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Shifting School Design to the 21st Century: Challenges with Alternative Learning Environments

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SHIFTING SCHOOL DESIGN TO THE 21ST CENTURY:

CHALLENGES WITH ALTERNATIVE LEARNING ENVIRONMENTS

By

Bryan H. Perez

A THESIS

Presented to the Faculty of
The Graduate College at the University of Nebraska
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There is a need for major change in our educational system and in particular the design of schools. Our existing school model was defined in the mid- to late-1800s, as a response to the Industrial Revolution, and does not reflect the needs of the next generation of 21st century students. One of the key elements of change in schools is the shift from confined classrooms towards alternative learning environments – spaces that are designed for a specific learning type or activity.

This thesis focuses on secondary education and examines three schools identified as having innovative school designs. While all three schools are professionally recognized as innovative institutes by the American Institute of Architects (AIA) Committee on Architectural Education (CAE), their local AIA chapter, and/or by the Association for Learning Environments’ James D. MacConnell Award, they vary in curriculum, program requirements, size, and site context.

The research of these schools uses a qualitative mixed method approach to measure the effectiveness of alternative learning environments in secondary schools. It is conducted through a combination of an inventory and analysis of each school’s program and spaces as well as through a questionnaire sent to the faculty, staff, and administration of each school to assess the use and qualities of the alternative learning environments in
their schools. The objective of this research is to identify the positive and negative impacts of the alternative learning environments on the school’s organization, curriculum, educators, and students.
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Introduction

American schools are distinctly identifiable and have seen minimal change over the past century, with students today learning in similar classroom environments to the students three generations removed. School design is based on an outdated educational model established during the Industrial Revolution that is based on social and societal constructs focused on conformity and standardization modeled after industrialism, grouping students by age and educating them by the masses through the dissemination of knowledge (Robinson 2017). Classrooms are designed for students to sit in rows of desks and chairs facing a presentation wall where teachers lecture and students take notes by hand (Wallis and Steptoe 2006). According to Henry Sanoff, as school design perpetuates mass standardization, research indicates increasing evidence that students learn best in different educational settings depending on their abilities, causing the one-size-fits-all approach to be replaced by more diverse learning environments (Walden 2015).

The future of schools and the architects and designers who design them are faced with significant design challenges to positively impact the future of learning environments. Opportunities lie in challenging the traditional model of schools where students are grouped by age and passively receive compartmentalized information, and instead proposing new design models of customizable learning spaces for and by the learner and connecting instruction to the interests and lives of the students (Goodwin et al. 2010). This new model of customization would offer student-focused instruction in smaller networks of highly personalized education based on 21st century skills including collaboration, interdisciplinary thinking, and technology integration (Horn 2015; Wallis and Steptoe 2006; Jones, Jo, and Martin 2007). Acknowledging that school design is
changing has prompted many speculative and post-occupancy evaluations schools that have integrated new environments. These speculative and post-occupancy evaluations are creating best practice models of designing diverse learning environments in schools, and are measuring the impact of new space typologies in the school’s organization, infrastructure, and curriculum. This thesis will analyze the impact and effectiveness of diverse learning environments in three 21st century schools in an attempt to quantify the need for alternative learning environments and contribute to continued research towards best practices for educational design. The analysis includes the type and size of the learning environments, their relationship to the curriculum, and their positive and negative impacts on the teaching methods, student learning, and overall school organization.
1. Literature Review

1.1 History of American Education

1.1.1 The One-Room Schoolhouse

The first classroom in America was in the one-room colonial schoolhouse, established under the first statute in America by the Massachusetts Bay government in 1647. This statute required the establishment of an education system with a provision to build a school building (Gulliford 1991). Known as the “Old Deluder Satan Law”, the government also required all towns of 50 or more families to provide a teacher for reading and writing to educate the youth (Gutek 2013). By nature, these schoolhouses were built in rural towns and were centralized and multi-functional. They were the identity of their community and in addition to providing a space to educate town’s youth, the schoolhouse was used for other town functions too, including town meetings, voting, fundraisers, and celebrations (Lackney 2015). Roughly the size of a standard home, notable exterior features included clapboarded sides and a shingled roof while the interiors were comprised of planked floors with minimal, simple furnishings, poor ventilation, and oil lamps for light and wood burning stoves for heat (Monaghan, n.d.; Lackney 2015). In more urban settings, the schoolhouse was comprised of two, four, or six classrooms next to each other with a private, exterior entrance provided for each classroom (Lackney 2015).
Figure 1: Drawings for Chancellor Avenue School in Newark, New Jersey. Historic American Building Survey. 1784. From the Library of Congress Prints and Photographs Division, Washington, D.C. Digital Image.
In his book “School Ways”, Ben Graves details the educational experience of the one-room schoolhouse:

The teacher worked with one or two students of the same age or learning ability, making direct supervision possible. After hearing recitations from one or more pupils, the teacher moved to the next individual and repeated the process. Children were exposed to every lesson. Many times they heard it time after time as older students recited for the teacher in front of the room and then read it themselves from their texts. Students worked at their own pace and were promoted from reader to reader when the teacher believed that each was ready. One student reported that the one-room schools provided ‘the almost unlimited opportunity for the gifted pupil to advance.’

During the Industrial Revolution, America experienced not only a growth in factory jobs, but also a large westward migration of homesteaders and an increase in English immigrants (Gutek 2013). In response to the shift in the population and job market, rural towns paved way for urbanized cities. Due to the population growth and westward expansion, schoolhouses in the nineteenth century became localized and decentralized. The one-room schoolhouse remained the primary educational facility through the eighteenth century and most of the nineteenth century. As of 1913, there were 212,000 one-room schools educating approximately half of American schoolchildren, but by 1990 there only 792 one-room schools in operation, accounting for less than 0.5% of all public school buildings in operation (Gulliford 1991).
1.1.2 The Common School Movement

In the 1840s, the establishment of the common school movement helped to unify education across the nation and was instrumental in Americanization, defining an educational democracy for all ethnic, religious, and social backgrounds (Gutek 2013). The common school taught reading, writing, and arithmetic as well as formalizing school through the first hierarchical organization of schools by separating students who are eligible to advance to a higher grade from those who are not ready (Gutek 2013; Lackney 2015). This organization was the beginning of the grade levels that are apparent in schools today. Increased populations in the mid-nineteenth century also lead to increased classroom sizes in urban cities, supporting 50 or more students per classroom (Lackney 2015).

1.1.3 Henry Barnard and the Rise of School Architecture

In 1842, Henry Barnard’s book titled “School Architecture” standardized the American schoolhouse, providing principles for the design of school buildings as well as the organization of the school and its furnishings within. Barnard reiterated the importance of school designs, “emphasizing school ‘architecture’ over school ‘building’ by suggesting that the architect is ultimately concerned with the cultural, spiritual, and humane value of his work, while the builder is primarily concerned with its physical structure, reasonable cost, and the service of function” (Lackney 2015). The book was created as a response to the “disgraceful condition of the average schoolhouse” and became a “major manual on the art of building and equipping schools” (McClintock and McClintock 1970).
Barnard referenced existing schoolhouses while identifying design principles to help standardize the American school to promote the physical, intellectual, and spiritual well-being of the students and teachers. Prior to “School Architecture”, schoolhouses consisted primarily of classrooms and corridors. Instead, Barnard supported the introduction of support spaces in the school’s design, in particular libraries and playgrounds. He also detailed the size and types of furnishings that should be provided in each school. This included the teacher’s desk at the front of the classroom with a chalkboard for instruction, and the pupils’ desks and chairs organized in rows facing the front and bolted to the floors (Barnard 1970). By the late nineteenth century, other major design changes included wider hallways for increased traffic flow and the inclusion of auditoriums, large assembly halls, administrative offices, and specialty classrooms for art and science (Lackney 2015).
Figure 2: Westfield State Normal School House Floor Plan. From Henry Barnard's School Architecture. 1850. 141. Digital Image.
1.1.4 The First Graded Public School

Built in 1848, Quincy Grammar School in Boston, Massachusetts is the first graded public school in the United States (Graves 1993) and is “an oft-cited example of early factory model design principles [whose] design [was] replicated across the country throughout the 20th century” (Lackney 2015). The school accommodated 660 students and stood four stories tall featuring classrooms opening onto a common corridor. Each classroom measured 31 x 26 feet, a common dimension still present in modern
classrooms, and was furnished with individual desks bolted to the floor with seven rows of eight desks in each row (Figure 4). Each classroom also housed 55 students, which had become a common class size in the mid-nineteenth century with the boom in population growth. (Graves 1993)

1.1.5 The Evolution of Secondary Education Curriculum

In addition to providing a primary educator for the towns’ youth, the “Old Deluder Satan Law” of 1647 also required larger towns with more than 100 families to provide a Latin grammar teacher (Gutek 2013). Gutek (2013) further discusses the structure of the Latin grammar school, saying it was established primarily for the sons of the town’s elite by providing continued education beyond the townhouse school for boys destined for the Puritan Church ministry or political leadership in their colonies. Attendance at the Latin Grammar school declined as the Industrial Revolution began. By the 1780s, the Academy had replaced the Latin Grammar school as the common secondary education which focused on preparing the rising middle class students for vocational work and citizenship (Gutek 2013). The private academies would maintain as the dominant secondary educational facility until the late nineteenth century, when education shifted towards free public high schools which was able to offer education to a larger population.

Although secondary education had existed in the states prior to the nineteenth century, the structure of the public high school as it exists today was formally defined at the end of the nineteenth century as the United States shifted “from a basically rural agrarian nation to an urban industrial one” (Gutek 2013). Under the Kalamazoo Decision of 1874, the Supreme Court of the United States declared free, public schools paid for by
local property taxes were legal, leading to a vast expansion of public schools (Baker 2012). Gutek (2013) reiterated Justice Cooley’s decision in defense of the Kalamazoo school district, saying “[the decision] to tax the community for support of a high school was based on the state’s obligation not only to provide elementary education, but also to maintain equal educational opportunity for all.”

1.1.6 The Comprehensive Public High School

In 1892, the National Education Association created the Committee of Ten to standardize the curriculum for public education in high schools. The report of the committee defined a school structure that is arguably still evident in high schools today, identifying the public high school’s role of education is for both preparation for students destined for college as well as terminal students who do not seek further education. The committee recommended eight years of primary education followed by four years of secondary education with “no differentiation between subjects or teaching of college preparatory and terminal students” (Krug 1969). The committee also defined a curriculum that focused on a few, select subjects to be studied for longer periods of time, including foreign language, English, math, science, and history (Gutek 2013). Gutek (2013) reiterated the committee’s stance on secondary education, saying “every subject was to be taught in the high school in the same way and to the same extent to each student regardless of his further educational aims”.

Between 1880 and 1920, the high school population increased from 110,277 to 2,382,542 students (French 1957). French also believed the high school’s selective character between 1880 and 1920 was reinforced by three factors: the lack of secondary education tradition among many European immigrants; hidden costs including books,
supplies, transportation, lunches, and clothing; and many rural districts lacked a solid financial base to support the establishment of a high school. Despite these challenges, the comprehensive high school had established itself as an American institution, enrolling 4,427,000 students in 1930 and 9,619,000 by 1960 (Gutek 2013).

The comprehensive high school’s pursuit to provide accessibility to a democratic, general education for all youth would be criticized by James B. Conant towards the end of the Civil Rights Movement (1954-1968). In his book titled “The American High School Today”, James Conant visited and analyzed the educational programs at twenty-two different high schools. Based on his analysis, Conant identified successes and discrepancies with each of the schools, concluding:

“…there is no such thing as a typical American high school…A school that would be highly satisfactory in a small industrial city would be unsatisfactory in many suburban areas, and vice versa…[therefore] avoid generalizations, recognize the necessity of diversity, get the facts about your local situation, elect a good school board, and support the efforts of the board to improve the school.” (Conant 1959)

Conant (1959) also identified twenty-one recommendations to improve the quality of secondary education. Below are a few of Conant’s recommendations that are evident in high school education today:

- **Required programs for all**, including a general education required for graduation and an elective program to urge students to participate in art and music (in addition to physical education). In addition to these programs, a
**standard for pass and fail** should be established, and should be different for elective and general education courses.

- Establishment of a **minimum required program** to allow for the academically talented to engage in additional courses of their interest. A minimum of eighteen courses are recommended, including: four years of math, four years of one foreign language, three years of science, four years of English, and three years of social studies.

- Students should be **grouped by ability** for each subject. Each subject should offer three sections – one for the “more able”, one for the large group who are “average”, and one for those who are struggling.

- The **school day** should be organized in six-, seven-, or eight-period day, with each period occupying as little as forty-five minutes. Seven or eight periods allows for flexibility for students to engage in elective courses including art, music, and practical classes beyond the required academic program.

- The importance of **homerooms** as “significant social units [that aid in] the development of mutual respect and understanding between students with different abilities and different vocational interests”. Homerooms should be a cross-section of the school and include students of all abilities who are “kept together in one homeroom for the entire senior high school course (three or four years)”. 
1.2 The Evolution of the Classroom in 20th Century High School Design

With the secondary education program and curriculum now defined, attention shifted to the design of schools in response to both internal and external factors. Below identify significant modifications or events involving the evolution of school design during this past century.

1.2.1 The 1930s “Open Air School” Design

In his article titled “Needed Research in the Field of School Buildings and Equipment”, T.C. Holy expressed concern for the design of schools, stating:

…so little real research has been done…The explanation may lie in the fact that in the past, and to a great extent at present, the process of education has been largely a sitting-at-a-desk one with the major emphasis on textbook study…The broadening curriculum, the more active methods of learning, and emphasis upon doing and working with things rather than merely studying books – all have focused attention upon the importance of the physical environment and the supply of materials necessary for this changed type of work. (Holy 1935)

The importance of school design shifted in the 1930s, led by two emerging school reformers who supported child-centered learning: Maria Montessori from Italy and John Dewey from the United States. These new ideas lead to an era of innovative school designs to support these programs, shifting the importance of school design from the textbook-centered curriculum to the physical environment and active methods of learning. Designed by such architects as Eliel Saarinen, Alvar Aalto, and Richard Neutra,
these new school designs were known as the “open air school” movement for their emphasis on easy circulation throughout the building, air and lighting quality, and outdoor learning (Baker 2012). Baker (2012) also notes that the importance of child-centered design also lead to increased interest in the psychological effects of school buildings.

1.2.2 The 1940s “Finger Plan” and Crow Island School

Crow Island Elementary School in Winnetka, Illinois was designed by Perkins + Will and Eliel Saarinen in 1940 has been recognized by Architectural Record as one of the most important buildings completed in America during the preceding 100 years, has received the American Ins. The design of Crow Island marks the transition from the imposing scale, formal architecture, and rigid organization of classroom cells within a two- or three-story box apparent in the Victorian schoolhouse to a school designed at the

residential scale using an informal, one-story plan that divided classrooms into separate wings (Graves 1993). Graves (1993) also noted major architectural features of the classroom design which included a lower 9-foot ceiling (compared to the more traditional 12-foot ceilings), window seats, and direct access to the outdoors.

Crow Island was organized using a “finger plan” scheme (see Figure 4), with each wing comprised of individual classroom units attached to a shared corridor like “fingers”. Each classroom was “design in an “L”-shaped that [provided] an entrance foyer with storage and an adjacent bathroom, a separate kitchen project area, and a main classroom space with exterior glass wall on two sides of the classroom and a door to a semi-enclosed outdoor space” (Lackney 2015).

1.2.3 The 1950s Standardization of School Plans

As a result of the baby boom, the 1950s experienced an urgent need to expand the educational facilities to accommodate the population increase. Between 1950 and 1960, 11 million children entered the educational system and approximately 60,000 new classrooms were built each year (“Renovating Early and Middle 20th Century Schools” 1996). The National Council on Schoolhouse Construction estimates the United States spent $20 billion on new educational facilities between the end of World War II (1945) and 1964. The immediate need for new school buildings lead to changes in school building standards and a standardization of school designs.

Known as the “modern school era”, school designs in the 1950s were determined to be more practical and functional than the traditional two- or three-story brick schoolhouses, developing metal-framed lightweight construction using new building...
technologies which lead to schools that were less expensive and easier to build (Hille 2011). This mass standardization of school designs were the result of increasing spatial and financial needs of school districts, focusing on the building’s physical structure, cost, and function. This contradicts Henry Barnard’s previous approach to school design in the 19th century, emphasizing the impact of the building’s architecture on the cultural, spiritual, and humane value on its students and teacher. Hille (2011) also noted that these modern lightweight schools also lead to a shorter life expectancy, though it was argued that schools should be rebuilt periodically anyways.

1.2.4 The 1960s – 1970s Open Plan School

The open classroom design was inspired by elementary schools in England and their use of “informal education”. In his article titled “The Open Classroom Reconsidered”, James Rothenberg maps the design of the open classroom as a result of an immediate need during World War II, when many children were evacuated to the countryside to be protected from the bombing raids (Rothenberg 1989). He says some of the children continued to receive education but to varying degrees, while others were deprived of learning all together during this time.

At the end of the war when children were reconnecting in the classroom, London schools noticed students of the same age had widely varying amounts of education and levels of achievement (Rothenberg 1989). To resolve this issue and refrain from separating students by achievement levels, Rothenberg (1989) added that the schools’ educators sought to develop an organizational form that integrated different aspects of the curriculum and related them to ongoing daily activities and permitted students to learn in ways closer to their natural patterns of gathering and assimilating. He said, as a result,
this lead to classrooms being divided into learning areas with their own topic or subject, or in some schools dividing a larger room into sections for each subject.

In the United States, critiques of traditional schools and education and the recognized connection between the physical environment and students’ learning lead to the exploration of alternative designs and organizations. The Educational Facilities Laboratories developed the open plan concept based on the British primary schools, which influenced the design of thousands of schools between the 1960s and 1970s (Marks 2009). Jeffery Lackney (2015) says “these schools were planned with large, open, flexible spaces adaptable to team teaching [as well as] small-group and individualized instruction that characterized open education”. In addition to the construction of new schools, some existing schools opted to tear down existing walls in hopes to accommodate this new approach (Graves 1993).
Ben Graves (1993) explained the support for this new school design was based on the belief that the open-plan environment promoted self-direction and self-motivation in students which would “lead the individual to be more innovative, self-assured, intelligent, and understanding”. The concept of the open-plan school and the beliefs it supported could be traced back to the flexibility of the one-room schoolhouse but on a larger scale. Unfortunately, due to the lack of implementation of an adequate or systematic training for teaching professionals in the philosophy of open education, as well as noise and visual distraction, these schools failed almost immediately (Lackney 2015).

1.2.5 The 1990s Learning Communities

As educational research continued, the 1990s brought attention to discrepancies between large and small schools, “indicating that participation in school activities, extracurricular activities, student satisfaction, social connectedness, achievement, number of classes taken, and community employment were all greater in small schools relative to large schools, while disciplinary problems, incidents of vandalism, truancy, drug use, and drop-out rates were lower” (Lackney 2015). This concern led to smaller high school designs and renovation of existing larger schools into “schools-within-schools”, dividing the school into smaller autonomous subunits that run as a separate entity within the larger school (McAndrews and Anderson 2002). The design approach of the 1990s also incorporated historical theories and concepts in response to the number of students and size of schools, social factors, and variations of learning spaces. These design implementations included: school wings to create “learning communities”, comprised of a cluster of classrooms and approximately 100-120 students and their teachers; personalized, self-directed learning spaces including variable and flexible sized spaces as
well as individual work spaces; teacher team spaces and adjacent prep and meeting spaces to encourage collaboration and team teaching; collaborative learning spaces including presentation spaces, galleries, studios, and technology labs; and informal spaces such as study spaces, lounges, and outdoor spaces (Lackney 2015).

1.2.6 The Late 1990s Virtual School

By the end of the century, the implementation of digital technologies in school increased. Internet access had become more accessible throughout this decade, with less than 3% of schools providing internet access in 1994 versus 77% in 2000 and 94% by 2005 (Wells and Lewis 2006). As schools became connected, they explored opportunities to expand education beyond their building, from student access of information to high schools offering online courses that could be taken off-site.
2. Characteristics Of 21st Century Learning

2.1 Gen Z – The Next Generation

The Next Generation marks the first born into a digital world and currently represent more than 25 percent of the United States population (Dupont 2015). Also known as Gen Z, this generation includes everyone born after 1996 and are predominantly children of Generation X, born between 1965 to 1976, though some may have Millennial parents, also known as Gen Y and includes everyone born between 1977 to 1995 (“Generational Breakdown: Info About All of the Generations” 2017). According to the Center for Generational Kinetics,

“The end of the Millennial generation and the start of Gen Z are closely tied to [the events of] September 11, 2001…[which] marks the number-one generation-defining moment for Millennials [while] members of Gen Z cannot process the significance of 9/11 and has always been a part of history for them.”

For Gen Z, the Great Recession in 2009 has impacted their behaviors more than the events of September 11, 2001. Compared to previous generations, they are less likely to believe in the American Dream after witnessing their parents’ fear and stress of unemployment during the Great Recession (Magid Generational Strategies 2012). In his article titled “Move Over Millennials, Here Comes Generation Z”, Stephen Dupont also says the effects of the Great Recession has taught the Gen Z to be more independent and entrepreneurial (Dupont 2015).
Characteristics of Gen Z students can be directly related to characteristics of the Millennial Generation, or the Net Generation as named by Dan Tapscott in his book “Grown Up Digital” (Tapscott 2009). Below outlines characteristics of Gen Z and Net Generation students that researchers believe are important factors when analyzing 21st century pedagogy and school designs.

- **Digitally Savvy** - According to Dan Tapscott (2009), students today assimilated technology because they were born in the digital age and grew up with it. They view technology as just another part of their environment and, for many kids, using technology is as natural as breathing (Tapscott 2009). They were raised with personal computers, mobile phones, and other electronics and use the internet for research extensively for their school work and prefer instant messaging and email over the telephone to connect with friends and contact teachers (Jones, Jo, and Martin 2007).

- **Independent and Entrepreneurial** – “According to Gen Z Marketing strategist Deep Patel, ‘the newly developing high tech and highly networked world has resulted in an entire generation thinking and acting more entrepreneurially’…and seek uniqueness in all walks of life” (Beall 2016).

- **Construct Their Own Knowledge** – They crave interactivity and prefer to learn by doing, oriented toward inductive discovery or making observations, formulating hypotheses, and figuring out the rules (Oblinger and Oblinger 2005). “Given the large number of information sources on the Web…today’s youth have the ability to distinguish between fact and fiction.
They appear to have high awareness about the world around them and want to know more about what is happening” (Tapscott 2009).

- **Excellent Multi-Taskers** – These students are immersed in technology and live in a 24 x 7 x 365 world, always connected and in a state of continuous updates, instant access, and immediate responses, resulting in Gen Z being able to process information faster but also experiencing significantly lower attention spans than past generations (Skiba and Barton 2006; Beall 2016).

On the other hand, Gen Z are better multi-taskers than previous generations, “quickly and efficiently shifting between work and play, with multiple distractions in the background … working on multiple tasks at once” (Beall 2016).

- **Collaborators** – “In education, [the net generation] are shifting the pedagogical model from a teacher-focused approach based on instruction to a student-focused approach based on collaboration” (Tapscott 2009). Dan Tapscott (2009) says learning is a social activity. These students prefer to be engaged and interact with their learning, by not only constructing their own knowledge but by interacting with other students, faculty, professionals, and the content itself (Skiba and Barton 2006).

### 2.2 Types of Learning

Research has indicated that pedagogy is moving away from the standardized teach-to-test, one-size-fits-all approach to teaching in order to adopt a collaborative and interdisciplinary approach that is personalized to support the different ways students learn (Arieff 2013). The role of the teacher is also adapting from instructor to mentor, moving
the teacher from behind their desk to a more active role facilitating learning through self-directed student groups and within project areas which are comprised of students from varying backgrounds and levels of academic achievement (O’Donnell Wicklund Pigozzi and Peterson, Architects Inc 2010; Passantino 2000).

In their 2015 research document titled “Reimagining Learning”, Gensler defined learning as “a process not a product…that involves change in knowledge, beliefs, behaviors, or attitudes” (Gensler 2015). Their research also identifies the need to rethink the current classroom design to accommodate a variety of teaching modes and learning, and adapt to ever-changing advances to technology as a result of new approaches to pedagogy and increasing levels of collaboration between schools and industry. In their research publication titled “Active Learning Spaces”, Steelcase reiterates the current transitions in education saying:

For the first time in decades, [schools] are making significant changes in how they teach. Educators are exploring what it means to be learner-centric, adopting active learning pedagogies and embracing technology that supports varied educational strategies…yet both students and educators still face the challenge of having to operate in facilities built for age-old ways of learning and teaching. (Steelcase Education 2014)

Creating a school design that supports the needs of the next generation of students as well as changes to pedagogy requires a variety of diverse spaces that accommodate different activities and learning styles. Below identify research of different types of learning and learning models to be considered for 21st century education.
2.2.1 21st Century Learning Models

Below is a list of new and emerging learning models that have been connected to the needs of Generation Z students and 21st century pedagogy.

- **Student-Centered or Learner-Centered Learning** – Student- or self-directed learning through productively engaging complex, open-ended problems that are aligned authentically with the practices, culture, and process of a domain and provide interactive, complimentary activities that enable individuals to address unique learning interests and needs, study multiple levels of complexity, and deepen understanding (Land, Hannafin, and Oliver 2012; Hannafin and Land 1997).

![Student Centered Learning Chart](image)

**Figure 6**: Student Centered Learning Chart. Dr. Kenn Fisher. From *The New Learning Environment: Hybrid Designs for Hybrid Learning*. 2006. 15.
Problem-Based Learning – Students investigate problems, provide explanations, generate ideas, analyze data, and make judgements as they discuss and analyze real world issues and topics (Alismail and McGuire 2015). Problem-based learning increases student participation and enhances their critical thinking skills, self-directed learning and cooperation, as well as social interaction (Joyce 2015; Alismail and McGuire 2015).

Project-Based Learning – Students plan, implement, and evaluate projects with real-world applications beyond the classroom through interdisciplinary, long term and student-centered learning activities (Railsback 2002). Jennifer Railsback supports project-based instruction for student engagement because it encourages cooperative learning and collaboration as students construct new ideas or concepts based on their current and previous knowledge and are challenged to play an active role in choosing and executing their projects.

Blended Learning – Students learn in part a supervised setting away from home and in part through online delivery with some element of student control over time, place, path, and/or pace (Staker 2011).

Cooperative/Collaborative Learning – Students are divided into different groups with diverse abilities and interests which not only increases creativity and deep thinking as a result of the diversity of students’ skills and abilities, but also increases student motivation, performance, and social interaction (Alismail and McGuire 2015).
2.2.2 Gensler’s Six Ways of Learning

The following is based on research by Gensler to reimagine learning through the qualities of effective and innovative learning spaces, design strategies for engagement, and initiatives to innovate and improve the quality of education in this country (Gensler 2015). This research was featured in their report “Reimagining Learning: Strategies for Engagement”.

- **Acquire** – “Actively connecting with an idea gives it relevance”
- **Collaborate** – “Exchanging ideas with peers provides more than transferring information; collaboration forges networks of knowledge”
- **Reflect** – “Reevaluating and refining ideas, and absorbing and shaping new concepts embeds knowledge deeply”
- **Experience** – “Applying new ideas bridges the gap between learning and...
doing to build strong knowledge ownership”

- **Convey** – “Exposing new knowledge, when learners become teachers, solidifies the process”

- **Master** – “Assessing retention enhances learning by driving performance”

2.2.3 Linking Pedagogy and Space

As seen throughout history, architects and designers have responded to evolving educational theory and changes in pedagogy. As educational theory and pedagogy today responds to the Next Generation, Dr. Kenn Fisher supports the “need to explore alternatives to the classroom to deliver such a range of pedagogies, [linking] the pedagogical paradigm, its approach and its spatial archetype…” (Fisher 2006). He believes as learning environments evolve beyond the classroom, students “will work in a
range of modalities...collaborating through the social construction of knowledge in ‘learning communities’”. Dr. Fisher suggests the organization of these spaces can be clustered according to the modalities of learning; Mode 1 (teacher-centered); Mode 2 (student-centered); Mode 3 (informal or social). These spaces must then be arranged in a way such that students are able to move through these spaces freely according to their needs.
2.2.4 Steelcase’s Palette of Place

Educational researchers at Steelcase have defined a generalized framework of learning types to better understand active learning space design and the effectiveness of a variety of spaces:

- **Private/Alone** – Space for focused individual work or study with minimal visual or acoustic distractions, which may include small enclaves or private study rooms

- **Public/Alone** – Space for individual work or study in the presence of others with the opportunity for social connections

- **Private/Together** – Space that accommodates groups of varying sizes for group work with minimal visual or acoustic distractions

- **Public/Together** – Space that accommodates groups of varying sizes for collaboration with other peers, faculty, or staff
3. Explanation of Methodologies

The evolution of schools and the discrepancy between the current school model and characteristics of 21st century learning outlined in the literature review summarize the challenge educational design is faced with today. School design is changing to accommodate the shift in pedagogy and the ways schools are educating the next generation of students, but researchers are continuously trying to understand the complicated system of educational theory, best practices for teaching and learning, evolving tools and technologies, and their interconnectedness to the design of educational spaces. Innovative designs in education are isolated, with the majority of schools continuing to educate students using outdated methods and spaces. For this study, innovative educational spaces are identified as “alternative learning environments” and defined as any space designed for active, hands-on, collaborative activity, and/or flexibility within the space for multiple activities, beyond the traditional classroom structure (an enclosed space used for lecturing with rows or pods of desks and chairs and a primary presentation wall). Alternative learning environments may include but are not limited to laboratories, studios, group breakout space, individual breakout space, multi-functional commons, and/or activated corridors.

A pilot case study was conducted using a mixed methods approach to analyze three high schools in the United States that have been nationally recognized for their inclusion of innovative 21st century educational spaces. The three schools were identified for the case study based on the following criteria: (1) the school must be a high school in the United States; (2) the school must be built in the 21st century; (3) the school must be nationally recognized for their innovative design and incorporation of 21st century
learning; (4) there must be a diversity between the schools to represent different populations, school structures, and/or programs provided. These schools include: e3 Civic High School in San Diego, California; Vashon Island High School in Vashon Island, Washington; and Fairchild Wheeler Interdistrict Magnet Campus in Bridgeport, Connecticut. All three schools chosen meet all of these criteria, which are further discussed in a subsequent chapter.

The schools were then analyzed in two phases. First, an internal review was conducted, comprised of a quantitative analysis based on the types of learning spaces each school provides on the types of learning identified previously in this study. The internal review of the schools was based on previous research and findings from the researcher outlining school demographics including the location, student population, school size, and school structure as well as an inventory of the spaces provided within each school. The inventory includes types of spaces, size of these spaces, and a comparative analysis of the cumulative size of each space/program. The review expands on this research by analyzing the types of spaces/programs provided at each school based on the types of learning associated with 21st century education identified in section 2.2 of this study.

Second, a self-completed questionnaire was sent to all faculty, staff, and administration at each of the high schools assessing the qualitative and quantitative characteristics of the alternative learning environments provided at each school. This questionnaire was sent to the research participants through surveymonkey.com and consisted of both closed-format and open-format questions. The research participants
were asked about the qualities of the learning environments in their school and their personal experiences and observed experiences of these learning environments.

The purpose of this study is to provide insight through personal accounts of educational spaces identified as innovative and supportive of 21st century learning. Through a pilot case study analysis and directed questionnaire, the data collected represents a theoretical sample of 21st century educational spaces and its users. The subsequent data and analysis provides an example of the effectiveness or ineffectiveness of incorporative alternative learning environments in schools and spatial qualities appropriate for 21st century learning.

3.1 Definitions

The following terms and definitions are used during the analysis of the three case studies and were included in the questionnaire for clarification.

- **Active Learning Classroom / Learning Studio** – Modified traditional classrooms to include easily movable furniture, readily accessible outlets, ports, computers, mobile whiteboards, projectors, video, the internet, and/or other learning accessories. These are designed more for the user by eliminating the division between the front and back of the classroom, facilitating and increasing mobility for both instructors and students, and accommodating diverse pedagogies (Painter, Fournier, and Grape 2013).

- **Alternative Learning Environments** – For this study, alternative learning environments are defined as any space designed for active, hands-on, collaborative activity and/or flexibility within the space for multiple activities
beyond the traditional classroom. This may include but is not limited to laboratories, studios, group breakout space, individual breakout space, multi-functional commons, or activated corridors.

- **Collaboration Spaces** – For this study, collaboration spaces are defined as common spaces and/or similar open gathering spaces used for academic, social, and personal purposes. These spaces are generally the most public of spaces and can support a variety of different functions, which may include eating and socializing, individual work, group meetings, large group presentations, and/or events.

- **Informal Learning Spaces** – For this study, informal learning spaces are defined as flexible, supportive learning environments such as study lounges, group study rooms, furnished alcoves or gathering spaces in hallways, individual workstations, and/or indoor or outdoor breakout spaces which may be adjacent to classrooms and labs. Similar to classrooms, these spaces generally provide furnishings for academic purposes, which may include moveable furniture, whiteboards, monitors, accessible outlets, projectors, and/or other learning accessories.

- **Labs and Studios** – For this study, labs and studios are defined as spaces that are dedicated to specific discipline-based content and are often equipped with special, often fixed equipment for use in experimentation, creation, and design.

- **Traditional Classrooms** – Flat floor plan, forward-facing desks and chairs in rows or pods, presentation wall, and clear division between the front and back of the classroom (Painter, Fournier, and Grape 2013).
4. Case Study High Schools

4.1 Case Study A - e3 Civic High School

e3 Civic High School is located in downtown San Diego, California and occupies the sixth and seventh floors of the San Diego Public Library. Outlined in their James D. MacConnell Award Submission, LPA, Inc. (2015) designed e3 as a 64,000 square foot urban public charter school for grades 9-12 that serves approximately 500 students. The school was designed to help reduce the number of students in the area who commute to school, offering an educational opportunity within walking or biking distance. e3’s curriculum is based on a project-based blended learning environment derived from five tenants of learning that were identified through interviews with community and education leaders. These five tenants include: Cultural & Social Literacy; New Media & Info-Technology; Nutrition & Health/Wellness; Internship & Job Shadowing; and Civic Service & Community Engagement.

Figure 9: Learning Studio at e3 Civic High School. LPA, Inc. Photograph. From 2014 Exhibition of School Planning and Architecture e3 Civic High Presentation for the Association for Learning Environments.
Figure 10: Lab in e3 Civic High School. LPA, Inc. Photograph. https://www.lpainc.com/work/e3-civic-high. Digital Image.

The core learning and project development at e3 occurs primarily within the four Learning Villages, with each village consisting of the following:

- **Learning Studios** – Flexible classrooms with multiple presentation walls and writable surfaces (Figure 9)
- **Quiet Studio** – Flexible classroom that is acoustically separated from other spaces that has the ability for extremely quiet or loud activities without disrupting groups in nearby spaces
- **Flex Lab** – Specialized labs which include the Biomedical Engineering Studio; Multi-media Studio; and Rhythm Studio. The Nutrition Lab and Maker Studio are located next to the Cafeteria and not within a Learning Village. (Figure 10)
- **Think Tank** – Small, private space dedicated for more focused or group work
- **Shared Project-Based Learning Commons** – Centralized open space within the Learning Village that connects all other Learning Village programs and provides opportunities for socialization, break out instruction and larger group activities. (Figure 11)

In addition to the Learning Villages there are two large collaborative spaces located on each floor, called the “Entry Park” and “Plaza. These spaces are connected by a large centralized stair called the Central Steps which provides an additional gathering space and is surrounded by walls dedicated to the display of student work, pride, and digital activities. The centralized circulation through each floor consists of writable
surfaces and scattered seating, activating the circulation space and providing opportunity for informal gathering and collaboration.

Figure 12: Entry Plaza. e3 Civic High School. LPA, Inc. Photograph. https://www.lpainc.com/work/e3-civic-high. Digital Image.


e3 Civic High School is a LEED (Leadership in Energy and Environmental Design) Gold certified project and is the recipient of the 2015 American Institute of Architects (AIA) Committee of Architecture for Education (CAE) Education Facility Design Awards - Walter Taylor Award.
4.2 Case Study B - Vashon Island High School

Vashon Island High School is the only high school located on Vashon Island in Washington. Detailed in their 2014 James D. MacConnell award submission, the school was designed by Integrus Architecture is a 110,000 square foot public school for the island community to replace the outdated 1970’s building and serves approximately 575 students in grades 8-12 (Integrus Architecture 2014). Vashon Island is based on a project-based learning curriculum with focus on STEM (Science Technology Engineering and Math) and CTE (Career and Technology Education). The school was organized “utilizing a departmental model, with several teachers engaging in cross-discipline collaboration to pursue theme or project-based learning opportunities” (Integrus Architecture 2014).

![Commons Adaptability Diagram](image)

**Figure 14:** Commons Adaptability Diagram. Vashon Island High School. Integrus Architecture. From *Vashon Island High School James D. MacConnell Award Submittal*. 2014. 25.

Vashon Island supports a culture of learning, understanding that learning happens anywhere and everywhere the school has a variety of learning spaces distributed
throughout which include shared areas ("The Dens") adjacent to more formal teaching areas, a Learning Commons that connects the Library and Dining Commons that acts as a dining area during lunch and provides opportunities for learning and studying throughout the rest of the day, and a small group presentation room perched within the Learning Commons (Integrus Architecture 2014).


The primary learning facilities in Vashon Island consist of general subject classrooms located on the second floor and specialty labs located beneath the classrooms on the first floor. Integrus Architecture (2014) designed the classrooms based on 21st century learning needs, incorporating interactive display technology to support direct instruction, writing boards/surfaces on all walls, moveable furniture for both individual and group activities, large windows to the exterior for generous natural daylight and ventilation, and windows directed to the interior of the school for a strong visual
connection to the larger school community (Figure 16). There is also at least one door in every classroom that connects to an adjacent classroom “to promote collaboration, team teaching, and interdisciplinary curriculum planning”.


**Figure 17**: Student Den. Vashon Island High School. Integrus Architecture. Photograph. From *Vashon Island High School James D. MacConnell Award Submittal*. 2014. 25.
The specialty labs and studios support the STEM/CTE curriculum at Vashon Island. These spaces are clustered around a Student Den (Figure 17) and include Fabrication Labs (Figure 18) connected to an Outdoor Fabrication space, a 2D/3D Art Studio, an Information and Technology Studio, an Enterprise lab, and Science Labs.

Vashon Island High School is the recipient of two major educational design awards which includes the 2015 AIA CAE Educational Facility Design Awards - Excellence Award and the 2015 AIA Washington Council Civic Design Awards - Honor Award. Vashon Island was also a finalist for the 2014 Council of Education Facility Planners International (CEFPI) James D. MacConnell Award. (CEFPI is now known as the Association for Learning Environments)
4.3 Case Study C - Fairchild Wheeler Interdistrict Magnet Campus

Fairchild Wheeler Interdistrict Magnet Campus was designed by JCJ Architecture and occupies 25 acres of the 100-acre Fairchild Wheeler Park in Bridgeport, Connecticut. The 220,000 square-foot school opened in 2013 and currently serves approximately 1,500 students in grades 9-12 from the Bridgeport school district and eight other surrounding districts. Outlined in their 2016 James D. MacConnell Award Submittal, JCJ Architecture designed Fairchild Wheeler to incorporate an interactive STEM curriculum utilizing project-based learning via inquiry, the engineering design cycle, collaborative projects, and direct partnerships with educational and industry experts (JCJ Architecture 2016).

The campus is comprised of three distinct magnet schools – Information Technology and Software Engineering, Biotechnology Research and Zoological Sciences, and Aerospace/Hydrospace Engineering and Physical Sciences – that are

connected by bridges to a central building housing the main entrance to the school, administration, student health services, cafeteria, gymnasium, black-box theater, music rooms, and student commons (JCJ Architecture 2016). The student commons (Figure 19) is the largest multi-purpose space within the school, used for morning arrival, lunch, and student wide exhibits and presentations. On the second level of the commons are maker spaces designed as flexible and transparent learning labs with movable furnishings.


In the submission, JCJ also said each school is designed as a small learning community of 500 students and faculty, where students are organized based on their academic focus and activity requirements and not by grade. In each of the schools there are specialized lab spaces (Figure 20), general academic learning studios, flex rooms,
Figure 21: View from Small Group Instruction to Flex Room. Fairchild Wheeler Interdistrict Magnet Campus. JCJ Architecture. Photograph. From New Context and Connections. 2016. 41.

laboratory classrooms, administration and teacher work rooms, partnership labs, and green roofs. There is also an area for student workstations (Figure 22), which provide each student with a small personal workspace and a project locker, and is organized like a “contemporary open-office environment with abundant light, mature finishes, and a variety of work surfaces” (JCJ Architecture 2016). A wide circulation artery bisects each floor of the school and incorporates flexible furnishings, providing additional opportunities for classroom breakout and student work space.

Fairchild Wheeler is a certified LEED Gold project and the recipient of the 2016 CEFPI James D. MacConnell Award.
**Figure 23: Program Inventory Cross-Analysis for Case Studies.**

<table>
<thead>
<tr>
<th></th>
<th>E3 Civic High School</th>
<th>Vashon Island High School</th>
<th>Fairchild Wheeler Interdistrict</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size of School</strong></td>
<td>64,000 SF</td>
<td>110,000 SF</td>
<td>220,000 SF</td>
</tr>
<tr>
<td><strong># of Students</strong></td>
<td>500 (maximum)</td>
<td>575 (2016)</td>
<td>1,500 (500 per School)</td>
</tr>
<tr>
<td><strong># of Faculty, Staff, and Administration</strong></td>
<td>49</td>
<td>41</td>
<td>62</td>
</tr>
<tr>
<td><strong>Total Area of Classrooms / Learning Studios</strong></td>
<td>13,000 SF (20.5%)</td>
<td>17,550 SF (16%)</td>
<td>29,915 SF (13.5%)</td>
</tr>
<tr>
<td><strong># of Classrooms / Learning Studios</strong></td>
<td>12 (Includes Quiet Studios)</td>
<td>17</td>
<td>36 (12 in each school)</td>
</tr>
<tr>
<td><strong>Average Size of Classroom / Learning Studio</strong></td>
<td>1,020 SF</td>
<td>1,030 SF</td>
<td>930 SF</td>
</tr>
<tr>
<td><strong>Total Area of Informal Spaces</strong></td>
<td>8,375 SF (13%)</td>
<td>1,455 SF (1.3%)</td>
<td>52,415 SF (24%)</td>
</tr>
<tr>
<td><strong># of Informal Spaces</strong></td>
<td>7</td>
<td>4</td>
<td>42 (13 in each school)</td>
</tr>
<tr>
<td><strong>Average Size of Informal Spaces</strong></td>
<td>185 sf (Think Tank) - 1730 SF (Learning Village Commons)</td>
<td>365 SF</td>
<td>1,250 SF</td>
</tr>
<tr>
<td><strong>Total Area of Labs / Studios</strong></td>
<td>14,985 SF (23.5%)</td>
<td>19,750 SF (18%)</td>
<td>29,505 SF (13.5%)</td>
</tr>
<tr>
<td><strong># of Labs/Studios</strong></td>
<td>8</td>
<td>11</td>
<td>19</td>
</tr>
<tr>
<td><strong>Average Size of Lab/Studio</strong></td>
<td>1,875 SF</td>
<td>1,795 SF</td>
<td>1,555 SF</td>
</tr>
<tr>
<td><strong>Total Combined Area of Collaboration Spaces and Commons</strong></td>
<td>8,000 SF (12.5%)</td>
<td>9,075 SF (8%)</td>
<td>11,625 SF (5%)</td>
</tr>
</tbody>
</table>

*Average Size (Area) is estimated based on a measurable floor plan*

** Number of informal spaces includes all types informal learning spaces
5. Questionnaire Data Collection

5.1 Participant Selection

For the second part of this case study analysis, the researcher created a self-completed questionnaire that was distributed to the faculty, staff, and administration at all three high schools. Participants were selected based on their position in the school with the likelihood of involvement and interaction in student spaces, learning, and teaching. Potential participants in supportive roles that do not directly interact with the learning environments or instruction were omitted from the questionnaire, including IT, custodial, and other support positions. The questionnaire was emailed to all participants using their school-associated email available on their high school’s public staff directories (Appendix F). In total, 152 potential participants were identified across the three schools as eligible potential participants- 49 from e3 Civic High School, 41 from Vashon Island High School, and 62 from Fairchild Wheeler Interdistrict Magnet Campus. After the questionnaire was emailed to the potential participants, they were given approximately two weeks to complete the questionnaire.

5.2 Questionnaire Development

This questionnaire (Appendix G) was created using surveymonkey.com and was organized in six sections: General inquiry, Classrooms/Learning Studios, Informal Learning Spaces/Flex Space/Shared Learning, Labs/Studios, Collaboration Spaces/Commons, and Formal Learning Environments versus Alternative Learning Environments. Each of the sections incorporated a combination of open- and closed-format questions to gather information regarding the qualities of these spaces and their effects on 21st century instruction and learning. The first section collected participant
information including the participant’s role in the school, how long they have worked for the school, and if they have had previous experience teaching at an institution comprised primarily of traditional learning environments. This information is used in summary in subsequent sections, but individual identifiers are withheld for participant confidentiality.

The next four sections (Classrooms/ Learning Studios; Informal Spaces/Flex Space/Shared Learning; Labs/Studios; Collaboration/Commons) were defined based off of (1) preliminary research of 21st century learning spaces and (2) spatial analysis of the three schools. Definitions were added to each of these sections of the questionnaire to help describe the type of space and give examples, though the specific spaces in each school were not directly categorized in the questionnaire.

These four sections consisted of both qualitative and quantitative questions to further analyze the spaces. Participants were asked to rate their satisfaction of the spatial qualities using a Likert scale which ranged from Poor to Excellent. In addition to the Likert scale were directed questions regarding the use of the space, including what type of activities is the space used for, who uses the space, how long is this space used at a time, when during the day is the space use, and how often is the space used.

The final section was a series of seven open-format questions asking the participant to reflect on their experiences using Alternative Learning Environments; (1) if they knew the intention for integrating Alternative Learning Environments in their schools; (2) if they thought Alternative Learning Environments are important to 21st century education; (3) how Alternative Learning environments have improved or (4) challenged their teaching or working methods; (5) how often do they and (6) their
colleagues utilize or integrate Alternative Learning Environments in their teaching; (7) are there any space or type of space they currently do not have but wish they did.
6. Questionnaire Results and Analysis

In total there were fifteen (15) complete and partial responses collected out of all potential participants (152), a response rate of 9.87%. Of those fifteen responses, there were 10 responses from e3 Civic High School, 2 responses from Vashon Island High School, and 3 responses from Fairchild Wheeler Interdistrict Magnet Campus. Due to the limited responses, the results are analyzed and reported in summary, omitting individual response identifiers. Instances where responses are clearly divided between case study groups are indicated based on the case study group name and not by individual respondents. Qualitative results are represented based on the percentage of participant responses. The average rating of a response is the mean of the respective responses and represented in decimal format based on the Likert scale used in the questionnaire ranging from 1 (Poor) to 5 (Excellent). Since the analysis is on the positive and negative qualities of theses spaces, any Not Applicable (N/A) responses are noted in the analysis but are omitted from the average rating of the qualities.
Figure 24: Cross-Analysis of Spatial Quality Results.

<table>
<thead>
<tr>
<th>Overall, I am satisfied with the size of this space</th>
<th>Classrooms / Learning Studios</th>
<th>Informal Spaces / Flex Space / Shared Learning</th>
<th>Labs / Studios</th>
<th>Collaboration Spaces/ Commons</th>
<th>Average Rating per Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.08</td>
<td>4.10</td>
<td>4.29</td>
<td>3.89</td>
<td>4.09</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4/5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall, I am satisfied with the proximity of this space to other spaces in the school</td>
<td>4.09</td>
<td>3.89</td>
<td>4.29</td>
<td>4.00</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>3/4/5</td>
<td>5</td>
<td>3/4/3</td>
<td>4.02</td>
<td></td>
</tr>
<tr>
<td>Overall, I am satisfied with the type of furniture in this space</td>
<td>3.92</td>
<td>3.90</td>
<td>4.14</td>
<td>3.78</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4/5</td>
<td>3.94</td>
<td></td>
</tr>
<tr>
<td>Overall, I am satisfied with the organization of this space</td>
<td>3.77</td>
<td>3.30</td>
<td>3.71</td>
<td>3.56</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>3.59</td>
<td></td>
</tr>
<tr>
<td>Overall, I am satisfied with the level of flexibility in this space</td>
<td>3.92</td>
<td>3.90</td>
<td>4.00</td>
<td>4.13</td>
<td></td>
</tr>
<tr>
<td>4/5</td>
<td>5</td>
<td>4</td>
<td>4/5</td>
<td>3.99</td>
<td></td>
</tr>
<tr>
<td>Overall, I am satisfied with the technology and resources in this space</td>
<td>4.23</td>
<td>3.56</td>
<td>3.86</td>
<td>3.13</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3.70</td>
<td></td>
</tr>
<tr>
<td>Overall, I am satisfied with the lighting and ventilation in this space</td>
<td>3.85</td>
<td>4.00</td>
<td>3.86</td>
<td>3.78</td>
<td></td>
</tr>
<tr>
<td>3/4/5</td>
<td>5</td>
<td>5</td>
<td>3/5</td>
<td>3.87</td>
<td></td>
</tr>
<tr>
<td>Overall, I am satisfied with the noise level in this space</td>
<td>4.15</td>
<td>3.30</td>
<td>3.86</td>
<td>3.67</td>
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</tr>
<tr>
<td>4/5</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>3.75</td>
<td></td>
</tr>
<tr>
<td>Average Rating per Space</td>
<td>3.99</td>
<td>3.73</td>
<td>4.00</td>
<td>3.74</td>
<td></td>
</tr>
<tr>
<td>% of Participant Responses</td>
<td>93.33%</td>
<td>66.67%</td>
<td>60.00%</td>
<td>60.00%</td>
<td></td>
</tr>
</tbody>
</table>

| % of Excellent Ratings                              | 36.61%                        | 35.00%                                        | 44.64%         | 29.17%                      |
| % of Very Good Ratings                              | 26.79%                        | 25.00%                                        | 21.43%         | 27.78%                      |
| % of Good Ratings                                   | 22.32%                        | 20.00%                                        | 23.21%         | 26.39%                      |
| % of Adequate Ratings                               | 6.25%                         | 15.00%                                        | 10.71%         | 13.89%                      |
| % of Poor Ratings                                   | 0.89%                         | 3.75%                                         | 0.00%          | 0.00%                       |
6.1 Classrooms and Learning Studios

- **Spatial Use** - Participants indicated their classrooms and learning studios are used continuously throughout the day (83%), typically by both teachers and students (100%) for classes (83%), large group work (83%), and small group work (75%). These spaces are typically used by 10-30 individuals at a time (60%) for an average use of 1-2 hours (75%). The primary uses of their classrooms and learning studios were for class lectures and presentations (100%), class group discussions (83%), one-on-one instruction, group meetings and projects outside of class and individual work (75% each respectively).

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**Figure 25:** Quality Satisfaction Graph of Classrooms/Learning Studios From surveymonkey.com.
• **Qualities** – The analysis of the spatial qualities for classrooms and learning studios (Figure 24) are based on 14 participant responses (1 out of the 15 participants omitted responses for this question).
  
  o Participants indicated a high level of satisfaction overall with the spatial qualities of their classroom and learning studio. 63.4% of all responses indicated Very Good or Excellent satisfaction and only 7.14% indicating Poor to Adequate satisfaction (1 Poor rating only), with an overall average rating of 3.99.

  o Participants were most satisfied with the technology and resources of this space (64% Very Good/Excellent with an average rating of 4.23) and least satisfied with the organization of the space (43% Adequate/Good with an average rating of 3.77).

  o The level of flexibility had mixed response - while 71.42% indicated Very Good to Excellent satisfaction, it also received the only Poor indication of all qualities due to the limited flexibility of computer tables in one of the participant’s lab, requiring several hours of disconnection and reconnection of cables in order to reorganize.
6.2 Informal Learning Spaces/Flex Space/Shared Learning

- Spatial Use
  - Participants identified their informal learning spaces are the most accommodating spaces for the variety of activities. While the informal learning spaces received the most response for individual work (100%), class projects (91%), group meetings and projects outside of class (91%), class group discussion (82%), and socializing (73%), 64% of all responses identified their informal learning spaces are used for all types of activities.
  - These spaces are used by both teachers and students (100%) typically in small (82%) or large groups (73%), or as a class (64%).
  - There was no definitive indication on the average number of users at a single time, though responses varied from 1 to 450.
  - The classrooms and learning studios are used by both teachers and students (100%) for between 15 minutes to 2 hours at a time (91%) with the majority of users spent between 30 minutes to 1 hour (36%) at a time in the informal learning spaces.
  - Although the majority of responses indicated use continuously throughout the day (64%), 57% of respondents indicated use more than twice per day but not continuously (100% of all responses for that category)
Qualities – The analysis of the spatial qualities for informal learning spaces are based on 10 participant responses (5 out of the 15 participants omitted responses for this question).

- The satisfaction of the informal spaces had an overall average rating of 3.73, which was more than the collaboration spaces and commons, but less than both the classrooms/learning studios and lab/studios.
- The informal spaces received three Poor ratings (the most of all spaces) and had 19% of all responses indicating Poor – Adequate satisfaction of specific qualities (the most of all spaces).
o Participants were most satisfied with the lighting and ventilation of these spaces (60% Excellent with an average rating of 4.10). Participants also indicated a higher level of satisfaction in the size of the spaces, with an average rating of 4.10 (30% Good and Very Good respectively, and 40% Excellent ratings).

o The lowest level of satisfaction was split between the organization of the informal spaces and the noise level. The organization of these spaces received 10% Poor, 20% Adequate, 20% Good, 30% Very Good and only 20% Excellent ratings, while the noise level received 40% Adequate, 10% Good, 30% Very Good, and only 20% Excellent ratings).

o Although additional comments commended these spaces for accommodating breakout for students to make-up tests or one-on-one instruction, one respondent recommended additional separation between socialization and individual work.

o The biggest discrepancy of satisfaction in case study responses was between the flexibility in the informal learning spaces, with e3 averaging a rating of 4.57 (89% Very Good/Excellent) while Fairchild Wheeler indicated low satisfaction with an average rating of 2.33 (33% Poor and 67% Good).
6.3 Labs and Studios

• Spatial Use

  o According to the responses, the labs and studios are used primarily by teachers and students for class lectures, class presentations, class discussions, and class projects (88% respectively for each).

  o These spaces are used primarily by classes (75%) during class time (100%), with additional use by small and large groups (63%) throughout the day. 50% of responses indicated use outside of class time, with the least amount of use indicated before school (25%).

  o Although the majority of responses identified use for class purposes, some respondents said their labs and studios were also used for individual work (75%), group meetings and projects outside of class (63%), and one-on-one instruction (38%).

  o All participants stated their labs and studios are used for 1-2 hours at a time.

  o The labs and studios are typically occupied by 25-28 users at a time (80%), with the mode being 25 users (100%).
Qualities – The analysis of the spatial qualities for labs and studios are based on 7 participant responses (6 out of the 15 participants omitted responses for this question, while 2 out of the 15 participants indicated Not Applicable).

- Participants indicated the highest satisfaction overall with the labs and studios (66% of all responses were Very Good/Excellent and an overall average rating of 4.00). Zero respondents indicated Poor satisfaction, while only 10.71% of all responses indicated Adequate satisfaction.
- Participants are most satisfied with the size of these spaces and their proximity to other spaces equally (both receiving 72% Very Good/Excellent and a 4.29 Average Rating).

Figure 27: Quality Satisfaction Graph of Labs/Studios. From surveymonkey.com.
They are least satisfied with the organization of the space (43% Adequate/Good with an average rating of 3.71).

6.4 Collaboration Spaces and Commons

- Spatial Use –
  - According to participants, their collaboration spaces and commons are used primarily outside of classroom functions. These spaces are used by both teachers and students (78%) typically in small or large groups (67%) for group meetings and projects outside of class (89%), individual work (78%), and socializing (78%).
  - 67% of participants also indicated use as breakout for class group discussions (67%) and reflection and relaxation (67%), while only 44% indicated use for class lectures and presentations.
  - The number of responses for the number of users utilizing these spaces at a single time is inconclusive, though participants estimated anywhere from 2 to 300.
  - It is estimated these spaces are used for 15 minutes to 2 hours at a time, with 44% estimating use between 15 minutes – 30 minutes at a time and 33% estimating use between 1-2 hours at a time.
  - It is inconclusive if the space is used continuously throughout the day, though responses are split (45% each) between “continuously throughout the day” and “more than twice per day but not continuously”, while only 44% indicate use at all times of day.
- **Qualities** – The analysis of the spatial qualities for informal learning spaces are based on 9 participant responses (6 out of the 15 participants omitted responses for this question).
  
  o Although the collaboration spaces and commons received no Poor satisfaction ratings, it averaged an overall rating of 3.64 (similar to the level of satisfaction of the Informal Spaces). These spaces received only 57% Very Good - Excellent responses (the least of all spaces).
  
  o Participants were most satisfied with the level of flexibility of these spaces (67% Very Good/Excellent responses and 22% Good, with an average rating of 4.13).

**Figure 28:** Quality Satisfaction Graph of Collaboration Spaces and Commons. From surveymonkey.com.
The technology and resources in these spaces received the lowest level of satisfaction (22% Very Good/Excellent, 44% Good, and 22% Adequate; with 1 N/A response, the adjusted average rating of 2.78).

The proximity to other spaces received an even distribution or responses between Good to Excellent, and is the only other quality of the collaboration spaces and commons to not receive an Adequate rating (The level of flexibility also did not receive an adequate rating).

6.5 Formal Learning Environments versus Alternative Learning Environments

The following analysis is based on the open-format questions assessing the effectiveness of Alternative Learning Environments.

- Participants identified four main reasons for the inclusion of Alternative Learning Environments in their school’s design: (1) to support group collaboration, (2) to support project-based learning, (3) to support a variety of learning styles and social needs, (4) to support alternate activities indoors. All of these qualities support the previous research of Generation Z teaching and learning methods.

- All participants believed incorporating Alternative Learning Environments are important to 21st century education and learning for students because they (1) provide spatial flexibility to maximize the use of space and support collaboration, and (2) provide feelings of comfort, security, and community. One participant believed they provide students choices, but noted some students still require a more traditional setting to support their learning style.

- When asked how Alternative Learning Environments have affected or impacted student learning, only positive effects were stated. Participants believed
Alternative Learning Environments (1) lowered emotional boundaries that contribute to daily stress and may impede learning, (2) encouraged communication among students throughout the entire class period, (3) increased comfortability to collaborate and engage in group work, (4) increased ability to adapt to different lessons and gain deeper understanding of the content, and (5) encouraged cross-discipline collaboration and opportunities for additional courses.

- Participants felt Alternative Learning Environments improved their teaching or working methods by providing a supportive environment for (1) shifting lesson plans and trying new approaches, (2) effectively using technology, (3) facilitate flexible student groups, and (4) eliminate the feeling of working alone in distinct settings.

- Two main challenges were identified when teaching or working in Alternative Learning Environments; (1) Increased reliability on technology leads to increased possibility for an issue or glitch, and (2) increased flexibility equals increased opportunities to adapt, but changes should only be made to improve a lesson or course in ways that the traditional classroom may not be able to.

- While only 25% of participants identified using Alternative Learning Environments “not often/once per day or less”, 75% of participants indicated seeing colleagues utilize and incorporate Alternative Learning Environments into their teaching “often/ multiple times per day”.
7. Conclusion

7.1 Overview

As education shifts to adapt to the needs of the 21st century, school design is faced with the challenge of supporting a highly collaborative, personalized, flexible and technology focused environment to accommodate a range of learning styles and activities. While the design of schools, as a whole, is still centered around traditional classroom environments, there are schools incorporating alternative learning environments in their design, which may include labs, studios, informal learning spaces, flex space, collaboration spaces, and a multi-functional commons. The purpose of this study was to analyze three high schools that have incorporated these environments in their design to better understand the effects of alternative learning environments on their teaching and learning methods. This intent of this research is meant to contribute to other research and discussions on the types and qualities of the alternative learning environments necessary to better support the educational shift of the 21st century.

These three high schools – e3 Civic High School, Vashon Island High School, and Fairchild Wheeler Interdistrict Magnet Campus – were analyzed through a pilot case study, which included both a quantitative analysis of their programs followed by a qualitative analysis constructed through a self-completed questionnaire sent to the faculty, staff, and administration. The program analysis provided background information to better understand their learning environments, while the questionnaire results provide insight into how these spaces were used and positive and negative qualities of their spaces.
7.2 Summary of Findings

Overall, the findings supported the inclusion of Alternative Learning Environments and provided a positive influence on 21st century education. Participants provided positive feedback with the incorporation of Alternative Learning Environments at their schools, saying these spaces support collaborative and flexible environments for alternative teaching methods and a variety of learning styles, which aligns with theories on teaching and learning to support a new generation of students. They also felt these environments support the project-based learning curriculum that is adopted at each of the three high schools. In particular, participants indicated an increased feeling of comfort and community, increased communication and collaboration among students, as well as increased adaptability and flexibility of spaces to support new lessons, additional courses, and cross-discipline collaboration.

7.2.1 User Groups

Based on the responses, all of the learning environments are used by both teachers and students, and primarily by groups of various sizes. The classrooms/learning studios and labs/studios are used primarily by classes, though participants almost 50% of responses identified all spaces were used by classes. Over half of the participants indicated individuals primarily used the classrooms/learning studios and the informal spaces/flex space, while the labs/studios were used the least. (Appendix H)

7.2.2 Types of Activities

Although all spaces are used for class activities, including lectures, presentations, group discussion, and projects, the collaboration spaces/commons are used the least. Group projects outside of class and individual work were identified in all spaces with
labs/studios identified the least. Reflection/relaxation and socializing is primarily in the collaboration spaces/commons and informal spaces, the spaces which offer the most flexibility of space and furniture options. One-on-one instruction was also evenly distributed between classroom/learning studios and informal spaces, followed by collaboration spaces/commons and then labs/studios. (Appendix I)

7.2.3 Average Length of Use

The findings indicated the classrooms/learning studios and labs/studios are used continuously throughout the day for approximately 1-2 hours at a time, accommodating for classroom instruction and activities. The informal spaces and collaboration spaces/commons are used multiple times per day but not continuously, ranging in use from 15 minutes to 2+ hours at a time with the most variation in the informal spaces. (Appendix J)

7.2.4 Overall Satisfaction

The participants responses indicated they are most satisfied overall with both their labs/studios and their classrooms/learning studios, with 63% - 66% of all responses providing Very Good – Excellent quality ratings. The high satisfaction of these spaces may be contributed to their close similarities to the design of traditional classrooms. The responses also indicated the participants are least satisfied with their informal spaces and collaboration spaces/commons, the two environments that deviate the most from the traditional classroom design. 14% - 19% of all responses provided Poor – Adequate quality ratings for these spaces, while 20% - 27% gave Good ratings. (Appendix K)
Participants are consistently most satisfied with the size of each type of learning environment, and most satisfied with the size of their labs/studios. The labs/studios are roughly similar sizes for all three schools, ranging from 1,500 SF to 1,800 SF (Figure 23). The organization of the spaces received the lowest overall satisfaction rating, with participants indicating the least satisfaction with their informal spaces/flex space, the most diverse space between the three high schools. Additional responses indicated both the technology and resources in the spaces and the noise level of the spaces could be contributing factors to the low ratings for the organization of the learning environments. (Appendix L)

7.3 Limitations of the Study

1. Program analysis is based on the limited text found (primarily award submissions by the architectural / design firm), where they describe what the spaces “should” be or are “supposed” to be, but not what they currently are or how they are actually being used.

2. The researcher received 15 responses out of 152 potential participants, resulting in a sample size too small for conclusive analysis.

3. Due to the limited responses, the analysis of this data and conclusions should not be generalized to represent all schools providing alternative learning environments nor should it represent all educational faculty, staff, and/or administration of the case study schools identified in this research.

4. Potential participants were contacted twice using their work emails that are publically available on their school’s online directories – once with an invitation to participate in the survey, and another time as a reminder to complete the
survey. This cannot guarantee all potential participants saw the email and was aware of this study.

5. The study was conducted over the summer months, where although the faculty, staff, and administration should have extra time to respond, they may not check their work emails during this time and vacations may have conflicted with the timeframe of the study.

6. Although definitions were provided, discrepancy between the spaces the participants were rating and the spaces the researcher had identified may still exist.

7.4 Recommendations for Future Research

The following are recommendations to expand on the research findings of this study as well as recommendations for additional studies and analyses related to this study.

1. Another questionnaire should be conducted to yield more results. This should be done during the school year when the faculty, staff, and administration are checking their work emails more frequently. Additional forms of contact will help ensure all potential participants have received and are aware of the questionnaire. This can be done by first contacting the school principals informing them of the study personally (by phone preferably) and requesting their assistance distributing the questionnaires to all faculty, staff, and administration at their schools.

2. Providing annotated floor plans with the questionnaire can help further clarify the grouping of spaces and terms used. Having the researcher identify all spaces at the high school to be considered “Classrooms/Learning Studios” on a floor plan when
issuing the questionnaire will eliminate any misinterpretation of the terms or definitions.

3. Meeting with the faculty, staff, and administration in person allows the researcher to conduct a more detailed investigation of the Alternative Learning Environments. This would be an interview format with organized questions, allowing the researcher to ask follow up questions for clarification and further understanding of how these spaces are used, who uses the spaces, and how the spaces have affected the teaching and learning at the school.

4. Meeting with students or conducting a student questionnaire regarding their satisfaction of the qualities of these spaces will help bridge a gap between the teachers’ needs and priorities of the spaces for working/teaching versus the students’ needs and priorities of the spaces for learning and collaborating.

5. Conducting a “day in the life” of both a student and faculty/staff. The researcher would follow a student or faculty member throughout the day and be able to better understand an individual experience of these spaces. Through observational mapping, the researcher would be able to better understand how the spaces work together throughout a school day, the user’s path through these spaces, and the time spent in specific spaces and for specific activities. This information can help further understand how these spaces are used, spatial preferences or priorities throughout the day, and the appropriate proximity relationship between spaces.

6. Conduct a focus group study of a school comprised of traditional learning environments using this questionnaire to collect data on their satisfaction of their educational spaces. These findings should be compared to the findings from
schools using alternative learning environments to see how the alternative learning environments are impacting teaching and learning perceptions of the teachers, staff, administration, and students in each school.

7. Conduct case study analysis on more schools. Although Alternative Learning Environments are not common at all schools, conducting case study analyses schools that are incorporating some or all of these spaces will increase the sample size, therefore leading towards more conclusive evidence of positive and negative effects of these spaces. The information from this study and subsequent case studies should be used for further research and exploration into the design of Alternative Learning Environments to support 21st century teaching and learning.

8. Based on the low satisfaction ratings for informal spaces and collaboration spaces, additional research of these spaces are required for further discovery of design standards (lighting, acoustics, furniture/organization of space, etc.) to meet the realistic needs of teaching and learning in these spaces. 21st century pedagogical trends and the needs of Generation Z students reiterate the importance of collaboration, flexibility, and personalization in schools, and the importance of a variety of spaces. Therefore, additional design research of informal spaces and collaboration spaces is necessary to further develop best practices for these spaces.

7.5 Implications for the Design of Schools

1. Schools are becoming de-compartmentalized. All spaces in the school should be designed for both teachers and students to accommodate a variety of activities.
Learning is happening everywhere, and students and teachers are moving throughout the day more frequently.

2. Collaborative design is important to design innovative schools. Designers and architects should include teachers, staff, administration, and students during the design process. As schools are shifting to accommodate 21st century needs, there is a discrepancy that exists between the learning methods, the teaching methods, and the design of the spaces to support them.

3. As school designs continue to shift, designers and architects must continue to train teachers on how to use these spaces. If teachers do not know how to use these spaces, the design of these spaces become a hindrance to the teachers and students, affecting their teaching and learning which previously led to the collapse of the open plan school in the 1960s – 1970s.

4. Designers and architects must continue to evaluate and explore the design of learning environments, especially alternative learning environments and their relationship to curriculum and educational trends.

5. Interior design must be proactive. Additional focus and efforts should be directed to small scale design of the individual space, in particular the organization of these spaces and their level of flexibility.

6. Individual work space must not be forgotten in the school. According to Gensler’s 2016 Workplace Survey, “innovative companies are 5x more likely to have workplaces that prioritize both individual and group workspace”. (“The Gensler 2016 Workplace Survey Reveals Workplace Secrets of the Most Creative and Innovative Companies | Press Releases | News” 2016) Gensler’s co-CEO Diane
Hoskins also says high-performing workplaces provide environments where employees “have room to not only collaborate but also have space to focus and are empowered to work when and how they work best…”.
References


LPA, Inc. 2015. *e3 Civic High School James D. MacConnell Award Submittal 2015*.


Appendix A – IRB Certificate of Exemption
Official Approval Letter for IRB project #17336 - New Project Form

June 14, 2017

Bryan Perez
Interior Design Program
1431 D Street Lincoln, NE 68502

Lindsay Bahe
Interior Design Program
ACG 231, UNL, 68588-0107

IRB Number: 20170617336 EX
Project ID: 17336
Project Title: Shifting School Design to the 21st Century: Challenges with Alternative Learning Environments

Dear Bryan:

This letter is to officially notify you of the certification of exemption of your project. Your proposal is in compliance with this Institution's Federal Wide Assurance 00002258 and the OHRPs Regulations for the Protection of Human Subjects (45 CFR 46) and has been classified as exempt.

You are authorized to implement this study as of the Date of Final Exemption: 06/14/2017.

1. Review conducted using exempt category 2 at 45 CFR 46.101
2. Date of Exemption: 6/14/2017
3. Funding (Grant agreement, CSP Project/Form ID and Funding Sponsor Award Number, if applicable) N/A

We wish to remind you that the principal investigator is responsible for reporting to this Board any of the following events within 48 hours of the event:

- Any serious event (including on-site and off-site adverse events, injuries, side effects, deaths, or other problems) which in the opinion of the local investigator was unanticipated, involved risk to subjects or others, and was possibly related to the research procedures;
- Any serious accidental or unintentional change to the IRB-approved protocol that involves risk or has the potential to recur;
- Any publication in the literature, safety monitoring report, interim result or other finding that indicates an unexpected change to the risk/benefit ratio of the research;
- Any breach in confidentiality or compromise in data privacy related to the subject or others;
- Any complaint of a subject that indicates an unanticipated risk or that cannot be resolved by the research staff.

This project should be conducted in full accordance with all applicable sections of the IRB Guidelines and you should notify the IRB immediately of any proposed changes that may affect the exempt status of your research project. You should report any unanticipated problems involving risks to the participants or others to the Board.

If you have any questions, please contact the IRB office at 402-472-6965.

Sincerely,

Becky R. Freeman

Becky R. Freeman, CIP
for the IRB
Appendix B – IRB Approval Letter for Questionnaire Changes
Official Approval Letter for IRB project #17336 - Change Request Form

June 26, 2017

Bryan Perez
Interior Design Program
1431 D Street, Lincoln, NE 68502

Lindsey Bahr
Interior Design Program
ARCH 251, UNL, 68588-0107

IRB Number: 201706I3336-EX
Project ID: 17336
Project Title: Shifting School Design to the 21st Century: Challenges with Alternative Learning Environments

Dear Bryan:

The Institutional Review Board for the Protection of Human Subjects has completed its review of the Request for Change in Protocol submitted to the IRB.

The change request form has been approved to include the following changes and procedures as described in the form:

Implementation and use of revised questionnaire that will add definitions and response categories

We wish to remind you that the principal investigator is responsible for reporting to this Board any of the following events within 48 hours of the event:
- Any serious event (including on-site and off-site adverse events, injuries, side effects, deaths, or other problems) which in the opinion of the local investigator was unanticipated, involved risk to subjects or others, and was possibly related to the research procedures;
- Any serious accidental or unintentional change to the IRB-approved protocol that involves risk or has the potential to recur;
- Any publication in the literature, safety monitoring report, interim result or other finding that indicates an unexpected change to the risk/benefit ratio of the research;
- Any breach in confidentiality or compromise in data privacy related to the subject or others;
- Any complaint of a subject that indicates an unanticipated risk or that cannot be resolved by the research staff.

This letter constitutes official notification of the approval of the protocol change. You are therefore authorized to implement this change accordingly.

If you have any questions, please contact the IRB office at 402-472-6965.

Sincerely,

Rachel Wenzl, CIP
for the IRB

[Signature]

University of Nebraska-Lincoln Office of Research and Economic Development
nugrant.unl.edu
Appendix D – Vashon Island High School Floor Plan
Appendix E – Fairchild Wheeler Interdistrict Magnet Campus Floor Plan
Appendix E – Fairchild Wheeler Interdistrict Magnet Campus Floor Plan
Appendix F – Questionnaire Invitation To Participants (Email)
(The following email was modified and personalized for each case study to include their respective name and national awards/recognitions.)

Shifting School Design to the 21st Century: Challenges with Alternative Learning Environments

To the Faculty, Staff, and Administration of E3 Civic High School,

My name is Bryan Perez and I am a graduate student at the University of Nebraska-Lincoln’s Interior Design program. I am currently writing my thesis to complete my master’s degree, which is entitled “Shifting School Design to the 21st Century: Challenges with Alternative Learning Environments”. This thesis is analyzing the effectiveness of alternative learning environments through three case studies of secondary education schools.

I have identified E3 Civic High School as a facility of interest because it has been nationally recognized as an innovative educational facility that incorporates alternative environments, receiving the 2015 AIA CAE Education Facility Design Walter Taylor Award. I am interested in analyzing the intended use versus actual use of these alternative learning environments and the positive and negative influences these environments have on teaching and learning.

You have been identified as a potential participant because of your role in your school. Please use the link provided to access the questionnaire. Prior to the questionnaire, please review the informed consent form on the first page of the link provided which describes your role as a survey participant should you choose to accept.

Please complete the survey by July 9, 2017.

If you have any questions, please let me know.

Thank you for your time!

Bryan Perez

Questionnaire

Please do not forward this email as its survey link is unique to you.

Unsubscribe from this list
Appendix G – Questionnaire via SurveyMonkey.com
Participant Informed Consent Form

University of Nebraska Lincoln
IRB Approval #20170617336 EX

Title:
Shifting School Design to the 21st Century: Challenges with Alternative Learning Environments

Purpose:
This research project will aim to examine the impact of alternative learning environments on schools structure, curriculum, and teaching in high schools. You are invited to participate in this study because you are a faculty member or administrator at a high school that has been professionally recognized for your innovative design spaces. Your information will aid in identifying factors to consider when including alternative and innovative spaces in future school design.

Procedures:
You are asked to answer an online questionnaire through SurveyMonkey, with a link to the questionnaire provided in the subsequent email. The questionnaire should take 15-25 minutes to complete and you will have until 11:59pm on Sunday July 9th to respond to the questionnaire.

Benefits:
There are no direct benefits to you as a research participant.

Risks and/or Discomforts:
There are no known risks or discomforts associated with this research.

Confidentiality:
Any information obtained during this study which could identify you will be kept strictly confidential. The data will be stored in a secured folder on the primary investigator’s account on the university’s online storage system, Box. The information obtained in this study may be published in scientific journals or presented at scientific meetings but the data will be reported as aggregated data.

SurveyMonkey Privacy Policy:

Compensation:
You will receive no compensation for participating in this project.

Opportunity to Ask Questions:
You may ask any questions concerning this research and have those questions answered before agreeing to participate in or during the study. Or you may contact the investigator(s) at the phone numbers below. Please contact the University of Nebraska-Lincoln Institutional Review Board at (402) 472-6965 to voice concerns about the research or if you have any questions about your rights as a research participant.

Freedom to Withdraw:
Participation in the study is voluntary. You can refuse to participate or withdraw at any time without harming your relationship with the researchers or the University of Nebraska-Lincoln, or in any other way receive a penalty or loss of benefits to which
Consent, Right to Receive a Copy:
You are voluntarily making a decision whether or not to participate in this research study. By submitting responses to the online questionnaire, consent is implied and certifies that you have decided to participate having read and understood the information presented.

Participant Feedback Survey:
The University of Nebraska-Lincoln wants to know about your research experience. This 14 question, multiple-choice survey is anonymous; however, you can provide your contact information if you want someone to follow-up with you. This survey should be completed after your participation in this research. Please complete this optional online survey at: http://bit.ly/UNLresearchfeedback.

Name and Phone Number of Investigator(s):
Bryan Perez, Principal Investigator Phone: (310) 995-0225
Lindsey Bane, Secondary Investigator Phone: (402) 472-0033
General

What is your role/title within your school?

- Principal/Vice Principal
- Administration
- Counselor
- Teacher
- Other (please specify)

How long have you worked for your school?

- 0-2 Years
- 2-5 Years
- 5-10 Years
- 10+ Years

Do you have previous experience teaching at a school comprised primarily of Formal Learning Environments? (For this survey, "Formal Learning Environments" are defined as traditional classrooms and lecture halls)

- Yes
- No
Shifting School Design to the 21st Century: Challenges with Alternative Learning Environments

Classrooms / Learning Studios

Definitions

**Traditional Classrooms:** Flat floor plan, forward-facing desks and chairs in rows or pods, presentation wall / clear division between front and back of classroom (Panted 2012)

**Active Learning Classroom/Learning Studio:** Modified traditional classroom to include easily movable furniture, readily accessible outlets, ports, computers, mobile whiteboards, projectors, video, the internet, and/or other learning accessories. These are designed more for the user by eliminating the division between front and back, facilitating and increasing mobility for both instructors and students, and accommodating diverse pedagogies. (Panted 2012)

Reference:


Please rate the following qualities of the Classrooms / Learning Studios in your school:

<table>
<thead>
<tr>
<th>Overall, I am satisfied with the size of this space.</th>
<th>Poor</th>
<th>Adequate</th>
<th>Good</th>
<th>Very Good</th>
<th>Excellent</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall, I am satisfied with the proximity of this space to other spaces in the school.</td>
<td></td>
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</tr>
<tr>
<td>Overall, I am satisfied with the type of furniture in this space.</td>
<td></td>
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<tr>
<td>Overall, I am satisfied with the organization of this space.</td>
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<tr>
<td>Overall, I am satisfied with the level of flexibility in this space.</td>
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<tr>
<td>Overall, I am satisfied with the technology and resources in this space.</td>
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<tr>
<td>Overall, I am satisfied with the lighting and ventilation in this space.</td>
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<tr>
<td>Overall, I am satisfied with the noise level in this space.</td>
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</tbody>
</table>
Please add any additional comments that you feel would be helpful to the investigator to understand the positive and/or negative attributes of the space.
Shifting School Design to the 21st Century: Challenges with Alternative Learning Environments

Classrooms / Learning Studios

Definitions

**Traditional Classrooms**: Flat floor plan, forward-facing desks and chairs in rows or posts, presentation wall / clear division between front and back of classroom (Painter 2012)

**Active Learning Classroom/Learning Studio**: Modified traditional classroom to include easily movable furniture, readily accessible outlets, ports, computers, mobile whiteboards, projectors, video, the Internet, and other learning accessories. These are designed more for the user by eliminating the division between front and back, facilitating and increasing mobility for both instructors and students, and accommodating diverse pedagogies. (Painter 2012)

Reference:

*The following questions are based on a typical school day at your institution.*

**What are these spaces used for? (Check all that apply)**

- [ ] Class Lectures/Presentations
- [ ] Class Group Discussion
- [ ] Class Projects
- [ ] One-on-One Instruction
- [ ] Group Meetings/Projects [Outside of Class]
- [ ] Individual Work
- [ ] Reflection/Relaxation
- [ ] Socializing
- [ ] Other (please specify)
Who uses these spaces? (Check all that apply)

- Teachers Only
- Teachers and Students
- Students Only
- Individuals
- Small groups (6 or Less)
- Large groups (More than 6)
- Classes
- Other (please specify)

How many people use these spaces at a time?

What is the average duration these spaces are in use at a time?

- 15 Minutes or Less
- 15 - 30 Minutes
- 30 Minutes - 1 Hour
- 1 - 2 Hours
- 24 Hours

How often are these spaces used?

- Continuously throughout the day
- More than twice per day, but not continuously
- Once or Twice per day
- Less than Once per day
- Other (please specify)
When are these spaces used?

- During Class
- In Between Classes
- During Breaks
- During Lunch
- During Classes AND Breaks
- Before School
- After School
- Before AND After School
- All of the Above
- Other (please specify)

Please add any additional comments that you feel would be helpful to the investigator to understand the users and activities that occur in these spaces.
**Definition**

For this study, **informal learning spaces** are defined as flexible, supportive learning environments such as study lounges, group study rooms, furnished alcoves or gathering spaces in hallways, individual workstations, and/or indoor or outdoor breakout spaces which may be adjacent to classrooms and labs.

Similar to classrooms, these spaces generally provide furnishings for academic purposes, which may include moveable furniture, whiteboards, monitors, accessible outlets, projectors, and/or other learning accessories.

---

**Please rate the following qualities of the Informal Learning Spaces / Flex Space / Shared Learning in your school**

<table>
<thead>
<tr>
<th></th>
<th>Poor</th>
<th>Adequate</th>
<th>Good</th>
<th>Very Good</th>
<th>Excellent</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall, I am satisfied with the size of this space.</td>
<td></td>
<td></td>
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<tr>
<td>Overall, I am satisfied with the proximity of this space to other spaces in the school.</td>
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<tr>
<td>Overall, I am satisfied with the type of furniture in this space.</td>
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<tr>
<td>Overall, I am satisfied with the organization of this space.</td>
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<tr>
<td>Overall, I am satisfied with the level of flexibility in this space.</td>
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<tr>
<td>Overall, I am satisfied with the technology and resources in this space.</td>
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<tr>
<td>Overall, I am satisfied with the lighting and ventilation in this space.</td>
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<tr>
<td>Overall, I am satisfied with the noise level in this space.</td>
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</tr>
</tbody>
</table>
Please add any additional comments that you feel would be helpful to the investigator to understand the positive and/or negative attributes of the space.
Shifting School Design to the 21st Century: Challenges with Alternative Learning Environments

Informal Learning Spaces / Flex Space / Shared Learning

Definition

For this study, informal learning spaces are defined as flexible, supportive learning environments such as study lounges, group study rooms, furnished alcoves or gathering spaces in hallways, individual workstations, and/or indoor or outdoor breakout spaces which may be adjacent to classrooms and labs.

Similar to classrooms, these spaces generally provide furnishings for academic purposes, which may include moveable furniture, whiteboards, monitors, accessible outlets, projectors, and/or other learning accessories.

The following questions are based on a typical school day at your institution.

What are these spaces used for? (Check all that apply)

- [ ] Class Lectures/Presentations
- [ ] Class Group Discussion
- [ ] Class Projects
- [ ] One-on-One Instruction
- [ ] Group Meetings/Projects (Outside of Class)
- [ ] Individual Work
- [ ] Reflection/Relaxation
- [ ] Socializing
- [ ] Other (please specify)
Who uses these spaces? (Check all that apply)

- Teachers Only
- Teachers and Students
- Students Only
- Individuals
- Small groups (6 or Less)
- Large groups (More than 6)
- Classes
- Other (please specify)

How many people use these spaces at a time?

What is the average duration these spaces are in use at a time?

- 15 Minutes or Less
- 15 - 30 Minutes
- 30 Minutes - 1 Hour
- 1 - 2 Hours
- 2+ Hours

How often are these spaces used?

- Continuously throughout the day
- More than twice per day, but not continuously
- Once or Twice per day
- Less than Once per day
- Other (please specify)
When are these spaces used?

- During Class
- In Between Classes
- During Breaks
- During Lunch
- During Classes AND Breaks
- Before School
- After School
- Before AND After School
- All of the Above
- Other (please specify)

Please add any additional comments that you feel would be helpful to the investigator to understand the users and activities that occur in these spaces.
Shifting School Design to the 21st Century:
Challenges with Alternative Learning Environments

Labs / Studios

Definition

For this study, **labs and studios** are spaces that are dedicated to specific, discipline-based content and are often equipped with special, often fixed equipment for use in experimentation, creation, and design.

Please rate the following qualities of the Labs / Studios in your school

<table>
<thead>
<tr>
<th>Overall, I am satisfied with:</th>
<th>Poor</th>
<th>Adequate</th>
<th>Good</th>
<th>Very Good</th>
<th>Excellent</th>
<th>N/A</th>
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<tbody>
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<td>space.</td>
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<td>the organization of this</td>
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<td>space.</td>
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<td>the level of flexibility in</td>
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<td>this space.</td>
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<td>resources in this space.</td>
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<tr>
<td>the lighting and ventilation</td>
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<td>in this space.</td>
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<tr>
<td>the noise level in this space</td>
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</tbody>
</table>

Please add any additional comments that you feel would be helpful to the investigator to understand the positive and/or negative attributes of the space.
Shifting School Design to the 21st Century: Challenges with Alternative Learning Environments

Labs / Studies

Definition

For this study, **labs and studios** are spaces that are dedicated to specific, discipline-based content and are often equipped with special, often fixed equipment for use in experimentation, creation, and design.

*The following questions are based on a typical school day at your institution.*

What are these spaces used for? (Check all that apply)

- [ ] Class Lectures/Presentations
- [ ] Class Group Discussion
- [ ] Class Projects
- [ ] One on One Instruction
- [ ] Group Meetings/Projects (Outside of Class)
- [ ] Individual Work
- [ ] Reflection/Relaxation
- [ ] Socializing
- [ ] Other (please specify)


**Who uses these spaces? (Check all that apply)**

- [ ] Teachers Only
- [ ] Teachers and Students
- [ ] Students Only
- [ ] Individuals
- [ ] Small groups (6 or Less)
- [ ] Large groups (More than 6)
- [ ] Classes
- [ ] Other (please specify)

**How many people use these spaces at a time?**

<table>
<thead>
<tr>
<th>Number</th>
</tr>
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<tbody>
<tr>
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</tbody>
</table>

**What is the average duration these spaces are in use at a time?**

- [ ] 15 Minutes or Less
- [ ] 15 - 30 Minutes
- [ ] 30 Minutes - 1 Hour
- [ ] 1 - 2 Hours
- [ ] 2+ Hours

**How often are these spaces used?**

- [ ] Continuously throughout the day
- [ ] More than twice per day, but not continuously
- [ ] Once or Twice per day
- [ ] Less than Once per day
- [ ] Other (please specify)

<table>
<thead>
<tr>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>
When are these spaces used?

- [ ] During Class
- [ ] In Between Classes
- [ ] During Breaks
- [ ] During Lunch
- [ ] During Classes AND Breaks
- [ ] Before School
- [ ] After School
- [ ] Before AND After School
- [ ] All of the Above
- [ ] Other (please specify)

Please add any additional comments that you feel would be helpful to the investigator to understand the users and activities that occur in these spaces.
Collaboration Spaces / Commons

**Definition**

For this study, **collaboration spaces** include the commons space and/or similar open gathering spaces used for academic, social, and personal purposes. These spaces are generally the most public of spaces and can support a variety of different functions, which may include eating and socializing, individual work, group meetings, large group presentations, and/or events.

**Please rate the following qualities of the Collaboration Spaces / Commons in your school**

<table>
<thead>
<tr>
<th>Overall, I am satisfied with the size of this space:</th>
<th>Poor</th>
<th>Adequate</th>
<th>Good</th>
<th>Very Good</th>
<th>Excellent</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall, I am satisfied with the proximity of this space to other spaces in the school:</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Overall, I am satisfied with the type of furniture in this space:</td>
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</tr>
<tr>
<td>Overall, I am satisfied with the organization of this space:</td>
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</tr>
<tr>
<td>Overall, I am satisfied with the level of flexibility in this space:</td>
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</tr>
<tr>
<td>Overall, I am satisfied with the technology and resources in this space:</td>
<td></td>
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<tr>
<td>Overall, I am satisfied with the lighting and ventilation in this space:</td>
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<tr>
<td>Overall, I am satisfied with the noise level in this space:</td>
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</tbody>
</table>

**Please add any additional comments that you feel would be helpful to the investigator to understand the positive and/or negative attributes of the space.**

---
Collaboration Spaces / Commons

Definition

For this study, collaboration spaces include the commons space and/or similar open gathering spaces used for academic, social, and personal purposes. These spaces are generally the most public of spaces and can support a variety of different functions, which may include eating and socializing, individual work, group meetings, large group presentations, and/or events.

The following questions are based on a typical school day at your institution.

What are these spaces used for? (Check all that apply)

- [ ] Class Lectures/Presentations
- [ ] Class Group Discussion
- [ ] Class Projects
- [ ] One-on-One Instruction
- [ ] Group Meetings/Projects (Outside of Class)
- [ ] Individual Work
- [ ] Reflection/Relaxation
- [ ] Socializing
- [ ] Other (please specify)
Who uses these spaces? (Check all that apply)

- Teachers Only
- Teachers and Students
- Students Only
- Individuals
- Small groups (6 or Less)
- Large groups (More than 6)
- Classes
- Other (please specify)

How many people use these spaces at a time?

What is the average duration these spaces are in use at a time?

- 15 Minutes or Less
- 15 - 30 Minutes
- 30 Minutes - 1 Hour
- 1 - 2 Hours
- 2+ Hours

How often are these spaces used?

- Continuously throughout the day
- More than twice per day, but not continuously
- Once or Twice per day
- Less than Once per day
- Other (please specify)
When are these spaces used?

- During Class
- In-Between Classes
- During Breaks
- During Lunch
- During Classes AND Breaks
- Before School
- After School
- Before AND After School
- All of the Above
- Other (please specify)

Please add any additional comments that you feel would be helpful to the investigator to understand the users and activities that occur in these spaces.
Alternative Learning Environments: Alternative learning environments are defined for the research as any space designed for active, hands-on, collaborative activity, and/or flexibility within the space for multiple activities, beyond the traditional classroom structure defined as an enclosed space used for lecturing with rows or pods of desks and chairs and a primary presentation wall.

This may include but is not limited to laboratories, studios, group breakout space, individual breakout space, multi-functional commons or activated corridors.

Do you know the intention or reason why Alternative Learning Environments were integrated into the design of your school? If yes, please explain.

Do you think that Alternative Learning Environments are important to 21st Century education and learning for students? Why or why not?

In what way(s), if any, have the Alternative Learning Environments affected or impacted student learning?

In what way(s), if any, have the Alternative Learning Environments improved your teaching or working methods?
In what way(s), if any, have the Alternative Learning Environments challenged your teaching or working methods?

To what degree do you utilize and integrate Alternative Learning Environments into your teaching?

- Often / Multiple Times per Day
- Not Often / Once per Day or Less
- Never

To what degree do you see your colleagues utilizing and integrating Alternative Learning Environments into their teaching?

- Often / Multiple Times per Day
- Not Often / Once per Day or Less
- Never

Is there a space or type of space that you do not currently have but wish that you did? What would that be and why?

Please include any additional recommendations or considerations for other schools who are interested in incorporating Alternative Learning Environments.

Thank you very much for participating in this questionnaire.

Your responses are greatly appreciated!
Appendix H – User Group Response Graphs from SurveyMonkey.com
USER GROUPS

CLASSROOMS / LEARNING STUDIOS

<table>
<thead>
<tr>
<th>Group</th>
<th>Teachers Only</th>
<th>Teachers and Students</th>
<th>Students Only</th>
<th>Individuals</th>
<th>Small groups (6 or Less)</th>
<th>Large groups (More than 6)</th>
<th>Classes</th>
<th>Other (please specify)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answered: 12</td>
<td>25.00%</td>
<td>100.00%</td>
<td>8.33%</td>
<td>50.00%</td>
<td>75.00%</td>
<td>83.33%</td>
<td>83.33%</td>
<td></td>
</tr>
<tr>
<td>Skipped: 3</td>
<td></td>
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</tr>
</tbody>
</table>

INFORMAL SPACES / FLEX SPACE / SHARED LEARNING

<table>
<thead>
<tr>
<th>Group</th>
<th>Teachers Only</th>
<th>Teachers and Students</th>
<th>Students Only</th>
<th>Individuals</th>
<th>Small groups (6 or Less)</th>
<th>Large groups (More than 6)</th>
<th>Classes</th>
<th>Other (please specify)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answered: 11</td>
<td>18.18%</td>
<td>100.00%</td>
<td>27.27%</td>
<td>54.55%</td>
<td>81.82%</td>
<td>72.73%</td>
<td>63.64%</td>
<td></td>
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<tr>
<td>Skipped: 4</td>
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</tbody>
</table>

LABS / STUDIOS

<table>
<thead>
<tr>
<th>Group</th>
<th>Teachers Only</th>
<th>Teachers and Students</th>
<th>Students Only</th>
<th>Individuals</th>
<th>Small groups (6 or Less)</th>
<th>Large groups (More than 6)</th>
<th>Classes</th>
<th>Other (please specify)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answered: 8</td>
<td>12.50%</td>
<td>67.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>75.00%</td>
<td></td>
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</tr>
<tr>
<td>Skipped: 7</td>
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</tr>
</tbody>
</table>

COLLABORATION SPACES / COMMONS

<table>
<thead>
<tr>
<th>Group</th>
<th>Teachers Only</th>
<th>Teachers and Students</th>
<th>Students Only</th>
<th>Individuals</th>
<th>Small groups (6 or Less)</th>
<th>Large groups (More than 6)</th>
<th>Classes</th>
<th>Other (please specify)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answered: 9</td>
<td>11.11%</td>
<td>77.78%</td>
<td>11.11%</td>
<td>22.22%</td>
<td>44.44%</td>
<td>44.44%</td>
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<tr>
<td>Skipped: 6</td>
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</table>
Appendix I – Activities Response Graphs from SurveyMonkey.com
ACTIVITIES

CLASSROOMS / LEARNING STUDIOS

INFORMAL SPACES / FLEX SPACE /
SHARED LEARNING

LABS / STUDIOS

COLLABORATION SPACES /
COMMONS
Appendix J – Average Length of Use Response Graphs from Surveymonkey.com
Appendix K – Highest and Lowest Overall Satisfaction

Cross-Analysis of Average Ratings Chart
<table>
<thead>
<tr>
<th>Mean Mode</th>
<th>Classrooms / Learning Studios</th>
<th>Informal Spaces / Flex Space / Shared Learning</th>
<th>Labs / Studios</th>
<th>Collaboration Spaces / Commons</th>
<th>Average Rating per Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall, I am satisfied with the size of this space</td>
<td>4.08</td>
<td>4.10</td>
<td>4.29</td>
<td>3.89</td>
<td>4.09</td>
</tr>
<tr>
<td>Overall, I am satisfied with the proximity of this space to other spaces in the school</td>
<td>4.00</td>
<td>3.80</td>
<td>4.29</td>
<td>4.00</td>
<td>4.02</td>
</tr>
<tr>
<td>Overall, I am satisfied with the type of furniture in this space</td>
<td>3.92</td>
<td>3.90</td>
<td>4.14</td>
<td>3.78</td>
<td>3.94</td>
</tr>
<tr>
<td>Overall, I am satisfied with the organization of this space</td>
<td>3.77</td>
<td>3.30</td>
<td>3.71</td>
<td>3.56</td>
<td>3.59</td>
</tr>
<tr>
<td>Overall, I am satisfied with the level of flexibility in this space</td>
<td>3.92</td>
<td>3.90</td>
<td>4.00</td>
<td>4.13</td>
<td>3.99</td>
</tr>
<tr>
<td>Overall, I am satisfied with the technology and resources in this space</td>
<td>4.23</td>
<td>3.56</td>
<td>3.86</td>
<td>3.13</td>
<td>3.70</td>
</tr>
<tr>
<td>Overall, I am satisfied with the lighting and ventilation in this space</td>
<td>3.85</td>
<td>4.00</td>
<td>3.86</td>
<td>3.78</td>
<td>3.87</td>
</tr>
<tr>
<td>Overall, I am satisfied with the noise level in this space</td>
<td>4.15</td>
<td>3.30</td>
<td>3.86</td>
<td>3.67</td>
<td>3.75</td>
</tr>
<tr>
<td>Average Rating per Space</td>
<td><strong>3.99</strong></td>
<td><strong>3.73</strong></td>
<td><strong>4.00</strong></td>
<td><strong>3.74</strong></td>
<td></td>
</tr>
<tr>
<td>% of Participant Responses</td>
<td>93.33%</td>
<td>66.67%</td>
<td>60.00%</td>
<td>60.00%</td>
<td></td>
</tr>
<tr>
<td>% of Excellent Ratings</td>
<td>36.61%</td>
<td>35.00%</td>
<td>44.64%</td>
<td>29.17%</td>
<td></td>
</tr>
<tr>
<td>% of Very Good Ratings</td>
<td>26.79%</td>
<td>25.00%</td>
<td>21.43%</td>
<td>27.78%</td>
<td></td>
</tr>
<tr>
<td>% of Good Ratings</td>
<td>22.32%</td>
<td>20.00%</td>
<td>23.21%</td>
<td>26.39%</td>
<td></td>
</tr>
<tr>
<td>% of Adequate Ratings</td>
<td>6.25%</td>
<td>15.00%</td>
<td>10.71%</td>
<td>13.89%</td>
<td></td>
</tr>
<tr>
<td>% of Poor Ratings</td>
<td>0.89%</td>
<td>3.75%</td>
<td>0.00%</td>
<td>0.00%</td>
<td></td>
</tr>
</tbody>
</table>
Appendix L – Highest and Lowest Satisfaction per Space

Cross-Analysis of Average Ratings Chart
<table>
<thead>
<tr>
<th></th>
<th>Classrooms / Learning Studios</th>
<th>Informal Spaces / Flex Space / Shared Learning</th>
<th>Labs / Studios</th>
<th>Collaboration Spaces / Commons</th>
<th>Average Rating per Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall, I am satisfied with the size of this space</td>
<td>4.08</td>
<td>4.10</td>
<td>4.29</td>
<td>3.85</td>
<td>4.09</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>4/5</td>
<td></td>
</tr>
<tr>
<td>Overall, I am satisfied with the proximity of this space to other spaces in the school</td>
<td>4.09</td>
<td>3.80</td>
<td>4.29</td>
<td>4.09</td>
<td>4.02</td>
</tr>
<tr>
<td>Overall, I am satisfied with the type of furniture in this space</td>
<td>3.92</td>
<td>3.90</td>
<td>4.14</td>
<td>3.75</td>
<td>3.94</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4/5</td>
<td></td>
</tr>
<tr>
<td>Overall, I am satisfied with the organization of this space</td>
<td><strong>3.77</strong></td>
<td><strong>3.80</strong></td>
<td><strong>3.71</strong></td>
<td><strong>3.56</strong></td>
<td><strong>3.59</strong></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Overall, I am satisfied with the level of flexibility in this space</td>
<td>3.92</td>
<td>3.90</td>
<td>4.00</td>
<td>4.13</td>
<td>3.99</td>
</tr>
<tr>
<td></td>
<td>4/5</td>
<td>5</td>
<td>4</td>
<td>4/5</td>
<td></td>
</tr>
<tr>
<td>Overall, I am satisfied with the technology and resources in this space</td>
<td><strong>4.23</strong></td>
<td>3.56</td>
<td><strong>3.86</strong></td>
<td><strong>3.13</strong></td>
<td><strong>3.70</strong></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Overall, I am satisfied with the lighting and ventilation in this space</td>
<td>3.85</td>
<td>4.00</td>
<td>3.86</td>
<td>3.75</td>
<td>3.87</td>
</tr>
<tr>
<td></td>
<td>3/4/5</td>
<td>5</td>
<td>3</td>
<td>3/5</td>
<td></td>
</tr>
<tr>
<td>Overall, I am satisfied with the noise level in this space</td>
<td>4.15</td>
<td><strong>3.30</strong></td>
<td>3.86</td>
<td>3.67</td>
<td>3.75</td>
</tr>
<tr>
<td></td>
<td>4/5</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Average Rating per Space</td>
<td>3.99</td>
<td>3.73</td>
<td>4.00</td>
<td>3.74</td>
<td></td>
</tr>
<tr>
<td>% of Participant Responses</td>
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<td>60.00%</td>
<td>60.00%</td>
<td></td>
</tr>
</tbody>
</table>

| % of Excellent Ratings       | 36.61%                        | 35.00%                                        | 44.64%         | 29.17%                          |
| % of Very Good Ratings       | 26.79%                        | 25.00%                                        | 21.43%         | 27.78%                          |
| % of Good Ratings            | 22.32%                        | 20.00%                                        | 23.21%         | 26.39%                          |
| % of Adequate Ratings        | 6.25%                         | 15.00%                                        | 10.71%         | 13.89%                          |
| % of Poor Ratings            | 0.89%                         | 3.75%                                         | 0.00%          | 0.00%                           |