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How does the Physical Design of a Classroom Influence Learning? ~ Design Ideas for Japanese Secondary School Classrooms ~

Karin Nakano , '23

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Educational Studies Thesis Fall 2022
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Introduction

My interest in the physical design of a classroom and school most likely originates from my experiences going to several Montessori schools in kindergarten and elementary school. Montessori education was designed in the early 1900s by the first woman doctor in Italy, Maria Montessori (Aljabreen, 2020). In Montessori, the individual child learns at their own pace by choosing which activity he/she/they wants to engage in and progressing as far as he/she/they are interested. One of the most important elements of Montessori education is the prepared environment: an environment that is designed to assist children's development and independence (*Montessori Basics: The Prepared Environment*, 2020). Montessori pays great attention to the layout of the classroom, each piece of furniture, and how each child will move within and interact with the space. Tables, chairs, and shelves are sized to match the children who will be using them so they can easily access their work and be comfortable while concentrating on their tasks. Most classrooms also have rug space where children can spread out, individual seating as well as group tables, floor chairs, and cushions to give children the opportunity to switch seats and move around depending on the needs of their bodies (*Montessori Basics: The Prepared Environment*, 2020). Wood or other natural materials are used such that the environment has minimal distractions for learning. In Montessori, the classroom is designed with great intentionality and flexibility to respond to the needs of individual children in the classroom.

Learning in such spaces while I was young, repeatedly reflecting on my own educational experiences and how they lead to where I am now, I consciously and unconsciously became aware of the power of design in education and how it can affect students' learning experiences in schools. After becoming more aware of my interest in the physical design of the classroom and its influence on learning, I decided to do an internship at an architectural firm called Education Design International (EDI). EDI designs and renovates school facilities across the world with the goal of transforming education through design. Although it is an architectural firm, the company works with school administrators, teachers, students, and community members to redefine the school's educational goals and improve education; the (re)creation of the physical building itself is only one part of its work that aims to improve education.

This thesis gathers my previous works from several Educational Studies courses at Swarthmore College and my work at EDI to come up with ideas for classroom designs in Japanese secondary schools. The importance of the physical design of classrooms and schools is not yet fully acknowledged nor explored; although both EDI and I believe that it is crucial to the learning experience. This is especially true in Japan, which has emphasized content learning in

preparation for exams. It is important that this thesis focuses on middle and high school because content learning and the focus on exam preparations are salient in these stages of education. Moreover, most classroom designs in secondary schools do not reflect the kinds of designs that are found to be beneficial to students and teachers discussed in this thesis. By thinking about how the design of the classroom and schools can look like, teachers, school administrators, and parents would have the opportunity to think about the goals and what they value in education.

This thesis argues that classrooms and schools are no longer places where one-way teaching occurs; they are places for students, teachers, and community members to all learn together. Classrooms are spaces where collaboration occurs and communities are created. The physical design of these spaces can contribute to student and teacher well-being as well as better learning experiences and outcomes. This thesis hopes that learning how physical design can affect and shape learning will inspire Japanese educators to reconsider what they value in their education and what education should achieve. Education that emphasizes knowledge input may limit students' potential to develop problem-solving, communication, and synthesizing skills. By seeing classrooms and schools as communities built with mutual trust and respect, we can cultivate students' self-esteem and establish a sense of belonging for every student in the classroom. Looking at and reconsidering education from a design perspective will benefit Japanese middle and high school students both in their learning experiences and well-being.

Overview of the Thesis

In the following section, this thesis introduces the reasons why school buildings and classroom designs are fundamental to education. It analyzes traditional classroom designs and their relationship to the goals of education at the time they were built, and how education has changed over time. This analysis demonstrates the ways in which school buildings are not aligned with the current educational goals, at the same time, points to the power of design in making change. The following section provides an overview of Japanese education and the possible challenges and tensions in trying to implement design elements that this thesis introduces. The third section provides several fundamental frameworks for designs, including classrooms as learning communities, the role of teachers, and universal design. Finally, the last section introduces six main components of design, including open space, privacy, fluidity, and interactive spaces. This section illustrates how the frameworks presented in the previous section can be applied in designs and explains the ways in which design can help achieve the goals of education and respond to the needs of individual students. Altogether, this thesis argues that education that emphasizes student and teacher engagement, community, sense of self-worth, and self-esteem will benefit Japanese education in the future and design is key to achieving such educational change.

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Schools are Outdated!

What is the role of education? Education has served different roles and goals throughout history. Similar to the industrial revolution period, during Japan's rapid economic growth between the 1950s and 1970s, education was used to nurture workers, specifically factory workers who were taught the same set of skills. The "cells and bells" model of school where students spend their school day in a cell and move to another, identical cell when the bell rings, was created during the industrial revolution. This model is still widely seen in Japanese schools, with classrooms separated into different "cells" and students and teachers moving between them as the bell rings. Education has been all about teaching knowledge to students and "the more 'knowledge' one had, the more educated he or she was" (Nair et al., 2020, p. 17). Although Japanese education is currently at its transition stage, this notion is still evident as the knowledge-based examination is, oftentimes, treated as the primary way in which students are granted admission to schools. Teaching was one-way and what students were taught in schools transferred directly to the workforce. A high school diploma became a status symbol and meal ticket; education was seen as a stepping stone for obtaining a better job but was not assigned any significance on its own (Springer, 1994). The education model during this time, both in Japan and in other parts of the world, was based on the idea that "education can be mass produced in a factory-like setting to churn out 'educated' students ready to tackle college and careers" (Nair et al., 2020, p. 5).

Since then, the workforce and society as a whole have changed drastically. Many jobs nowadays require creativity, the ability to adapt and to be flexible, and collaboration and communication skills. Moreover, with technology and the internet being widely available, knowledge has become incredibly accessible, changing the role of traditional schools (Nair et al., 2020). One can easily go online and find significant amounts of information, tutorials, and other forms of resources to learn. Then, what is the role of schools? What should schools be aiming for?

Nair et al. (2020) claim, "Education must now be about building strong social, creative, and conceptual thinking skills, building character and a whole range of new literacies" (2020, p. 17). Springer (1994) also indicates how the nature of the work changed to increasingly more sophisticated tasks, requiring higher levels of thinking skills and integrated knowledge. Students are required to know how to work with ever-changing facts, analyze information, synthesize results, re-evaluate and revise throughout the process, and problem-solve (Springer, 1994). Obviously, teaching uniformly a set of knowledge to students would not achieve this goal. Every student is unique and using the same method and material would not lead to the same results. Creativity, critical thinking and communication skills, and the ability to coordinate with others are a few of the many skills that are valued in the workforce. The "cells and bells" model of school makes it a challenge for students to develop such skills and go deeper into their interests.

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Moreover, such ways of teaching can lead to the development of self-worth and increased self-esteem, both of which are important for every student to have as they grow up. In the process of nurturing creativity, problem-solving, and communication skills, teachers and students can share the understanding that each individual brings diverse and valuable abilities to the work that happens in the classroom and every contribution is needed for success as a whole (Cohen et al., 1999). This leads to students' belief that everyone is essential to the classroom community, including themselves and other students around them. This understanding, coupled with student interactions and collaboration, can promote students' well-being as well as encourage them to learn ways to develop meaningful relationships and how to care for others.

Lastly, keeping teachers in one "cell" and having them teach independently also limits the possibilities for students to make connections between disciplines and explore their interests across subjects. Although changes are happening in what happens inside the classroom, such as calls for individualized instruction, collaboration among students, and exploratory learning, the space in which learning happens - the physical design of schools - must also be reconsidered. Surely, many traditional school buildings are outdated.

Design is Fundamental

Design is fundamental to achieving the kinds of education we want our children to experience nowadays. Nair et al. (2020) state, "The most visible, and maybe even the most influential, element of the educational experience is the environment in which we place children in their most impressionable and formative years" (p. 6). The physical environment can encourage new forms of learning while at the same time, preclude what education can achieve. Although design on its own can only do so much, it is true that design can lead to the creation of new forms of education. Changing the design of classrooms will allow us to introduce innovative ways of teaching and learning that fit the current goals of education.

For example, school buildings that are designed for the cells and bells model are made to accommodate teacher-directed learning better than student-led learning such as collaboration, independent study, and research (Nair, et al., 2020). In many ways, the current educational environment works against teachers working in ways that are different from teacher-directed learning and individual teaching (Lindfors, 1987). The "hardware" of such buildings places severe constraints on the school's ability to adopt other ways of teaching and learning (Nair et al., 2020).

Moreover, physical spaces can give out certain messages to people as they enter the space. Many children perceive their role as a passive one: to take in information that is given and do as they're told to (Lindfors, 1987). The traditional Japanese classroom has a platform in the front for the teacher to put their notes on and stand, and students' desks and chairs that fill the

rest of the classroom. Frequently, there is a blackboard in the front, and students are seated to face the front of the room. Nair et al. (2020) state:

> *[These characteristics of] classrooms send a powerful message to students that they are there to listen to and take direction from the teacher. Even when the teacher changes the model to empower students by joining tables to create collaborative student groupings, the fundamental structure of the room remains one of control where one adult is fully in charge of what happens, how it happens, and where it happens.* (p. 20)

In contrast to this quote, we want students to feel like they have the ability and autonomy to alter the space to cater to their needs; to believe that the space belongs to them, not the teachers. The space must be inviting, exciting, stimulating, and relaxing. Students should feel encouraged and comfortable to take risks, pursue their interests, be creative, and collaborative, and feel relaxed at the same time. The teacher-centered model of education and classrooms and the building designs that support this model are simply not made to accommodate the diverse needs of students and the activities needed to equip students with skills, knowledge, and self-esteem that are all important for their success in the future.

Overview of Japanese Education

Some of the characteristics of Japanese education may be a challenge for adopting the design models discussed in this thesis. Since Japan established a nationwide school system in 1872, it has maintained a uniform education across its country (Nakano, 2019a). The system is ensured by the School Education Act which requires definite levels of education in schools and equal opportunities for quality education (Nakano, 2019a). This is the contributing factor to Japan's high literacy rates among its citizens. Starting from the end of World War II until the late 1970s, Japan experienced rapid economic growth. During this time, Japan "put economic issues above all other policy to invest every effort in economic rehabilitation and to catch up with the West," constructing education in which the outputs were carefully aligned with the "manpower requirements of the rapidly expanding economy" (Nakano, 2019b, p. 2). From this time, the goal of Japanese education has been to develop necessary skills for individuals as well as to develop the nation as a whole. Policies strongly promoted educational systems that were heavily focused on examinations, creating the foundations of current Japanese education.

Starting from this period, academic qualifications became a significant factor in getting jobs and succeeding in life (Nakano, 2019b). Degreeocracy often referred to as *gakureki-shakai*, is a widely held belief in Japan that an individual's career and success in life are solely determined by their academic background (Nakano, 2019b). As Japan experienced high economic growth, degreeocracy became a much considered-issue throughout Japanese society.

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On one hand, degreeocracy is seen to provide equal educational opportunities to all members of society, as individuals who work hard can achieve higher levels of education through standardized examinations. However, it also creates fierce competition in examinations since academic background is the only source that determines one's occupational role as well as income and social status. It also leads to stifling the development of individual creativity since it puts little importance on "children's real intelligence or aptitude for study, and instead [places] great emphasis simply on the skillful control of material in the entrance examinations" (Nakano, 2019b, p. 3).

The strong emphasis placed on examinations makes test preparations the primary concern of students, teachers, parents, and schools. This focus on test preparation makes it challenging for Japanese education to introduce student-centered, project-based learning as these require more time and flexibility, and exam-oriented education value efficiency. In 2002, Japan introduced a new subject called Integrated Studies (IS) into its national curriculum (Bjork, 2009). This was part of a few initiatives that were introduced in the same year in an attempt to respond to the criticism of Japanese education that "the uniformity and rigidly of the Japanese education system was preventing its students from acquiring the skills and attitudes necessary to succeed in an increasingly interconnected world" (Bjork, 2009, p. 28-29). In IS, students chose topics within a theme that the school selected and designed projects that they found interesting. The goal of IS was to provide opportunities for students to engage in problem-solving activities, student-centered learning, and nurture creativity and critical thinking skills (Bjork, 2009).

However, the integration of IS was not a successful one. Teachers were not given enough support and guidance to effectively assist students. Furthermore, as IS was added to the curriculum, the number of hours set aside for most academic subjects was reduced and this created the belief that IS interfered with the core curriculum rather than complementing it. This led to the notion that IS was contributing to a lowering of academic standards (Bjork, 2009). This notion was especially true in secondary schools; on many occasions, the time allocated to IS were used for other purposes such as to teach other subjects that were tight on schedule. The lack of teacher support and support from parents as well as the exam-oriented education system that shapes teaching priorities and public opinion all interfered with the original intentions of IS, making it an unsuccessful intervention.

From this example, we can see that even if teachers are willing to incorporate student-centered learning into their teaching, the priority to prepare students for examinations predominates, making it difficult to find the balance. The fundamental approach of this thesis is geared towards student-centered learning and student-teacher interactions, which may pose challenges when we consider implementing these design elements in Japanese classrooms. Although investing in such designs when more emphasis is placed on exam preparations and uniformly transferring knowledge to students seems not worth it, this thesis hopes that these ideas would inspire school administrators, teachers, parents, and community members to think

about what they hope to achieve through education and ways to incorporate such ideas to best support learning.

Frameworks for Design

This section provides four frameworks for design: 1) schools as learning communities, 2) teachers as central facilitators of building identity and community, 3) biophilic design, and 4) universal design. These frameworks present the fundamental beliefs and approaches toward education that the design presented in this thesis is based on. Simply said, these frameworks illustrate the reasons why each component illustrated in the next section - six main components of design - are chosen and designed in such ways.

The first framework, schools as learning communities, demonstrates the beliefs of this thesis on what education should achieve and the kinds of environment it should have to achieve such goals. This forms the basis of how the physical design of the classroom should look like.

The second section, teachers as central facilitators of building identity and community, discusses the role of teachers in learning communities. Just like the first framework is important in thinking about design, how we think about teachers' roles in classrooms is an important piece to direct our attention to. How teachers teach and design learning informs the kinds of functions the space would need to accommodate such ways of teaching and learning.

The third section, biophilic design, presents a relatively new concept that incorporates natural elements and designs that connect humans with nature in built environments. Biophilic design is shown to improve both physical and mental health and incorporating such design into classrooms can lead to improved learning outcomes and students' well-being. Since the benefits of biophilic design are vital and apply to every individual in the space, it is included as one of the four main frameworks. Each component illustrated in the next section has some connection to biophilic design.

Lastly, the fourth framework, universal design, provides a brief introduction to what universal design is and how it may be applied to learning spaces. Universal design is not only about designing an accessible space for every individual but is also about the importance of designing learning in ways that are accessible to each student. Universal design allows us to think about the design of the classroom in ways that allow such flexible and adaptable learning to occur, and is also the underlining idea that contributes to the design choices of each component presented in the next section.

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Schools as Learning Communities

The fundamental educational concept of this thesis is community; classrooms and schools are learning communities where reciprocal learning occurs. As the previous sections suggest, simply adopting the traditional banking approach to education: teachers "deposit" knowledge in students' brains just like people deposit money in banks will not lead to the development of skills and knowledge as well as a sense of self-worth and self-esteem that we want children to have as they grow up (Souto-Manning & Martell, 2016). Instead, the classroom can be seen as a place where students and teachers engage in discussions, share their ideas, and learn from each other.

Both Resnick et al. (2010) and Cohen et al. (1999) emphasize the importance of student interactions in the classroom. By providing students with open-ended tasks that do not necessarily have certain answers, students act as resources for one another, at some times depending on others, and other times, being responsible for assisting others who need help in the process (Cohen et al., 1999). Teachers act as guides, asking questions and encouraging students to explore alternative approaches, communicate their thoughts and justify their arguments (Cohen et al., 1999). Such scaffolding and social interactions are shown to develop individual mental processes and improve students' cognitive performance (Resnick et al., 2010). Such activities prepare students with the skills to analyze and synthesize information, problem solves, think at higher levels, and effectively communicate their ideas - all skills that are valued nowadays (Springer, 1994).

Lindfors (1987) indicates the importance of a "no-risk" environment in classrooms where students can explore their ideas and make errors as part of their learning process. Springer (1994), similarly, calls attention to the importance of mutual trust and respect, which are essential aspects of a no-risk, safe learning environment, and students having a sense of belonging and self-worth in the classroom. Interactions and discussions cannot be successfully implemented without the development of trusting relationships among students and teachers. Students must feel comfortable asking for help in order for meaningful student interactions to occur in the classroom. Teachers and students can develop by acknowledging and accepting individual differences and valuing every student's questions and ideas (Brown & Campione, 1994). The open-ended tasks provide opportunities for every student to make contributions and draw upon each other's expertise and repertoire of problem-solving strategies (Cohen et al., 1999). Such multi-ability tasks demonstrate to students that there are various ways to be "smart" and see intelligence as multidimensional (Cohen et al., 1999). Students can develop an understanding that they each have their own strengths and weaknesses and by working together, they can complement each other. It is important that both teachers and students share the notion that each individual brings valuable and different abilities to the work that they do and every contribution is needed for success (Cohen et al., 1999). This shared understanding leads to

creating an environment that centers mutual trust and respect and provides a sense of belonging and self-worth in the classroom.

Classrooms should be places where such a community can be built and flourish. Although constructing such an environment is, in many senses, the product of students and teachers working together and making an effort to make it possible, design can also help ease the process. Designing rooms with movable walls, chairs, and desks, and making the room a relaxing and inviting space are some of the ways design could play a role in creating an effective learning community. This thesis introduces design concepts and ideas that are based on these fundamental philosophies of education.

Teachers as Central Facilitators of Building Identity and Community

What are the roles of teachers in a learning community? It is commonly thought that teachers' role in education is to prepare children to become effective citizens in a democratic society while also equipping them with the necessary skills and knowledge that they need to work the job that they desire. Gutman (2007) describes the tension between these two goals in which teachers educate children with civic virtue while also teaching the skills and knowledge they need to practice individual freedom (Nakano, 2021). As a way to overcome this tension, she suggests the role of education to allow children to learn how to behave in accordance with societal values but also to understand them and think critically about them (Nakano, 2021). This way, education prepares children to become effective members of society while also having the ability to question and challenge societal norms and values.

Gutman's definition of education brings our attention to the importance of cultivating skills such as literacy, communication, and critical thinking skills that will allow children to reason and argue about the structures and values imposed on society. The development of these skills also relies on identity development, making sure that children can explore their identities and learn more about them throughout schooling. Muhammad (2020) states that as teachers, helping children understand their identities is important because "it helps them to see their own positionality and stances in the world and across sociopolitical issues" (p. 70). By understanding who they are, children can gain the confidence to learn the skills and use learning as a personal and sociopolitical tool to navigate the world that they live in (Muhammad, 2020). Thus, a teaching approach that integrates children's identity, including cultural and familial knowledge and background is critical to nurturing children who are capable of making informed decisions. The role of teachers is not only to provide knowledge and intellectual abilities that will prepare individuals to be effective members of the workforce, but to allow children to develop a rich understanding of their identities, build stronger relationships with their communities, and become critical thinkers and activists who are willing to challenge the existing system.

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The strong emphasis on examination and the neoliberal framing of education in Japan create various challenges for teachers to achieve such goals. Exam-oriented systems and neoliberalism both put emphasis on efficiency, individual success, and freedom and believes that market-based values and approach yields the best results (Nakano, 2021). Under such trends, teachers are constantly under the pressure to choose between preparing students for standardized testing, teaching critical thinking skills, and engaging in students' identity development because the two require different emphasis and teaching styles, and the limited time teachers have obligates them to pick between the two (Nakano, 2021). Teachers cannot necessarily disregard the time to prepare students for standardized testing because students' performance determines how successful students are and the opportunities that lie in front of them.

What can teachers do? A community can be a powerful ally and resource for teachers. Resisting the neoliberal and exam-oriented framework in education is challenging for many teachers. It requires dedication and comes with various risks. Having a community that is willing to work collectively to educate the young and support teachers in their teaching can be extremely beneficial for teachers. In fact, teachers in Japan already have a culture of collaboration and teamwork that attempt to improve their instructional abilities, in contrast to the American culture that emphasizes independence (Bjork, 2000). Japanese schools have faculty rooms (*kyomu-shitsu*) which "essentially functions as a home room for all teachers" (Bjork, 2000, p. 63). Since every teacher's desk is located in this room, teachers usually return to this room during free periods or break time to work, encouraging interactions to happen. There is a strong consensus among Japanese teachers to work collaboratively and assist each other in their development of instructional abilities and overcoming challenges when they arise. Utilizing this existing culture can be a powerful way to resist the neoliberal push and exam-oriented approach to education and introduce some of the design concepts discussed in this thesis.

Biophilic Design

The rapidly developing and urbanizing world has distanced many people from nature and natural processes that used to be a central part of human activity. In fact, by the time 2050, it is said that 66% of the world will be urbanized, further dissociating humans from nature (Nair et al., 2022).

Why does this matter in the development of schools? Studies have revealed that the application of biophilic design in hospitals, workplaces, and schools has demonstrated many positive outcomes (Nair et al., 2022). These studies concluded that biophilic environments are health-promoting and restorative. They are known to combat mental fatigue, with stress recovery leading to enhanced creativity, relaxation, and excitement (Nair et al., 2022). Moreover, other studies have revealed that biophilia not only alters human attitude and behavior but can also

positively reduce the so-called 'Sick building syndrome, in which people suffer from health symptoms linked to the buildings in which they spend most of their time (Nair et al., 2022).

Although most people nowadays do not participate in primitive activities such as hunting and are not concerned about the need to be in a space that is protected from predators, these instincts are still embedded in our brains. Our brains react to certain spaces in certain ways and feeling connected to nature is shown to have a positive impact on our well-being. When people are exposed to a natural environment, they recover significantly faster compared to when they are exposed to an urban setting.

Biophilic Design invites urbanized spaces to include natural elements and processes to improve people's well-being inside buildings and spaces. It is an approach to design that aims to connect humans and nature in our living, learning, and working places. As the world becomes increasingly urbanized, not only adults but more children will lose their connection to nature as they grow up. Despite this fact, the basic form of schools remains to have plain walls, a limited number of windows, and made with materials that do not resemble nature. It is important to recognize how meaningful and beneficial it is for schools to incorporate biophilic designs to ensure that children, no matter their backgrounds or identity, are exposed to such designs and can improve their well-being while at school. (For more about the 14 patterns of Biophilic design, see Nair et al.'s white paper on Biophilic Design.)

Universal Design

Universal Design is the "design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people regardless of their age, size, ability or disability" (National Disability Authority & Centre for Excellence in Universal Design, n.d.). It is not a design that is built specifically to benefit certain populations; it is a design that meets the diverse needs and abilities of all people who wish to use the space. The 7 Principles of Universal Design guide the design of spaces, products, and communications (National Disability Authority & Centre for Excellence in Universal Design, n.d.):

1. Equitable use
2. Flexibility in use
3. Simple and intuitive
4. Perceptible information
5. Tolerance for error
6. Low physical effort
7. Size and space for approach and use.

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In the educational context, the universal design assumes that all students have unique sets of strengths and needs, and designing the environment, teaching, and learning to meet the needs of every student in the classroom (Baglieri, 2017). Universal design brings our attention to the strengths of each student and the need for a flexible curriculum that anticipates a range of student abilities and competencies. Universal Instruction Design interprets how the seven principles listed above can be interpreted for instruction and adds two additional principles (Baglieri, 2017):

1. Class climate
2. Interaction
3. Physical environments and products
4. Delivery methods
5. Information resources and technology
6. Feedback
7. Assessment
8. Accommodation

Although it is beyond the scope of this thesis to go deeper into each principle, it is worth considering how such principles could be considered as we think about the physical design of classrooms and schools. Nair and Fielding (2009) introduce Howard Gardner's Multiple Intelligence (MI) theory that says "all human beings possess eight 'intelligences,' though not each of us is necessarily strong in all of them" (p. 144). The eight intelligence are

1. Linguistic - Word Smart
2. Logical/Mathematical - Numbers Smart
3. Musical - Music Smart
4. Bodily/Kinesthetic - Sports/Fitness Smart
5. Spatial - Picture/3D Smart
6. Naturalist - Nature Smart
7. Interpersonal - Social Smart
8. Intrapersonal - Self-Smart.

MI theory can provide opportunities for students to become engaged in subjects that they would not have been interested in by supplementing the experience with their stronger intelligence area (Nair & Fielding, 2009). This also speaks to the idea of designing learning spaces and curricula to accommodate varying ways of learning.

Additionally, it is also worth noting the three main barriers to learning that prohibits the access of students with disability to school curriculum: 1) the mode of representation of materials and instruction, 2) the mode of expression or ways students are able to perform their learning,

and 3) the mode of engagement or methods in which students are engaged in learning (Baglieri, 2017). Many of these principles speak to the components of design introduced in the next section, such as interaction, physical environments and products, and delivery methods, which are discussed in detail in the next section. Having flexibility in the physical design of a classroom can help remove such barriers as well as better accommodate every student's needs. Universal design allows us to reconsider schools, classrooms, curriculum, and teaching practices such that we can bring out the strengths of each student, celebrate diversity, and respond to the needs of each student in the space.

Six Main Components of Design

This section illustrates the six components of design - biophilic design, open space, privacy, fluidity, interactive space, and individual expressions and needs - that this thesis believes as key to designing a classroom. As noted in the previous section, these design components are defined based on the four frameworks that are discussed in the previous section.

On top of biophilic design, the second component, open space, provides opportunities for students to interact with each other, collaborate, and learn ways to work in a community. It can also serve as a space where students can relax with one another. Open space also creates the possibility for play. Typically, play becomes less valued and permitted in schools as students move on to middle and high school. However, play is one of the most important ways children learn and develop, and this is not limited to preschool and elementary school children - it applies to middle and high school students as well. Having open space and furniture flexibility (which relates to the fourth component) allows students to engage in play, leading to social, emotional, and cognitive development (Mraz et al., 2016). The sense of authority and control that play provides benefits learning by increasing students' sense of self-worth and emotional stamina, enabling them to better handle academic tasks and competition with peers (Brooker et al., 2014).

In contrast, having spaces with privacy is also essential. Private spaces allow students to take mental breaks from learning and other chaotic moments that they may encounter and take time to reflect, recharge and focus better. As much as interactions are important, students also need opportunities to process intense amounts of information they receive everyday.

The fourth component, fluidity, ensures that the learning space accommodates the diverse needs and learning styles of students and activities. Student-centered and interactive learning requires spaces to accommodate various seating options and teaching and learning styles. Having flexibility in how the space can look will ensure that the space could adapt to various styles of learning.

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Interactive space, the fifth component, is a space that is designed to foster interactions both among students and between students and teachers. In some sense, this component overlaps with open space but interactive spaces can also be small study rooms or corners that students can use to interact in small groups with added privacy. Interactive spaces provide opportunities for students to learn from each other and ways to care for one another while working collaboratively as a team.

Lastly, individual expressions and needs are important pieces to consider in every classroom. Engaging in interactive, student-centered learning requires students to open up and be vulnerable in some situations. As educators, it is important to create spaces where students feel safe and comfortable to do so. Focusing on individual differences and honoring and valuing the unique stories and learning journeys each student has leads to learning communities that are centered around love and respect. Thinking about ways the physical space can help achieve this is crucial in considering the ways in which we can design classrooms.

Six Main Components of Design (Link to Canva)

1. *Biophilic Design*
2. *Open Space*
3. *Privacy*
4. *Fluidity*
5. *Interactive Space*
6. *Individual Expressions and Needs*

Limitations

As much as these designs are well-considered, it is important to recognize the limitations of this thesis and design ideas. Firstly, most examples presented in the section Six Main Components of Design are drawn from Swarthmore College's campus. It is important to recognize the resources and privileges that Swarthmore College has that many Japanese middle and high schools will not have. Some designs that the college adopts are made possible due to the financial resources that it has. While it is important to acknowledge this limitation, I would also like to point out that these concepts do not have to be applied on large scales as Swarthmore College does. Most components are possible to implement on a smaller scale; the documentation lists some ideas. Even introducing plant pots near the window in a classroom is beneficial to everyone who is part of the space; taking that first step to making the experiences in the space better for everyone is crucial.

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When the environments we grow up in are different from what we envision, our past experiences may limit our ability to imagine new spaces. It is certain that there are other ways to imagine these spaces that are talked about in this thesis and I encourage readers to do so. Although the underlining frameworks and components apply to most schools, the way we deliver them may vary depending on the context such as culture, geographical location and constraints, and financial resources. It is also possible that this thesis seems too idealistic in some ways. However, the objective of this thesis is not to provide concrete ideas and suggestions about what schools may look like but to encourage readers to start thinking about how these concepts may apply to their own schools and classrooms. Every school and classroom would have a different starting point and the hope of this thesis is that it would provide new perspectives and be a source of inspiration for educators and school administrators.

Conclusion

Japanese secondary education faces the need to shift from exam-oriented, content-heavy teaching to student-centered and interactive learning. Although the implementation itself was not successful, the motivation behind the introduction of IS into the national curiculum indicates the need for Japavation behind the introduction of IS into the national curriculum indicates a sense of urgency that Japan is feeling to reform education to nurture individuals who can be successful in current society. Teacher-directed, content-based, and exam-oriented secondary education simply does not fit the needs of students growing up in the 21st century. Incorporating student-centered, interactive learning can not only equip students with the skills and knowledge needed to be successful in their lives beyond school, but it also encourages the development of self-worth and self-esteem which are especially important for students as they go on in their lives. This thesis does not disregard the continuous efforts made by educators in Japan to reform education; however, it argues that changes must be made and design may offer new approaches to thinking about what to change and how such changes may be implemented. The process of understanding how design can be fundamental to education and thinking about how classrooms should look will encourage educators to reconsider the goals of schooling and education, and what we want students to walk away with after their secondary education.

This thesis explores the intersections between design and education and how the physical design of classrooms affects learning. The analysis precisely demonstrates how learning is a product of numerous factors coming together and shaping the learning experience. The first two frameworks, schools as learning communities and teachers as central facilitators of building identity and community, indicate the ways in which teachers, students, and their interactions define how learning occurs in the classroom. On the other hand, frameworks like biophilic design, universal design, and the six components illustrate how the design of the space - mainly

physical but also the ways in which we define the space to be and how it is used - affects learning and students' experiences in the classroom. Although the focus of this thesis is on design, every aspect of education shapes students' learning and their experiences in schools.

Lastly, we must remember that the main figures of classrooms are students. In the process of (re)designing a classroom, students' input on the space is critical. By inviting students into the conversation, we can ensure that schools and classrooms are comfortable spaces for students and spaces that they are willing to come and spend time in.

As we strive to improve education, I hope this thesis offers new frameworks for thinking of ways we could make changes. Ultimately, we want every child to walk away from school with a sense of self-worth, confidence, excitement to learn, and willingness to make a difference in the world inspired by and using what they have learned in school. I hope bringing attention to physical design will inspire new ways to think about educational transformation and ways in which we can shape students' experiences in schools so they walk away from school knowing that they are talented, valued, wonderful individuals.

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