as a teaching professional?				
#	Answer		Response	%
3	7+ years		33	59%
1	0 - 3 years		12	21%
2	4 - 7 years		11	20%
	Total		56	100%

4. Rank (in order) five of the following skills that you believe you promote within the classroom.

#	Answer	1	2	3	4	5	Total Responses
1	Critical Thinking	19	12	7	3	2	43
2	Communication	10	6	13	6	1	36
14	Problem Solving	8	10	4	5	8	35
10	Responsibility	3	7	6	7	5	28
3	Analysis	3	8	5	4	4	24
4	Creative Thinking	5	6	4	4	2	21
5	Time Management	0	0	3	4	7	14
12	Organization	0	2	3	4	5	14
9	Initiative	1	0	1	5	6	13
11	Flexibility	1	0	2	2	5	10
13	Motivation	1	2	1	3	3	10
7	Presentation Skills	0	1	2	3	3	9
6	Goal Setting	0	1	3	4	0	8
16	Other	4	0	1	0	3	8
15	Disciplinary Skills	0	0	0	1	1	2
8	Leadership	1	0	0	0	0	1
	Total	56	55	55	55	55	-

5. If you selected “Other” in the previous question, please state and rank the skill(s) below.

Computational thinking, independent learner

Life skills

Application

Collaboration

Focus on IEP goals/communication skills

Collaboration

Vocational skills

Critical reading

Global skills and multicultural education

6. Which of the following forms of technology do you regularly employ in your teaching? (checking all that apply)

#	Answer	Response	%
5	Projector	50	89%
1	Laptop Cart	29	52%
10	Smart Phones	28	50%
2	Laptop Speaker	23	41%
7	Calculators	23	41%
8	Smart Boards	12	21%
9	Document Camera	8	14%
6	Clickers	7	13%
4	iPad	7	13%
3	Interwrite Tablet	2	4%

7. What other forms of technology would you employ if they were made available to you?

Tablets/e-readers, my own class set of laptops/computers, my own document camera, clickers

Tablets, smart board, graphic design software

Something better than Blackboard.

Smart Board, student access to a laptop at all times

Smart Board, iPad

Smart Board, iPad

Smart board!

Smart board

Smart board

Smart board

Raspberry pi, HD projector, class set of android tablets for mobile app development

Probes

I would love a class set of mini I pads that we could take into the field/outside the classroom... (not all kids have smartphones) Digital documentation, notes, movie-making....

IPad for Algebra I

IPad, Document Camera, Smart Boards

IPad

IPad

IPad

Desk top computer

Dark Room, the original technology :)

Computer workstations, as I teach AutoCAD.

Computer lab

Clickers, Smart board and iPad

Clickers

Camera attachments to microscope

A smart board

1:1 technology

8. Are you satisfied with the technology in your classroom?				
#	Answer		Response	%
1	Yes		28	50%
2	No		28	50%
	Total		56	100%

9. Please describe any issues with technology in your classroom.

We do not have a lot of technology - teaching a larger class of 66 students makes it difficult to employ the laptop carts, as I cannot get enough for each student.

The laptop carts do not work on a regular basis.

Our projectors and sound system is not wired into the ceiling. We do not have smart board technology, document camera, etc. Laptop carts are often very slow and/or broken.

Availability of computers, other teachers not respecting sign-up features for computers

The projector takes up teaching space and the way that my room is arranged almost depends on how the projector will fit in the middle of it.

I'm ready to be paper free and have all work/material/production take place on personal computers.

The computers work much too slow and the battery life is too short to finish an activity. In addition, there are often not enough computers for all students to use. A majority of classes do not have smart boards, which could increase class instructiveness.

Laptops are old; many slow to boot up or don't work at all.

Need more computers

The interwrite tablet I have loses its connection on a regular basis. A smart board would allow for more student interaction.

We have access to iPad but not the apps that we need to complete our job.

The desktop computers are very slow, discouraging students from using them to complete research and typed information.

I feel there is better, more engaging technology for a teacher other than a projector.

Projector gets moved sometimes (wish it was in the ceiling)

The laptops available to the classrooms are antiquated and our internet connection is very slow.

Printing and Copying are nightmares.

Outdated software, lack of interactive materials / curriculum and horrible network upload speeds.

Would like a TV that isn't 800 pounds and taking up a ton of space

There's no good way to use the projector in my room. The screen is in the back. It would be nice to have one of those mounted ones that many other teachers/classrooms have.

I just don't have enough. I can only provide computer access to my students about half the time that I would like to, and even then, the laptops are slow or broken, and there are rarely 32 working machines (which is the size of my largest class). There is only one (ONE!!!) All-school computer lab that teachers can reserve, and it's usually in use for testing or some other school initiative.

The desktops are bulky - they take up room that could be used for project work or display, even though I do like that students stand to use them.

It is cumbersome and time-consuming. Due to the logistics and set-up of my room, I have to do a lot of reconfiguring whenever I switch between devices (computer vs. Document camera). I don't have a Smart board and the Laptop carts are not accessible.

Dated with insufficient battery life for laptops- looking forward to our soon to be renovated school

We have a need for more up to date technology. We need to be more mobile and secure. We need a device that allows multitasking.

Need more access to laptops

Our classrooms are limited in terms of technology and the school library should expand hours so ALL students have more access to technology outside of the classroom.

Computers are very old and slow. They take forever to start up.

It is beginning to be Out of Date. To constantly have to adjust the projector each day is a pain.

Projector - too close to my board and therefore projects too small. There is nowhere else to move it.
Laptops - quite slow and could do with been updated. I would also like either a smart board/tablet to use in class as i am restricted in my teaching styles

10. In your own words, what is your definition of a project?

A project is a broad, multi-faceted opportunity for students to demonstrate or obtain knowledge and understanding, often through a medium of their own choosing.

Uses learned skills and applies them to the real world

An assignment that involves students taking ownership of their own learning.

A project is a real task that has a deliverable product at the end.

Something that the students work on independently, or as part of a team/small group in order to gain the knowledge/information in the curriculum

Students choose a research question to gather evidence to find a possible solution

A collaborative effort by a group of students to achieve a common objective.

A task that is designed to achieve a particular goal

Something students research and work on independently over a period of time

Make deeper connections with content and outside world, practice research, presentation, research skills

Any activity that requires students to be creative and apply the key principles taught in the course.

A project is an assessment where students extend their understanding beyond the basic content in a meaningful way.

A process by which students engage in extended critical thinking and produce a product for an authentic audience.

Activity that requires independent learning and research in order to achieve a particular goal or answer a multifaceted question

An opportunity for the student to make the subject meaningful to herself and share that new found knowledge or connections with others

A long-term activity that culminates in a finalized product (although that product does not have to be physical). The final product should show student understanding of the lessons used in building up to it.

Connects student learning to real life application. Actively engages students

An opportunity to apply curriculum content to "real" or authentic problems

A real-world and ongoing learning experience where students develop the skills and knowledge along the way while working toward a complete and final product.

An assignment designed to engage the students that is not teacher led

A project is a culminating activity that allows students to synthesize and present what they've learned in a given unit of study. Ideally it's an authentic learning experience that is student-driven, allows for choice and focuses on what students can do with their newly acquired knowledge.

A group collaboration effort that demonstrates knowledge about a topic.

A group of students working together to create something dealing with the topic they just learned

Projects in my classroom are based on fulfilling real-world expectations that young marketing professionals would encounter in the workplace.

Projects are assignments where the result solution, product, or artwork requires individual brainstorming, drafting, and focused work. Solutions vary in appearance from student to student, as opposed to Exercises, which in our discipline are skill building assignments where students resulting work appears largely the same, and requires less creative thought or problem solving.

A major task involving investigation, critical thinking, and presentation.

An exploration/process of an idea/concept that culminates in a visual response

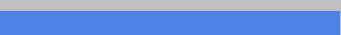

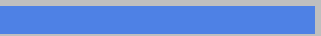






Something that is student driven, student created, and student produced. I as the teacher take the role of guide and resource.

An authentic problem to be solved

Any multistep process

A project is an open-ended demonstration of learning as it takes place (or has already occurred in some cases), chosen by students and/or teachers.
Application of technology and knowledge to create something that is applicable to the real world
Exploration of a topic in a way that is applicable and realistic
An interdisciplinary exploration of ideas / concepts related to a topic within a given subject.
A set creative goal that must be accomplished with certain parameters within a set amount of time.
A multi-component presentation.
A multipart assignment that culminates in a presentation to "sell" it to our class audience.
An activity that produces something that students have created and that shows investigation into and mastery of a desired outcome or objective
An assignment that enhances the knowledge study in class, hopefully by helping the students make connections to the material.
Some sort of presentable material and extra thinking rather than traditional homework
A long-term assignment that challenges students to investigate and produce in a way that builds their mastery of course knowledge and objectives.
Multi step experience applying somewhat real-world problems
A project is a specialized tool for learning that typically involves planning and research in a group or individually to address content learning needs. A student or group is expected to use an organized approach to divide or share tasks, communicate and collaborate, and to develop a well-honed final product (or set of products) that demonstrate(s) their learning.
Something that requires a student to research, question and analyze a topic and produce something creative to demonstrate their understanding.
An organized, planned endeavor designed to facilitate student learning, often with a collaborative component
A way for students to apply specific skills learned in class to real-world scenarios
A student designed process given a teacher initiated goal
Something that requires multiple disciplines within a subject or across subjects over time.
An assignments that encompasses many skills and enriches understanding of content
Students working together and communicating to solve a problem and generate many possible solutions
PBL
Team work for team results
A project is something lead by the student that takes longer than a typical lab and usually requires more time and effort on the student's part.
An activity that allows the students to use their creativity
Students work independently to research a topic and present the findings
Group effort collaborating on one common goal.

11. Do you utilize projects in your classroom?				
#	Answer		Response	%
1	Yes		49	88%
2	No		7	13%
	Total		56	100%

12. When designing a project, which of the following criteria do you use? (check all that apply)				
#	Answer		Response	%
7	Significant Content		40	71%
4	21st Century Skills		38	68%
3	Student Voice and Choice		37	66%
2	Driving Question		36	64%
1	In-depth Inquiry		31	55%
8	Public Presentations		27	48%
5	Critique and Revision		25	45%
6	A Need to Know		22	39%
10	Not applicable		2	4%
9	None of the above		0	0%

13. Please state any additional criteria you used that were not mentioned in the previous question.

Project roles

Authentic audience

Depends on the project

Experience with lab techniques and field testing

I like to have students reflect on their project after they've presented.

Problem solving using the tools available

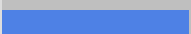




A grading matrix.

An authentic, real-world audience beyond the classroom.

Students sometimes present within the classroom or between classrooms.

Many small check points, rubrics

Creative thinking in product concept and design

14. How often do you assign projects?				
#	Answer		Response	%
4	Once per quarter		22	39%
5	Once per unit		18	32%
3	Once per semester		6	11%
2	Once per year		6	11%
1	Never		4	7%
	Total		56	100%

15. How long should a project in your discipline take?				
#	Answer		Response	%
2	One month		29	52%
1	One week		20	36%
3	Two months		5	9%
4	Four months		1	2%
5	Entire school year		1	2%
	Total		56	100%

16. To what extent does standardized testing influence your teaching?				
#	Answer		Response	%
3	Occasionally		14	25%
4	Very frequent		14	25%
1	Not at all		12	21%
5	All the time		9	16%
2	Somewhat		7	13%
	Total		56	100%

17. If standardized testing was not a factor, would this change your teaching methods?				
#	Answer		Response	%
1	Yes		32	57%
2	No		24	43%
	Total		56	100%

18. In what way does standardized testing influence your teaching?

We teach a unit on the SAT essay, as well as SAT vocabulary to prepare our students for standardized achievement tests.

We have a timeline for teaching skills and getting them all covered. No time to slow down and look at concepts in more detail and depth.

I have to cover more content with little depth instead of less content with more depth.

The fact that we have an AP test at the end of the course does influence the way in which I teach. We are looking at different writing styles and functions through the lens of the free response questions that are covered on the AP exam. While this doesn't change the skills I teach or would teach, it does influence how I talk about these skills and what we sometimes do with them.

Unfortunately, standardized testing directs the curriculum

I insist that students document their work in order to score well on the AP test

Coverage is more important than in-depth learning

I work off the adapted curriculum so it does not influence me as much.

AP World History students have to know 10,000 years of human history according to the College Board. If they don't know the content, they can't pass the exam.

It has a minimal impact on my teaching because there are no SOL standardized tests required in my curriculum.

I am considering the AP Exam a standardized test. It influences the pacing of my class.

I teach an AP course, so I am preparing students to be successful on the AP Lang exam in May. I use College Board materials and demand that they write in timed scenarios to prepare them for the exam. I also give some ungraded multiple choice quizzes to work on that skill.

The state and county have a required Program of Studies. Unmotivated and slow learners need more structure in order to access the content in a content-based class. I feel responsible for these students accessing and understanding all the content that will be assessed in a standardized test.

I teach an AP class. My syllabus has to pass the CB audit. I work on the assumption my students want to pass the AP Exam and trust that I have designed a course that prepares them to do that.

Focus on calculator use and use standardized questions on quarter exams

The county specifies the content that should be taught through the Program of Studies (POS). The POS contains a very detailed list of all the goals and benchmarks that should be taught during the school year. The POS includes the requirements of the Virginia Standards of Learning, plus more. In order to present all of the material, a strict pacing guide must be adhered to. Unfortunately, this leaves little "extra" time for alternative assessments or projects.

As a teacher, I feel compelled to expose students to problems that are similar to the state tests, and (of course) to teach all the content that will be tested completely. Both of these take time in mathematics and don't necessarily reflect how we teachers would prefer to teach the students or to what extent we would spend time on certain topics. I think the most efficient way to change how we teach (i.e. Performance assessments, more PBL, etc.) Is to change the way the state assessments look.

We are held accountable for test scores. Our in-depth analyses suffer at the hands of making sure we hit all the materials.

We have a common assessment the county requires us to give at the end of the year. Because of this test, I don't spend as much time on certain units as I'd like, because I need to get through a certain amount of material. Not having this assessment would give me more freedom to delve deeper into certain units and really focus on the student's ability to use their language in different contexts.

It is frequently used to document progress for an IEP goal, often it does not adequately assess mastery or lack of mastery with an IEP goal.

I have one class which has standardized testing (World History 1) and four that do not (two preparations: Government and Basic Skills Resource). In the two classes that do not require standardized testing, I have much more freedom to explore current events, work on vocational skills (such as communication and outside interactions) and relate that to the content that is being taught. For the World History class, I am required to teach a set curriculum with the understanding that I am the major source of information for the students as required for the Standards of Learning test at the end of the quarter. With that responsibility, I cannot use class time to explore the 21st century skills, vocational training, or collaborative learning that I would if I had more liberty to use class time as I see fit rather than to teach to a test.

I'm aware of it, but I don't let it take over my teaching and doing what's best for students.

The types of questions I ask my students are similar to questions they will see on specific standardized tests.

Standardized testing drives the pacing and exacting nature of what is taught. We can go beyond the requirements, just not below. The quick pace demanded can lead to breadth and lack of depth, unfortunately. Would like to have opportunity to really delve into matters in a more natural way, as students' interests and needs demand, rather than be concerned with "pacing" and "coverage" of tested material to the extent that we are.

The students having an AP exam at the end of the year influences how I score the students responses, how I review with the students, as well as what notation and detail that I expect from students. It also effects my pacing of the material, as the AP exam is in May.

In AP Classes, the AP exam drives the entire curriculum. This determines what subjects / topics / ideas I am required to cover by the exam date.

I have to prepare them for a multiple choice grammar and vocab based county final exam

Teaching an Advanced Placement class means that you have to cover all of the material so the students are prepared for the test. Without the AP exam, I could focus on more activities to enhance deeper knowledge of the material, rather than rushing through the connections.

Teaching to the test. Covering material that is on the test and not covering topics that I would most likely cover if I had more time and didn't have to worry about reviewing for the test.

I am lucky because my students do not take an end-of-course high-stakes test. Additionally, most of our standards are skill-based, so we have lots of flexibility in the content and assessments we can choose to move students toward skill/standard mastery. Where our progress is stymied is in trying to collaborate to develop interdisciplinary projects and assignments. So many of our colleagues, particularly in content areas where the standards are knowledge/content-based (i.e. Science and social studies) feel so much pressure to cover all of the content that could be on the SOL that they feel they can't spend 3 weeks of class time on an inquiry-based interdisciplinary assignment. I don't think there are any teachers at this school who feel that their teaching is helped or enhanced by standardized testing.

Have to cover SOL material, and in honors class get them prepped for AP courses. Not a lot of time to go deep ... Really driven by memorization which sucks.

I would like to be able to follow student paths of interest more often...Right now I think I shape their interests, taking a lead from them and pointing it in the direction of our Standards of Learning/Program of Studies. I feel pressure to cover the well-beaten path, and while I step off of it to show students the "sights" I'd like more time to let them dig around in a meaningful way, so they can discover the world themselves.

Having to move through the curriculum at a rapid pace that does not fit with the learning styles of my students. I am able to go in-depth on some topics, but I sometimes feel like we sacrificing breadth for depth. I think historical thinking skills are far more important than "covering" a certain number of standards.

Students who have not passed their SOL tests are invited to remediation workshops that I teach. In addition, I meet with individual students to review their performance by question reports, noting strengths and needs, to focus instruction.

Teachers are held accountable for how students perform on SOL's - so I feel it plays a big part in how and what I can teach; there might be some geometry concepts that students would never encounter in the real world or outside of school, but I'm forced to teach it because it will be on a test at the end of the year.

Ever mindful of targets students must attain for pacing of curriculum

I must ensure that all my students have learned the required standards of my course per state requirements.

Na

We follow the 9th grade English Program of Studies and standards in ultimate preparation for the 11th grade English SOL. Also, for our science and history classes -- we follow Biology content and World History 1 content. For math we are preparing students to move eventually to Algebra 1.

Often I explain how a standardized test would present a question for application of the concept so that beyond what the assignment actually is that unit, students can appreciate the skills have relevancy/accountability in the future.

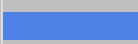





We must go at a good pace to cover everything from the sols to be sure the students have been introduced to all the ideas and concepts. We have to keep on schedule.

You have to meet the needs of the test in order to be viewed as a successful teacher.

Restricts the relevance of what/how we teach. We try to link all content to real-life situations but sometimes this is difficult. Also on some topics we don't go into much depth in things that students enjoy learning about. I would like to be able to run with how the students respond. If they are enjoying something then let it continue.

Ensuring I cover all of the necessary content in a timely matter.

19. How often do you interact with parents?

#	Answer		Response	%
4	2-3 Times a Month		16	29%
5	Once a Week		13	23%
3	Once a Month		10	18%
6	2-3 Times a Week		7	13%
7	Daily		6	11%
2	Less than Once a Month		4	7%
1	Never		0	0%
	Total		56	100%

20. What are the common themes in the conversations you have with parents? (IE. Grades, Assignments, Behavior, etc.)

The most common theme is grades, followed by assignments. Usually the parents are just curious about what they should be recommending to their students in terms of improvement.

Grades

Unsatisfactory grades, work that is not turned in.

Grades and behavior

Grades, behavior, upcoming tests, study skills

Attendance issues, achievement issues, grades

Announcements through Blackboard, letting them know what is going on in class, project expectations and deadlines. Occasionally I contact them for behavior but not too often. I always send an email out prior to sending them progress reports, which explains what the grades are from and how long students had to work on these projects. However, in order to avoid grade shock, I know send out announcements at the start of major projects, letting them know expectations ahead of time.

Grades

Behaviors- GOOD

Grades

We primarily discuss what we can collectively do to help their child succeed in the class.

Grades.

Grades

Grades, how to help students do better

Concern about grades and/or the work habits of their child.

We mainly talk about grades or other issues students are having in class. Occasionally parents will contact me with opportunities or information that might be valuable to pass on to students.

Grades and behavior (cell phone)

Parents are usually concerned about their child's grade and how their child can improve. Sometimes the concern is about mental or health issues that their child is dealing with. There are a few cases where discipline or attendance is a problem.

Concerns, grades, behavior, etc. Contact is typically made via email, phone or parent conferences.

Grades, achievement, behavior

Missing work, checking in on grades. Requesting parents' assistance to remind students to come to Cougar Time for extra help.

Progress toward IEP goals.

Grades

Behavior

I believe that at the high school level, it is important for students to learn to navigate the waters of academia as independently as possible. Parental involvement, aside from grade reports, is generally not required unless a student is failing to succeed due to a lack of effort, attendance, or participation. Most conversations I have with parents are related to grades, and whether or not students can revise poor quality work for a higher grade, or turn in late work for credit. Behavioral concerns severe enough to warrant parental notification are rare, and usually accompanied by disciplinary action. In my experience, speaking directly to students one on one about their performance is usually enough result in behavioral changes and help get them back on track.

Discussing grades, individual assignments, use of school resources, and connections to Individualized Education Plans (IEPs)

The most common conversation I have with parents is about cameras, technology and ways they can support their student is the creative process.

Most parents are concerned about their student's grades.






Their sons/daughters future plans.

That the student should take advantage of the retake policy to improve understanding of skills

Work completion, timeliness, behavior, grades.

Positive communication
Grades and Assignments
Grades and missing work. When communication has occurred at back to school night or parent-teacher conferences, the parent conversations are usually much less formal and get better results.
Assignments, behavior, schedule
-Upcoming music events -volunteer needs -grading policies -fundraising -involvement
Hard to say, as I talk to parents periodically discussing their student. Never an issue for behavior, but rather to complement their child for a positive occurrence in class.
Mostly grades and preparation for assessments
Grades, how to support the students at home.
Grades, lack of effort, behavior, missing assignments
If the parents initiate contact with me, it's because they want their child to get an A (and usually they have a B) or because they perceive that I have done their child some kind injustice (grading, class policy, etc.). If I initiate contact with parents, it's usually because I have a major concern, like a student hasn't turned in any work for a month, or there is a major behavioral issue. I have so many students with so many needs that I do not have time to initiate contact with parents over minor concerns (i.e. One missed assignment)
Grades
I have some parents who contact me once to twice weekly, and others who do not respond to my outreach....But overall, parents seem to be concerned with grades and assignment completion or behavior. Because I work with students with diverse learning needs, most parents with whom I have regular contact, want to make sure that their son(s)/daughter(s) are coping/managing/thriving in their high school experience. I love being able to convey how interesting and enjoyable their kids are to interact with -- to express how they are showing growth. Even when we must address issues or needs, I want parents to know that I will work with them with compassion and intelligence to help alleviate whatever issues arise.
Grades and IEPs
Typically grades, or special education considerations
Grades and retakes
Student needs, parent concerns
Grades, behavior,
Most students ask questions about grades and assignments. I am often notified about student absences as well.
Celebrate strengths and achievements, make parents aware of resources and or events coming up, respond to concerns or questions parents have or areas of need to address with families.
Grades, behavior
Grades, infrequently behavior that negatively impacts grades.
Yes, grades, assignments, and behavior. Picking up work for sick kids, kids that had surgery, struggling students, family issues, kids that have hurt themselves due to stress and we are helping them get back on track. Ordering things for science fair project, using equipment for science fair project.
Grades, grades, grades
Grades/retakes/missing assignments/extra help
Grades, grades, and grades.

21. How would you generally characterize your interactions with parents?

#	Answer		Response	%
4	Excellent		28	50%
3	Satisfactory		23	41%
5	Delightful		3	5%
2	Unsatisfactory		1	2%
1	Stressful		1	2%
	Total		56	100%

Appendix G: Similar Organization Directory

Sammamish High School:

Hours of Operation: 7:00am – 3:00pm

Main Office: 425-456-7600

Principal: Tom Duenwald

Work Number: (425) 456-7604

Abstract:

Sammamish High School is a public school located in Bellevue, WA. The school is currently in the transition of transforming the school into a 21st century school by implementing project-based learning into the curriculum. Sammamish applied for an Investing in Innovation grant from the Department of Education. Sammamish is currently undergoing their five year plan to shift towards 21st century teaching. Sammamish found implementation obstacles such as teachers not understanding how to inject PBL into their classroom. However, Sammamish has used interesting methods such as collaborating with companies to sponsor projects.

New Tech West

Hours of Operation: 8:00am – 3:10pm

Main Office: 216-281-1030

Principle: Erin Few

Email: Erin.Few@gmhs.cmsdnet.net

Work Number: 440-227-0461

Abstract:

New Tech West focuses on giving students a curriculum that builds on skills essential for success in college and beyond. This institution focuses on project-based work for students and having students work in groups to complete a common goal. New Tech Network has provided professional development to help with the implementation of new teaching methods along with tech coordinators to help with technology which is important for teaching. New Tech West is going through similar implementation obstacles and may be able to provide insightful information.

New Tech Network

Director: Paull Curtis

Email: Pcurtis@newtechnetwork.prg

Work Number: 707-259-5962

Abstract:

New Tech Network is a non-profit organization that helps institutions foster innovate learning environments. This organization promotes project-based learning as the primary method of incorporating 21st century learning. New Tech Network has provides professional development and hands-on mentoring for teachers apart of the network. They work with

numerous schools within the United States and Australia. New Tech Network has seen many different obstacles found when innovating.

Appendix H: Projected Timeline

Project-Based Learning at Oakton High School Projected Timeline	Oct. 27th	Nov. 3rd	Nov. 10th	Nov. 17th	Nov. 24th	Dec. 1st	Dec. 8th	Dec. 15th
Observational Studies								
Interviews								
Surveys								
Review Notes								
Draw Conclusions								
Make Recommendations								
Final Report								

Figure 17 Projected Timeline