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Master's Thesis
Academic Year 2014

CreoSystema: Redesigning Existing
University Classrooms to Create Interactive
Learning Spaces for Collaboration

Graduate School of Media Design,
Keio University

Niya Kabir

A Master's Thesis
submitted to Graduate School of Media Design, Keio University
in partial fulfillment of the requirements for the degree of
MASTER of Media Design

Niya Kabir

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Abstract of Master's Thesis of Academic Year 2014

CreoSystema: Redesigning Existing
University Classrooms to Create Interactive Learning
Spaces for Collaboration

Category: Design

Summary

Today, society is at an age where the nature of education is changing, curricula are evolving into content that is more interactive and focused on student engagement. These new standards of educational content are being developed to create individuals with skills and knowledge necessary for society's future development. However, there exists a contradiction between the contents' objectives and the environments in which students learn. The recent rise in creative content (ex. brainstorming, group work, ideation, etc.) looks to promote engagement and interactivity. However, the classroom format communicates traditional mental models that are hindering that potential. This thesis proposes a toolkit for improving space design considerations in classrooms. The proposed implementation is *CreoSystema* a creative ecosystem for existing classrooms. The *CreoSystema* Toolkit integrates 3 key principles flexibility of things, ownership of space, and relative perception. These defined principles are derived from fieldwork observations across 3 different types of learning environments Kindergartens, Workshops, and Design schools. The 3 principles are translated into visual re-designed floor plans and step by step guidelines to create a creative ecosystem. The implementation of the *CreoSystema* Toolkit produced noticeable changes in student behavior, level of engagement, and supported the creative content.

Keywords:

Education, Classrooms, Collaboration, Engagement, Creative Content, Space Design

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Chapter 1

Introduction

1.1. Experience in Classrooms

“Education is supposed to be taking us to the future we can’t grasp yet today.”

-Ken Robinson

A look inside a typical University classroom reveals rows and rows of students quietly sitting in their chairs facing the ‘front’ of the classroom. Some students are leaned into their computers or smart-phones, others are what seems to be diligently taking notes, while some students in the front rows have blank stares focusing on the lecturer. A scan of the room results in a number of empty desks separating students, leaving large gaps of dead space. Meanwhile, the lecturer is standing static behind the podium speaking to the crowd of students. Behind the lecturer blares a large screen projecting the class content. This is the current classroom setting that most students and educators experience and is an accurate visual design for most curriculum. These classrooms reflect and re-iterate the traditional well-established practices towards education.

On the other hand, a glimpse into a collaborative and interactive learning environment unveils a different experience. Students are grouped in 4s around the lecturer, who is actively moving around to groups. The classroom grows alive with students’ discussion and interaction. Students are not dependent on computers or technology. Instead they are used as tools for discovery. Resources are scattered and being used for communication and discussion by groups. There are no ‘dead’

or unused tables. Placements of desks are within steps of each other, allowing flexible movement within space. Students have access to all types of resources - like whiteboards, writable surfaces, posters, markers, post-its, clay, etc. - to help encourage creative thinking. Students proximity to each other and the lecturer help students feel more engaged and comfortable talking and answering questions from each other and the lecturer. This collaborative and interactive learning environment illustrates a better relationship with current trends of educational content and approaches. Current approaches to education are heavily centered on attaining knowledge through collaboration and critical thinking.

Today, society is at a point where the form of education is changing. Curriculums are more concerned with various skill developments and diversification of content. Education has developed into a structure of society responsible for preparing and developing future members of society. Through curriculum development students gain access to knowledge and skills essential for career opportunities. The educational system is made up of various subjects (i.e. Math, Science, English, Art, etc.). These categories of subjects represent the basic foundations of needed knowledge and skill. Over the course of history, content and expectations placed on its delivery has grown to reflect social trends. In the past, academics were focused on delivering information and evaluating student's ability to commit it to memory. In other words, learning based on memorization. However, as society has evolved and the needs for creative skills and critical thinking have surfaced, educational institutes have begun to respond with more interactive content and new categories of evaluation. As researchers like Lassig has stated, that more and more society is recognizing the high economic value associated with people's creative ideas.¹ Yet, despite current educational institutes' efforts to improve and meet society's needs, there are areas of contradiction.

Educational organizations carry contradictions between what is taught (i.e. content) and in what environment the content is taught in. Current educational learning environments, illustrate a large gap between the 'carefree exploring and sharing driven' Kindergarten classrooms to more traditional lecturer and student environments, found in Universities. As students move through the education system the once encouraged characteristics of exploration and curiosity are slowly

¹(Lassig 2009)

suppressed. However, it is these innate characteristics - open, curious, interactive personalities within people - that can foster creativity. All of which have become key characteristics employers look for. Instead educational environments are conflicting with societies need for creativity and its evolving pursuit of interactive experiences.

Society's needs and expectations have changed, with the development of innovative technology and the growing access to information and content. What is used to define successful products and services is all based on the perceived level of innovation and creativity. Consumers and society, today, are looking for innovation and creative design solutions. This demand and change in societal behavior has resulted in a huge shift to better equipping students with a learning experience that mimics and promotes this way of thinking.

1.2. CreoSystema: A Creative Ecosystem for Existing Classroom Environments

Education is an evolving and adapting system. Towards the end of the education system one can witness a shift in student behaviors – engagement and interaction. Despite efforts taken to develop more engaging class content, the environments they are being taught in do not communicate the same mindset. Therefore, the classroom interaction and learning model needs to be re-designed with attention to experience design. The experience should ultimately produce an environment that encourages and engages students. Thus, forming a ‘creative ecosystem’. One way to reboot or bring creativity back in parallel with education is through CreoSystema. CreoSystema comes from two latin words - *creo* and *systema*. *Creo*, is a root latin word that is associated with to *create, creative, creation*. *Systema*, meaning *system* is a word that signifies a set of interacting or interdependent components forming an integrated whole. Put together these words encompass the aim of a reformed existing classroom. This ‘creative ecosystem’, CreoSystema, can intuitively encourage the facilitation of discussion and idea sharing. Improving the facilitation of discussion and idea sharing will provide students the opportunity

to engage in collaborative learning and interaction.

CreoSystema is a classroom space that consists of 3 key needs or characteristics – flexibility, ownership, and perception. CreoSystema is a design concept proposed for existing classrooms located in University and is utilized during lessons by students and teachers. It is used to encourage discussion and communication. This is achieved through reconsideration of space design. In other words, it encourages collaborative and interactive learning through considerations in the flexibility of things, student ownership of space and relative perception. Collaborative and interactive learning is when there is more communication and exchanges in the classroom during a period of teaching, between students and their teachers.

The vision of CreoSystema is to simulate and produce active discussion and communication between students and their professors within a university classroom. In hopes of fostering increased communication and student collaboration to create the needed skills for future innovators. The future of innovation is dependent on our interactions, sharing of knowledge, and discussion with people both near and far. Through the development and implementation of a designed space, with the intention of improving discussion and communication, will help stimulate and produce more interaction and student involvement. CreoSystema's integration of flexibility, ownership, and perception is translated into the spatial design of the existing classroom.

Each characteristic - flexibility, ownership, and perception - carries a value that will be visualized in the design of space. Each element that define the 'creative ecosystem' was synthesized from the knowledge and experiences gained through fieldwork research in 3 learning space environments – kindergarten, workshop design, Global Innovation Design Program (i.e. Pratt/Imperial/RCA). The kindergarten fieldwork illustrated freedom and flexibility of space for students and teachers to use during lessons. Kindergarten classroom design results in student engagement, interaction and discussion. This is a result of the versatility and ownership encouraged through the openness of the space. In addition, the workshops were designed for encouraging students to interact and collaborate to produce ideas and solutions. The workshops were usually conducted in both University and High school classrooms around Asia, during specific class time. Participants included both teachers and students. Workshop design has progressed

a lot in how space is utilized or perceived. For instance, workshops were both conducted locally and remotely. This was achievable through consideration into remote communication techniques and orientation. The Global Innovation Design Program (GID) provided insight into different interpretations of creative spaces and essential resources, accessible and available to students and teachers. GID environments were available at each University for projects and lessons. The variety of classrooms promoted build to think philosophy, through the availability and access to resources.

Collaborative and interactive learning produces more active discussion and engagement, through considerations in the flexibility of things, student ownership of space and relative perception. Flexibility is the ease of mobility in available resources, within the University classroom during lessons by students and teachers. The element of flexibility in available resources adds a value of interactivity by promoting active interaction between students and space. Available resources includes and is not limited to tables and chairs. Movable whiteboards, permanent whiteboards, post-its, markers, white foam boards, Internet, and projectors are examples of key essential resources. Available resources are accessible in the existing University classrooms during lessons by students and teachers. Access to available resources is essential to promote various forms of communication and interaction by utilizing the resources available. While ownership speaks to ones needs to take claim of space. Student ownership is when students self initiate the interaction in the University classroom during lessons. Student ownership is a characteristic that removes the hierarchical roles and structure which are pre-existing in a classroom. This is achieved through allowing students to leave work in progress, or notes of class discussions/group brainstorming sessions. The element of relative perception, on the other hand, will foster communication and facilitate interaction between students and teacher-student. Relative perception is how students perceive their relationship between other students, the teacher, and access to resources, during lessons. A student's perceived relative position has a psychological effect on how students interact and communicate. Relative perception will be attained through consideration of proximity. Each characteristic – flexibility of things, ownership of space, and relative perception – carries a value that will be visualized in the design of space. The contextual spaces, in

question, for this research are existing University level classes and the students and teachers who utilize the space. The specific moment that will be targeted is the time during class discussion and group work (i.e. brainstorming, ideation).

Spatial design consists of 8-16 tables, 2ppl/table, with stackable chairs (quantity 24-32). The 'creative ecosystem' of CreoSystema has anywhere between 6-8 movable whiteboards, available to students. Consumable resources will consist of materials that will need replenishing - post-its, white foam core boards, markers and paper. These utensils should be in a visible area. Access to the Internet via Wi-Fi is another key element, along with projectors. These essential resources are located in each University classroom, for the 16-32 students and 1 teacher. Each resource contributes to facilitating the first 2 elements to a CreoSystema - flexibility and ownership. Access to materials that encourage the build mind and facilitate active creative thinking is a visualization of the principles of flexibility and ownership. The presence and access to materials that are in visual site will encourage use and familiarity. Meanwhile, the self initiated use will help break the boundaries existing in the space. In addition the access and presence of the materials will support the communication of creative imagination. Researchers like Resnick, also propose that offering a variety of materials can open up the project and spark imagination.² The final element, perception, is a product of orientation. As for the orientation of the space, all tables will be arranged in a circle, in groups of 2, within the existing classroom environment, for students and the teacher. The orientation facilitates the perception of space. This is achieved through the development of a fundamental space design. The center of the circle will have a space for the professor or the presenter to stand. In order to facilitate the socially accepted proximity (1.5-3m)(Griffin) between students and teacher-student, a floor plan outlines relative perception into a visualization. This orientation will become the fundamental space design model for the CreoSystema.

1.3. CreoSystema Toolkit

CreoSystema is a way for professors, teaching creative content, in existing University Classrooms to reclaim and best match current classroom environment to

²(Resnick 2007)

the content. CreoSystema encompasses 2 key principles that are the defining characteristics to transform a typical classroom into an interactive and collaborative environment. This transition comes with the visualization of the 3 principles after an assessment of the current situation within the classroom. Once the professor assesses their environment they can better integrate CreoSystema within their classroom according to how the principles need can be visualized in the environment. This creative process represents the flexibility and versatility of CreoSystema. The CreoSystema Toolkit is a developed 'how to' guideline for professors to help them recreate CreoSystema in any existing classroom that meet the requirements (i.e. movable chairs and tables).

The remainder of this thesis will outline the development of CreoSystema and its toolkit. Chapter 2 will first take a brief look into the existing discussion surrounding this topic of collaboration, engagement and interaction in the classroom. Followed by chapter 3, which will express in detail the design process of how the concept was developed. Chapter 4 will discuss the evaluation of its implementation. The paper will conclude with future work and discussion into areas where CreoSystema can be explored further.

Chapter 2

Related Works

Research into designing and improving the learning experience has often been centered on implementing the latest technology. The evolution of technology and the Internet have dominated what researchers believe can be the solution for many aspects of society, including education. While this research paper is not trying to argue with the power and value technology brings to the classroom, instead this research is suggesting a new directional focus - where technology is a tool but not a solution. On the contrary this research aims to put an often-overlooked factor to the design experience of learning - space.

Current existing educational institutes have been well designed and established to facilitate traditional pedagogical learning. It is this understanding and notion of how they already are “made for learning“ that has stopped educational institutes and teachers from questioning their value with today’s current shift in teaching. The current classroom design, which was established for sustaining the educational interaction model of lecture based learning, is now hindering the changing education system. The design is now failing at providing the needed engagement and interaction value that is currently in demand. This realization has been growing slowly within the design and behavioral science community.

The factor of space and environment has caught the attention of researchers from various design related industries, educational institutes, and especially researchers from 2 fields of psychology - environmental and behavioral. Researchers have become more and more concerned with how environments and spaces can influence users. The dimension of space, or environment, as some researchers re-

fer to it, has become a factor towards better understanding experiences with in various spaces. More specifically, how the users behavior and response are within particular settings of environments.

2.1. Teacher and Student Interaction

Tiina Makela, Marja Kankaanranta, and Sacha Helfenstein, researchers at the University of Jyväskylä in Finland recently published a study on including learner's perception within the design process of learning environment. The researchers narrowed in on the *Key Competences or 21st Century Skills* and how the recommendations for educational organizations to redesign their psychosocial and physical learning environments.¹ Their research aim was to define principles for integrating the learners within the design of learning environments.² Their results indicated that Finnish learners are in line with research for characteristics like safety, existence of nature and good social interactions. In addition, they also identified that the learners value adaptable, personally meaningful and collaborative learning contexts. This included both traditional and new tools and spaces for learning.³ The outcome of this research provides both the information and tools that educational institutions and their administrators can utilize for improving their learning environments.⁴

According to the study, the principles set out in Key Competences or 21st Century Skills are often obstructed due to current educational practices and physical infrastructures. An example they expressed is within the teacher-centered perspective, where the interaction between student and teacher is defined by the teacher transferring of knowledge to the student and it is a method that is further sustained by infrastructural elements - arrangement of teacher's desk as the control center. They argue that if various stakeholders within education had a say in the design process then the objectives and outcomes of education can be in parallel.⁵

¹(Kankaanranta and Helfenstein 2014)

²(Kankaanranta and Helfenstein 2014)

³(Kankaanranta and Helfenstein 2014)

⁴(Kankaanranta and Helfenstein 2014)

⁵(Kankaanranta and Helfenstein 2014)

In their study they compiled three key principles - overall comfort and security, teaching and learning methods, and educational tools and space design.⁶ Through an online survey and design workshops the researchers were able to analyze their principles. Their participants consisted of 4 volunteered teachers and their students. Their results indicated that learner's expectations and perceptions on the ideal learning environment was in parallel to the research at both the nation and international level. In other words, while the success of educational environments is goal and region specific and culture context and traditions is of influence, learners perceptions still remain consistent.⁷ These results assisted in the formulation of the principles mentioned previously, as they were proved to support the 21st century educational environment.⁸

2.2. Theories on how to bring Creativity and Collaboration into Learning Environments

Carly Lassig, a researcher from Queens University of Technology, conducted an investigation on how educators need to make a shift from the current approach towards effective methods to foster and teach creativity. Lassig's paper outlines creativity's essence during both personal and everyday creativity. However, Lassig's focus remains in Education and how can creativity be effectively developed within students. She conducts a brief analysis of the current situation by taking a look at education through Queensland, Australia's policies and incentives. These lenses led the research into an interesting examination of 2 areas related to improving and fostering students creative engagement and production: firstly, social and environmental factors, secondly self-efficacy. Lassig's examinations result in a proposal that argues that it is not just about policy, but it is essential to have a common understanding for the description of creativity and develop ways to support and foster it. Lassig's discussions are many, however they circulate the implication for a system that encompasses the proposal.⁹

⁶(Kankaanranta and Helfenstein 2014)

⁷(Kankaanranta and Helfenstein 2014)

⁸(Kankaanranta and Helfenstein 2014)

⁹Lassig 2009

With the 21st century, new definitions of values are placed on creativity. As Lassig has also noticed, people's creative ideas or mind are in high demand, with societies increased awareness in its economic value. Lassig's look into the environmental element expressed conversations about how the environment is an

Table 1. Opinions about Optimal Environmental Conditions for Creativity

Environmental conditions	Opposing views	
General environmental climate	'Bull-market' perspective: Creativity will only thrive in supportive, nurturing environments.	'Bear-market' perspective: Creativity can thrive, and is stimulated by, harsh and repressive environments.
Task constraints	People are most creative without any limits. Too many limits will inhibit creativity.	Creativity requires limits and constraints. With no constraints, people are unable to complete a task.
Evaluation	Evaluations are helpful in creative development and production. People produce more creative work if they are told how it will be evaluated than if they are not told.	Being observed and evaluated interferes with creativity. People produce less creative work if they know it will be evaluated.
Competition	Competitions and incentives can encourage more creative work.	When competition and comparison is de-emphasised, people are more creative.
Cooperation	Cooperation encourages creativity through brainstorming and building on one another's ideas, provided that criticism is deferred until the end of the process.	Cooperation can inhibit creative work when there is pressure to conform to group norms and unorthodox ideas are ridiculed or ignored. People may suppress their creativity in order to please the group.
Role models	The creative individuals in one generation are needed as role models to ensure more creative individuals in the next generation.	Role modelling can inhibit individuals' creativity if it encourages dependency on, and imitation of, the role models.

Figure 2.1: This image is from Lassig's paper. It is a table that outlines views on various environmental conditions.

According to Lassig, this is the element of environment becomes more important within schools. More specifically, within the social and environmental components of the classroom, teachers and fellow students. Lassig discussed with reference to other researchers, like Haddon and Lyston, that flexible classroom situations allow for better creative development than traditional environments.¹¹ In addition teacher's roles can significantly influence the level of engagement of students. As Lassig references McWilliams, teachers are able to promote creativity when they can shift from being 'on stage' or facilitating to meddling students to be active learners and critical thinkers.¹² Lassig's discussion even references, Mitchel Resnick's argument on his paper, *All I really need to know (About Creative Thinking) I learned (By studying How Children Learn in Kindergarten)*.

¹⁰(Lassig 2009)

¹¹(Lassig 2009)

¹²(Lassig 2009)

The defining characteristic of Kindergartens - Imagine, Create, Play, Share, Reflect and Imagine again - represents an endless cycle necessary for fostering creative thinkers. This reiteration process, outlined by Resnick Mitchel in his paper, *All I really need to know (About Creative Thinking) I learned (By studying How Children Learn in Kindergarten)*¹³, suggests that creative thinking skills are best developed through the actively ‘doing‘. The need for skills in creative thinking is growing in society and Resnick’s solution to meet this need is to re-establish traditional Kindergarten-style of learning, access to material, and activities, for learners of all ages. Through extending the age at which people learn like kindergartners, the greater the chance at developing creative thinkers. He suggests that the best means to re-create kindergarten-style of learning is through strategically designing new technologies that encourage and support it. Resnick defines the ‘kindergarten‘ approach to learning as a place where children are continuously exploring, creating, experimenting and designing. Children are able to grow and witness their potential.¹⁴

The author’s analysis into the changing education system in relation to the needs of the 21st century, suggest that the key is creative thinking. Creative thinking is linked to success and satisfaction within society. Nevertheless, it is a skill set slowly being lost in newer learning approaches. Kindergarten was a place where it was always time to tell stories, build castles, draw pictures, and learn to share. However, slowly these kindergartens themselves are beginning to change into the rest of the education system - lectures, worksheets and memorization.¹⁵ As Resnick argues, that society needs to reconsider traditional kindergartens, as its learning approach is more compatible with the needs of current society, and should be extended to all learners. In order to extend the kindergarten approach to older students there needs to be consideration of different types of tools, media and materials.¹⁶ The Resnick’s claim is digital technologies can produce a transformational role in education.¹⁷ According to Resnick, a properly designed and supported digital technology can further extend the kindergarten

¹³(Resnick 2007)

¹⁴(Resnick 2007)

¹⁵(Resnick 2007)

¹⁶(Resnick 2007)

¹⁷(Resnick 2007)

approach and in the process support the development of creative thinkers.

Resnick's focus on the looping kindergarten learning approach - Imagine, Create, Play, Share, Reflect, and back to Imagine - is to develop creative thinkers. His aim is more concentrated on how learning should be 'facilitated' rather than 'taught'.¹⁸ The concern is not the environment or the content but on the way students should be learning, with the argument that the solution lies in the utilization of technology. Resnick discusses strategies for designing new technologies for each point in the cycle to encourage the kindergarten learning approach. He suggests 2 technologies that were developed to help stimulate the stages - Cricket and Scratch. Each tool illustrates characteristics that reflect flexibility and yet can still encourage student imagination and creation process.¹⁹

Resnick's theory or perspective on creativity and education - spiral model - was also the basis for another study in 2011. Aragon and William's paper on *Collaborative Creativity: A Complex System Model with Distributed Affect* proposes a new model for group creativity. They defined groups as representing complex systems and stand that individuals play a key role within the model - communication. They discuss the model in 4 stages of collaborative creativity (i.e. focus, frame, create, and complete) and explain how ideas evolve and grow in each stage of collaborative creativity.²⁰ Aragon and Williams conducted longitudinal studies with groups distributed producing creative products. According to Aragon and Williams, creativity is a process towards discovery and an idea can only develop over time with exposures to social situations.²¹ Their work draws from related works that looked at various creative models. For instance, when looking at group dynamic Fischer and Shipman suggest careful design of technologies and socio-technical environments to promote creativity. Another is Dunbar, a research who discovered that the driver of collaboration was conversation.²² However, as for Aragon and William's model, while it is discussed in a linear progress, it reflects more of a process that Resnick argued - spiral.²³ Aragon and Williams research

¹⁸(Resnick 2007)

¹⁹(Resnick 2007)

²⁰(Aragon and Williams 2011)

²¹(Aragon and Williams 2011)

²²(Aragon and Williams 2011)

²³(Aragon and Williams 2011)

shed light on remote and local group collaboration process and their implications.

Meanwhile, researcher at Cisco, a technology company, recently submitted a paper that addressed the 21st century concerns and proposes a new perspective - *developing an innovative ecosystem for education*.²⁴ Hannon, Patton and Temperley produced a comprehensive perspective on the context with education systems, the users its operation and suggest approaches that can transition education to innovate and current practices.²⁵ While they provide insight on the value and opportunity technology opens, their main aim with this paper is to provide a framework for transformative approach.

Hannon, Patton and Temperley outline the ‘pressure and opportunities for change’. In their analysis of the current topics of the 21st century surrounding leaning and education the point out many topics including the need to re-engage students within schools and new environments. ²⁶ They have also brought into question if schools are effectively culturing engaged learners. Then from a look into international research and findings on innovation the Cisco research team, identified 3 fields towards creating their framework.

Hannon, Patton and Temperley, argue that new insights can be tapped into when students/learners are treated, as subjects not object in the educational process. Education that involves engagement and co-collaboration can result in greater improved outcomes. The new modeled framework suffers that by integrating other models, along with digital technologies in education and learners ownership, there is success of engagement and innovation in learning approach.²⁷ To the researchers at Cisco digital technology is a key tool both for empowering learning but more importantly changing learners relationship with teacher, other students, the world, and content of their education. Meanwhile, ‘learners ownership’ exemplifies the importance of students being active in their learning process that way learning can be effective. This comes from both a constructivist and a social collectivist theory, where knowledge is gather through interactions through life, unique to each individual and other people play a role in stimulating that

²⁴(Hannon, Patton, and Temperley 2011)

²⁵(Hannon, Patton, and Temperley 2011)

²⁶(Hannon, Patton, and Temperley 2011)

²⁷(Hannon, Patton, and Temperley 2011)

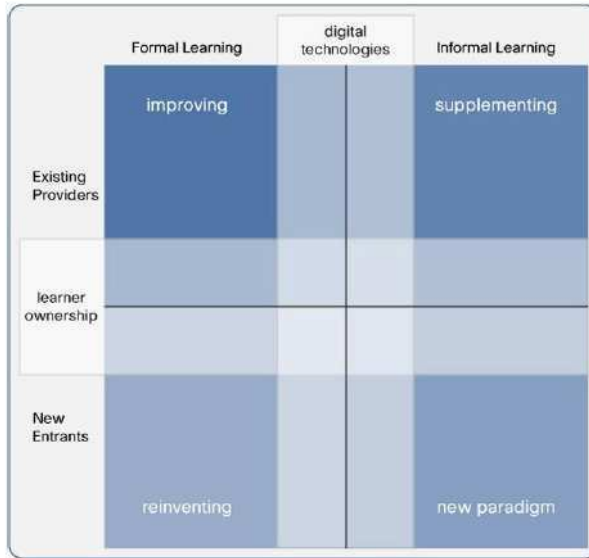


Figure 2.2: This figure illustrates the integration of their analysis of research papers on Learning from extremes, radical efficiency, digital technologies and learners ownership.(Hannon2011)

learning process.²⁸ According to Hannon, Patton and Temperley, the ecosystem can only be achieved with engaging and interactive teachers and discussion based learning.²⁹ The paper by Cisco illustrated a prospective framework towards a better learning ecosystem. Their position was well framed and integrated existing models with 2 new characteristics or values - technology and learners.

2.3. Designing Spaces for Collaboration

According to Scott, Carpendale, and Inkpen, an ‘ideal’ collaboration environment does not have to scale to the entirety of the class. Instead their focus is on traditional tabletop work spaces. In a joint research effort by two Canadian Universities, the University of Calgary and Dalhousie University, departments of Computer Science looked into issues associated with the design of collaborative tabletop interfaces - Territoriality in Collaborative Tabletop Workspaces. The related work findings of tabletop and co-located collaboration indicated the

²⁸(Hannon, Patton, and Temperley 2011)

²⁹(Hannon, Patton, and Temperley 2011)

importance of sustaining collaborative behavior like working at the same time, moving between activities, and transitioning between group and individual work. Through an examination of natural interaction practices by people during collaboration on tabletop surfaces the researchers identified three types of tabletop territories - personal, group, storage - to help coordinate interactions. These observational findings were a result of conducting two observational studies, one casual and one in formal settings, of traditional tabletop collaboration.³⁰

Scott, Carpendale, and Inkpen's argue that people have grown accustomed to collaborating on tables and thus these 'spaces' continue to provide interaction support. The limited territory provided by tabletop surfaces can initiate an awareness of others and their actions on the workspace. In other words, providing collaborators the ability to position items in different ways, which helps moderate interactions and enable distinct regions within the tabletop workspace.³¹ The researchers review of previous investigations of tabletop practices reveals that orientation and partitioning are key resources to bring about interactions. While there had been recent research into role of orientation within the collaborative process, no research had been found relating to partitioning. As such, Scott, Carpendale, and Inkpen research examines the role of partitioning on collaboration. Their research addressed the missing information (i.e. how and why it facilitates collaboration) through an investigation of spatial interactions during different group or team tasks and settings within a traditional table surface.³²

The preliminary study of the causal environment involved both individuals and groups playing different tabletop games. The location of this session was a local University drop in activity area. Observations were focused on use of artifacts and utilization of table surface. The results indicated that both fluid and dynamic interactions were taking place. Scott, Carpendale, and Inkpen discovered that personal spaces and group spaces expanded and contracted with interactions easily. In addition, no matter if it was group or individual, table areas were partitioned creating a possibility of 3 types of interaction areas - personal, group, and storage.³³ These behaviours of social interaction according to Scott,

³⁰(Scott, Carpendale, Tn, and Inkpen 2004)

³¹(Scott, Carpendale, Tn, and Inkpen 2004)

³²(Scott, Carpendale, Tn, and Inkpen 2004)

³³(Scott, Carpendale, Tn, and Inkpen 2004)

Carpendale, and Inkpen reflect ones society uses when marking territory (i.e. “my side of the room“). Taking these findings further the researchers conducted a more in depth study where the groups were asked to create a furniture layout plan. According to Scott, Carpendale, and Inkpen, the analysis indicated that tabletop territories have spatial properties and specific functionalities. In addition, Scott, Carpendale, and Inkpen, were able to eliminate ‘storage‘ as one of the interaction area type that needed partitions. Unlike personal and group areas of interaction, which exhibited distinct partitions, the storage area was movable within the tabletop surface.³⁴

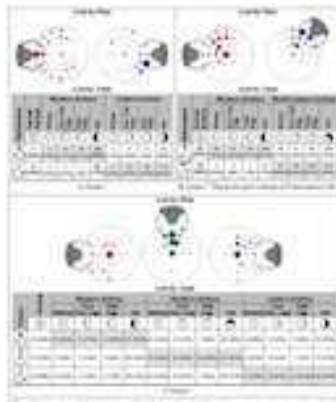


Figure 2.3: Visualization of activity plots and table for for each group. The dots indicate the intensity of activity.(Scott2004)

These results when integrated with previous research concluded in several insights by Scott, Carpendale, and Inkpen. Firstly, human territoriality, defined by Taylor, is a concept that explains how territories can help people negotiate their social interactions through claiming space or associating a space to a person due to consistence usage over a period of time. Secondly, tabletop territory, similarly to human territoriality emerged as a way to help individuals coordinate tasks and social interactions. This realization resulted in Scott, Carpendale, and Inkpen to identify which properties facilitated different types of coordination, by drawing from Pinelle et al.’s ‘coordination mechanics‘.³⁵ The following table illustrates what core actions of people can facilitate the coordination of shared workspaces.

³⁴(Scott, Carpendale, Tn, and Inkpen 2004)

³⁵(Scott, Carpendale, Tn, and Inkpen 2004)

#	Mechanic (category)	Typical actions	Corresponding Tabletop Territories
1	Obtain resource (shared access)	Physically take objects or tools. Occupy space.	personal, group, storage
2	Reserve resource (shared access)	Move to closer proximity. Notify others of intention.	personal, storage
3	Protect work (shared access)	Monitor others' actions in area. Notify others of protection.	Group
4	Handoff object (transfer)	Physically give/take object. Verbally offer/accept object.	group
5	Deposit (transfer)	Place object and notify.	group

Figure 2.4: The table communicates the analysis of behaviours.(Scott2004)

Scott, Carpendale, and Inkpen's research presents an interesting perspective on the scale of collaboration and interactions. This research's focus was specified to actions and exchanges on a tabletop. The analysis relative to the findings and research derived great insight in how people perceive space - personal and shared. However, what about if that understanding is expanding beyond a tabletop and reflected in larger spaces human scale. This research is relevant in illustrating that collaborative spaces, while in this case limited to tabletop surface, can be seen paralleling similar concepts of proxemics.

At the end of the 20th century Jamieson et al. identified the raising questions about how changing communication technologies are slowly being integrated into university campuses. In other words, changing the student learning experience. Their integration as Jamieson et al. understood, brings into question a need for new relationship between physical setting and learning experiences. More importantly, as their research suggests these new communication information technologies not only must be accepted by institutions but also teachers and researchers. Jamieson et al.'s paper provides examples of Australian universities where developments of new learning environments have been improved by educational developers (Jamieson, Fisher, Gilding, Taylor, and Trevitt 2000). These developments were early for its time as it was at the turn of the century. The discussion of communication technologies and learning environments leads Jamieson et al.'s paper into a proposal of a set of pedagogically-informed principles to help facilitate the transitions or changes of on campus teaching and learning environ-

ments.³⁶

According to Jamieson et al., the architecture of a University must have more meaning than just looking aesthetically pleasing. The researchers of this study believe that ‘space’ is not a neutral characteristic within the learning environment. It has the power to take on an integral part in the process of experiencing and learning. For instance, Jamieson et al. explains how a typical lecture hall, its size and format communicate to its user that ‘this is about the content from the teacher’.³⁷ In other words, it is a space focused on the teacher’s presentation. More importantly, according to Jamieson et al., what is important to realize from this illustration is that the physical environment is bound to influence how teachers will approach teaching and what they perceive as possible within that space. These embedded power relations are in part conflicting with the change into student-centered approach to learning. Institutions and their educators need to understand that learning takes ‘place’ somewhere, that there is an environment that needs attention to help in the learning process. Acknowledgement by all stakeholders is needed within a University so there can be an effective way to either design or re-design of buildings.³⁸ Jamieson et al. discusses two constructions; first constructing knowledge in ‘place’ and second knowledge in ‘place’ and ‘space’. In the first talk, the study expresses how the architectural model within universities of teaching spaces, administration offices, and social/ leisure place have not really changed in the 20th century. The separation between these environments is again supporting the power relations and hierarchy, which according to Jamieson et al. believes is hindering the potential for collaboration.³⁹ However, the second construction also acknowledges the difference between physical space and electronic places. In other words, with the integration of new communication information technologies also has resulted in a potentially new environment of learning.⁴⁰ In other words, the physical spaces and online places of learning need to negotiate various perspectives to ensure there is an effective learning experience. Thus, as Jamieson et al. suggests it is clearly not only the technology

³⁶(Jamieson, Fisher, Gilding, Taylor, and Trevitt 2000)

³⁷(Jamieson, Fisher, Gilding, Taylor, and Trevitt 2000)

³⁸(Jamieson, Fisher, Gilding, Taylor, and Trevitt 2000)

³⁹(Jamieson, Fisher, Gilding, Taylor, and Trevitt 2000)

⁴⁰(Jamieson, Fisher, Gilding, Taylor, and Trevitt 2000)

or multimedia in the learning environments but also about how they are integrated in. According to the research, Jamieson et al, identified two practices by Australian institutions, the redesign of an existing environment or new designed facilities by architects. In the case of the former, resulted in the school's facilities department staff simply put in new equipment and leaving the space otherwise untouched. Meanwhile, in the latter case architects did not really understand teacher and student interaction and designed based on existing foundations of institutions.⁴¹ Jamieson et al.'s analysis of the practices by the Australian institutes led to a set of 7 guidelines that can support the design and implementation of build environments:

- 1) "Design space for multiple uses concurrently and consecutively
- 2) Design to maximize the inherent flexibility within each space
- 3) Design to make use of the vertical dimension in facilities
- 4) Design integrate previously discrete campus functions
- 5) Design features and functions to maximize teacher and student control
- 6) Design to maximize alignment of different curricula activities
- 7) Design to maximize student access to and use and ownership of the learning environment"⁴²

These principles emerge from the current shift of learning towards student-centered, flexible learning and are intended to create institutions that are less conventional and specific to function.⁴³

While the study and research offered by Jamieson et al. was from the end of the 20th century it is still contributing to recent studies in the 21st century. Although there were many implementations and citations to the discussion, perspective and principles outlined by Jamieson, there are 3 papers with interesting follow-ups - *'Crossing the cultural divide: contemporary holistic framework for conceptualizing design studio education'*, *'The impact of space on student's perceptions of the value and quality of their learning experience: a case study of the Collaborative Learning Forum'*, and *'Designing learning spaces in higher education for autonomy: Preliminary findings and applications'*.

Researchers at the Queensland University of Technology, developed a cohesive

⁴¹(Jamieson, Fisher, Gilding, Taylor, and Trevitt 2000)

⁴²(Jamieson, Fisher, Gilding, Taylor, and Trevitt 2000)

⁴³(Jamieson, Fisher, Gilding, Taylor, and Trevitt 2000)

framework for a doctoral project on understanding the complexity and potential of design studio to fit to the changing global context.⁴⁴ The framework was developed from an in-depth analysis of existing systems and cases where there is an understanding of both the traditional space of design studio and the virtual design through the changing pedagogical approach and experiences of teacher and students. The researchers were effective at identifying key position, ideas and frames to develop their comprehensive one. Not only did they analyze the research study of Jamieson et al. but also discovered connections with Trigwell et al. on the links between the learning environment and approaches to education and likewise with Bender and Vredevoogd on the procedure and character of the design studio in relation to various technologies and interactive media.⁴⁵ The result of the analysis is a conceptual frame that can also aid in the development and evaluation of learning environments.

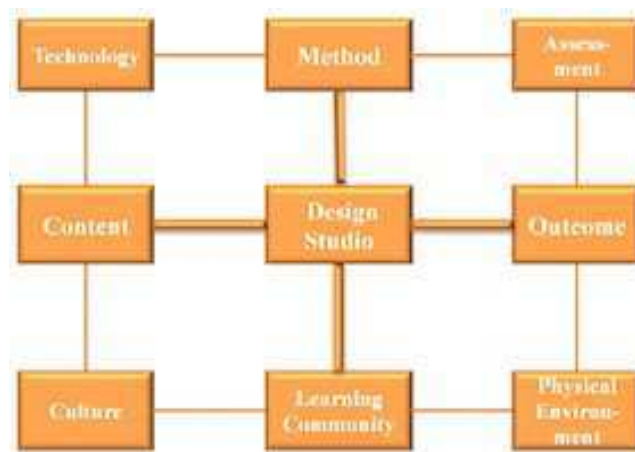


Figure 2.5: Main factors and their relationships (Saghafi2010)

This diagram communicates the title factor, which represents a category of features. For instance, within physical environment (i.e. the ‘where’ factor) there are physical, or virtual characteristics, special conditions, and furniture to just name a few. This model according to the researchers is applicable to development of courses, organizational tool for the facilitation of research, an analytical tool in new settings, and also for the support and planning of the evolving learning

⁴⁴(Saghafi, Franz, and Crowther 2010)

⁴⁵(Saghafi, Franz, and Crowther 2010)

system.⁴⁶ The proposed framework, was created to be both relevant for today's situation but also adaptable to inevitable changes that will occur through the evolution of education. Shaphafi et al. created this integrated model as a tool to provide a way to decide on the assessment, comparison, application, and investigation of various learning environment for design education. It was developed with a global aim and an understanding of local design, to be implemented flexibly. Shaphafi et al. framework contributes to the identification of characteristics and their interactions promoting application to education environments. The hope is for the analysis to provide data to architects and professionals to improve their learning spaces to adapt with future needs.⁴⁷

Meanwhile, a collaborative effort of 10 researchers at the Macquarie University in Sydney, conduct a study to improve and apply active and collaborative approaches to learning and teaching in their respective areas. Notably the researcher who collaborated were diverse in their subject areas (i.e. Law, marketing, statistics, etc.). The researchers in this study argue that evidence on how spaces contribute towards learning. Specifically they mention Temple, who had argued that spaces will become more prominent as students acknowledge their own learning. The evidence of student evaluation the researchers conducted, of the Collaborative Learning Forum space in Macquarie University, supported Temple and also provides a deeper way students can learn and improve satisfaction in learning experience.⁴⁸ The foundations of their argument on the relationship of space and students originates from the Jamieson et al. stance, which was outlined previously - the defined roles and hidden power struggle between teacher and students is manifested within the design of traditional lectures.⁴⁹

According to the researchers, Robertson et al., strategies to education and teaching which stimulate collaboration and activity lead to student engagement, positivity towards the subject, better recall, greater academic achievements and more critical thinking skills.⁵⁰ However, as they referenced from Lammers and Murphy, there is the lecture style, which higher education teachers use as a 'go-to'

⁴⁶(Saghafi, Franz, and Crowther 2010)

⁴⁷(Saghafi, Franz, and Crowther 2010)

⁴⁸(Robertson, Baumann, and Bilgin 2012)

⁴⁹(Robertson, Baumann, and Bilgin 2012)

⁵⁰(Robertson, Baumann, and Bilgin 2012)

model for teaching. This is especially for large numbers. This form is of learning style is conflicting to an ideal learning environment.⁵¹ While according to Robertson et al. there are a variety of strategies which can improve the teacher's ability to teach and encourage a larger amount of activity form students, the Scottish Funding Council have a different position. The Scottish Funding council wants to innovate the future of lectures with modules. However, for this type of innovation to exist in the typical pedagogical, according to Robertson et al. the contradiction of spaces needs to be delft with. In other words, the environment in which lectures take place. The design of space can limit the activities of those who utilize the space.⁵² However, attention to its influence has hardly been explored. As mentioned previously, according to Robertson et al. Temple's research suggest that the environment, which is now forgotten, will become important once students are satisfied by the education and form of teaching they receive. Through the exploration of Temple's view of the impact of an innovative space, in this case Collaborative Learning Forum, on student's perception and value they associate to their education, the research also potentially outlines possible ways to improve how student's experience learning.⁵³

The Collaborative Learning Forum that was used as a case study to explore Temple's notion and ultimately provide suggestions, was developed according to the idea that space could be designed to support both teaching and learning approaches. The space was a redesigned existing lecture theater for 220 students to support interactive and engaging modes for classes of 100. They replaced the furniture in the room with 100 individual chairs on wheels, rebuilt parts of the stage and seating area, and implemented large arched benches. These structural and interior changes allowed for students to switch concentration from the front of the class to the line behind them when it was time to interact. This also allowed teachers to easily move in the new defined tiers.⁵⁴ In this space the researcher, with their diversity in subjects, came to a consensus of indicators, which informed the creation of the student evaluation.⁵⁵ The results of the survey created a path

⁵¹(Robertson, Baumann, and Bilgin 2012)

⁵²(Robertson, Baumann, and Bilgin 2012)

⁵³(Robertson, Baumann, and Bilgin 2012)

⁵⁴(Robertson, Baumann, and Bilgin 2012)

⁵⁵(Robertson, Baumann, and Bilgin 2012)

model that illustrated the correlation between the student's satisfaction and their perception of the learning and teaching experience provided. However, an interesting finding demonstrated that the characteristics of the environment and the students were indirectly connected to satisfaction. The overall discussion, proved to illustrate that when students recognize the value of pedagogy and its ways they will notice the innovative space and realize it is the space that is supporting the methods of teaching.⁵⁶

Unlike the previous related works, which mainly explore and define principles or theories the Herman Miller Company, a furniture and space design company, approaches space design through innovative solutions. These solutions are products of their intensive research department. The Herman Miller Company products and overall company culture have always been ahead of their time, from first transition into modern furniture design by Gilbert Rohde, to achieving the first self-sustaining manufacturing facility. The Herman Miller research department over the last 7 years has been extensively researching around education, student engagement and collaboration. Their findings and research present current perspectives and design solutions based on their company available resources. The next part of the discussion will highlight 5 of Herman Miller's published articles, within which there will be 3 research summaries/ solution essays and 2 case studies from 2011 and 2014.

In 2008, Herman Miller's research department produced a solution essay to contribute to the design of educational spaces for student engagement. The essay, *Rethinking the Classroom: Space Designed for Active and Engaged Learning and Teaching*, discusses the topic how to approach classroom design when considering the advantages of collaboration and interactive engagement. The essay outlines four recognized finding from their research. Firstly, engagement and interaction are effective for helping retention and are affected by classroom design. Secondly, design of classroom can help develop self-directed learning and shared problem solving, which are valuable skills for life and work outside the classroom. Thirdly, interaction between students and teachers are influenced by classroom design. Finally, when classrooms promote a sense of comfort and security, keep

⁵⁶(Robertson, Baumann, and Bilgin 2012)

minds attentive and limit interruptions they are comfortable classrooms.⁵⁷ These accepted understandings lead the researchers at Herman Miller to conclude that learning spaces need to have qualities of serendipity and avoid perspective behaviors for both teachers and students. To Herman Miller the space should foster more engagement, foster learning and teaching to support the goals of higher education.⁵⁸ This leads to one of their proposed solutions, which was in collaboration with Goodmans and EMCC resulted in a collaborative solution of new proposed space using furniture from Herman Miller. They identified from interactions with the faculty of EMCC, a member of the Maricopa Community College District. The survey discovered that the most common style of teaching was one of an open forum where students and teachers could discuss freely and openly.⁵⁹

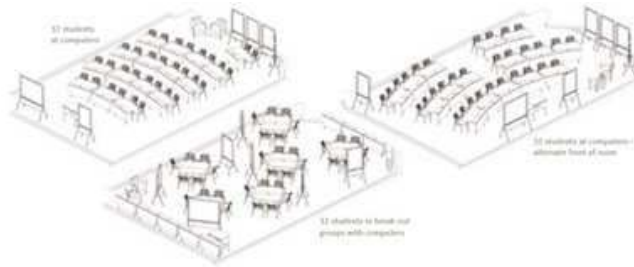


Figure 2.6: The same furniture in all three layouts, with only a change in configuration (HermanMillerresearch2008)

The proposed solution also met with the previously discussed acknowledged findings towards student engagement. In the following year 2009, they produced 2 interesting research summaries - *Adaptable Spaces and Their Impact on Learning, and Engaging Students: Using Space as a Tool to Connect with Millennials*. The research summary conducted by Herman Miller, on Adaptable Spaces and Their Impact on Learning, discusses the role adaptable spaces play on assisting the classroom experience. The collaboration with organizations all across North America has resulted in a new concept approach to learning spaces - Learning Studio. Learning Studio grew from design patterns in learning spaces, the design patterns reflected an L-shaped model for classrooms. The result was an environ-

⁵⁷(Herman Miller research 2008)

⁵⁸(Herman Miller research 2008)

⁵⁹(Herman Miller research 2008)

ment that was adaptable and could meet the needs of its stakeholders - students and teachers. The concept derived from process of researching into a variety of Universities.⁶⁰ The research gave way to 4 key findings (Please refer to Figure 2.7)

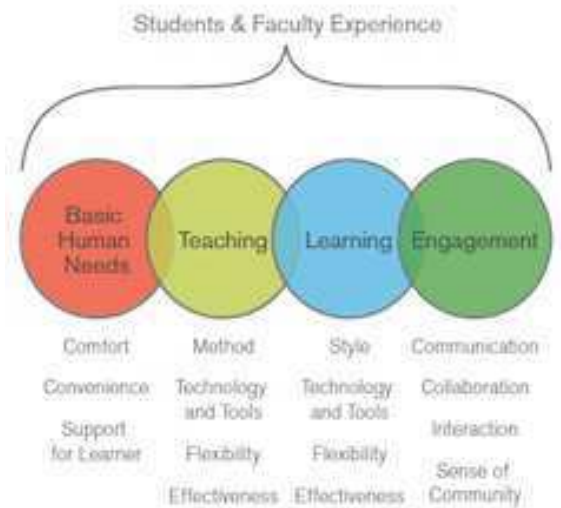


Figure 2.7: Herman Miller Research 2009

These findings guided the matrix of the Learning Studio (Please refer to Figure 2.8).⁶¹

The results indicated that the Learning Studio was flexible, which allowed both teacher and students to interact with each other. Results communicated that there was more engagement and communication that was built between students.⁶²

In the *Engaging Students: Using Space as a Tool to Connect with Millennials* summary, Herman Miller researchers identified that millennial needs or rather characteristics are conflicting with how learning is executed in the classroom. In other words, there is a conflict in today's students when put in with yesterday's teaching styles. Millennials are connected online and look for participatory interactions, and thus, according to the researchers expect interactive and social modeling of learning.⁶³ In other words, more so then ever spaces need to be

⁶⁰(Herman Miller research 2009a)

⁶¹(Herman Miller research 2009a)

⁶²(Herman Miller research 2009a)

⁶³(Herman Miller research 2009b)

Learning Studio Results Matrix

Design Elements	Basic			
	Human Needs	Teaching	Learning	Engagement
Architectural				
Floor plan, layout	●	●	●	●
Paint	●	●	●	●
Flooring, acoustics, & lighting	●	●	●	●
Furniture				
Tables (student & faculty)	●	●	●	●
Chair, side chair	●	●	●	●
Bench seating	●	●	●	●
Cafe tables & stools	●	●	●	●
Instructor's table/lectern		●		
Filing & storage unit		●		
Accessories				
Mobile marker board/Whiteboard	●	●	●	●
Technology				
Cables, wiring & technology placement	●	●		
Training				
UIT application		●		

Figure 2.8: Learning Studio Results Matrix (HermanMillerresearch2009)

considered more for these people. The strategy Herman Miller proposes is to re-design the classroom towards a new model, called Learning Studio. The Learning Studio is conceptualized to change and evolve. However, it is an approach that requires a new perspective on both physical space and education process.⁶⁴

The perspective of the Learning Studio by both faculty and Students were positive. Both groups according to the Herman Miller researchers, found that experienced engagement through the flexibility and design of the space.⁶⁵ Based on Herman Miller's researchers within the Learning Spaces Research program developed a plan for learning spaces, as is indicated before. More recent implementations of the Learning Studio, by Herman Miller, were in 2011 at Saint Louis University (Please refer to Figure 2.10 and 2.11) and 2014 California State University (Please refer to Figure 2.12). In both cases the findings and synthesis discovered previously were adapted for the needs of each University. However, they each were visualized differently.

⁶⁴(Herman Miller research 2009b)

⁶⁵(Herman Miller research 2009b)

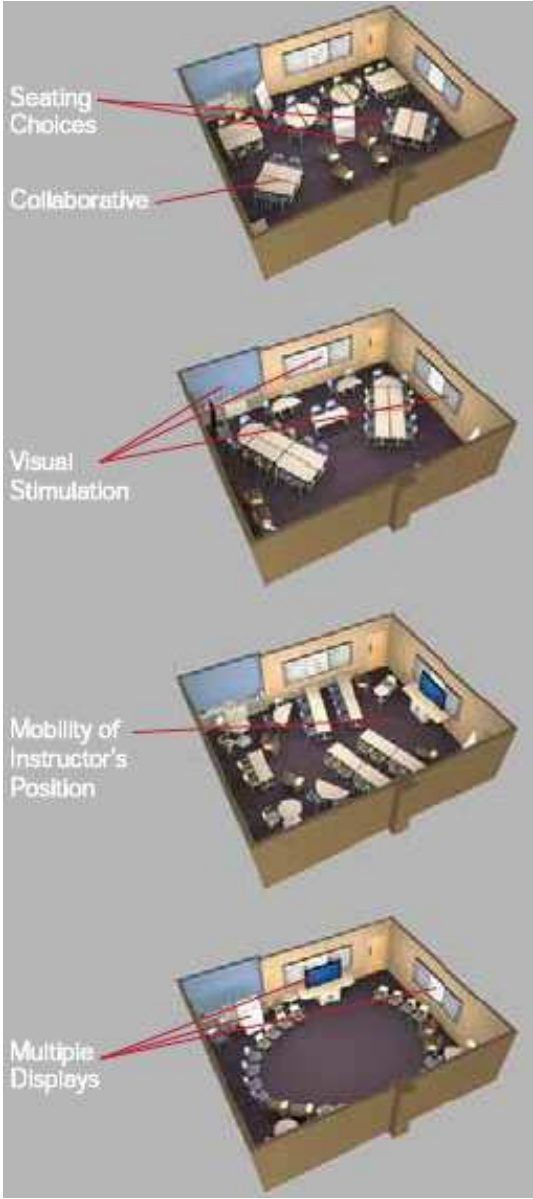


Figure 2.9: Various configurations. (HermanMiller2009)



Figure 2.10: St. Louis University: Varying forms of seating from lounging, stools, mobile chairs, and a bench (HermanMiller2009).



Figure 2.11: St. Louis University: Both elevated and low seating, with storage area (HermanMiller2009).



Figure 2.12: California State University: Dynamic and choices for students and teachers (HermanMiller2009).

Chapter 3

Design

CreoSystema is an interactive learning classroom space that consists of 3 key principles - flexibility of things, ownership of space, and relative perception. CreoSystema is a design concept proposed for existing University classrooms, to encourage discussion and communication amongst students and between students and teachers.

A contradiction in today's educational institutions exists between the type of creative content being adopted and the environment it is being introduced in. The traditional learning environment is unfit, or rather inflexible, for the modern interactive nature of curriculum content. In addition, current learning environment spaces contain 'unseen' barriers. More specifically, the stakeholders (i.e. students and teachers) within the classroom space experience varying perceptions of 'distance' and proximity. This context is resulting in hesitation and a lack in engagement. These two problems were observed during fieldwork conducted for this thesis and also reflected in the published literature and related works. However, this thesis proposes that one approach to reboot and instill interactive engagement and ultimately, creativity back to the classroom is through CreoSystema.

The three key principles - flexibility of things, ownership of space, and relative perception - set the foundations for CreoSystema. Each principle is derived from an analysis of fieldwork findings and observations from three learning space environments - Kindergartens, Workshops, GID program experience (i.e. RCA/Imperial, Pratt Institute, D. School). These principles are translated to visual characteristics to create CreoSystema. This 'creative ecosystem' - CreoSys-

tema - can intuitively encourage the facilitation of discussion and idea sharing. Improving the facilitation of discussion and idea sharing will provide students the opportunity to engage in collaborative learning and interaction.

The following sections of this chapter will discuss and share the fieldwork analysis, which gave rise to the three principles and then provide an overview of the concept of CreoSystema. After which case, each principle will be defined in more detail on how it is realized in the CreoSystema environment. The concept development visualization will follow, communicating a description of the contextual characteristics, which are necessary to achieve CreoSystema. This chapter will also discuss the preliminary iteration of CreoSystema implementation. Finally, concluding with a suggested approach checklist and model - CreoSystema Toolkit - derived from feedback and observations of the iteration process.

3.1. Understanding Interactive Learning Environments:Fieldwork

In order to better understand and deduce what behavior and actions are taking place in current learning environments, various classrooms and learning environments were analyzed and compared. These learning ‘spaces’ represent various stages and approaches to learning. The environments were chosen based on their diverse subject content to help develop a Toolkit that is flexible and adaptable to various contexts. The analysis and exploration of these diverse classrooms ultimately inspired the fundamental foundations to the CreoSystema Toolkit. In addition to fieldwork conducted in each of the three diverse learning environments, further field observation was also conducted in a creative content classroom conducted in a traditional lecture style format. The latter field observation provided a context similar to the target situation, which helped clearly identify the issues and inflexibility of typical lecture designed classrooms.

This section of the chapter will share and discuss the analysis obtained from each of the three main fieldworks and how it corresponds to the development of the principles. However, first this section will provide an analysis obtained from observations of the creative contents classroom designed in a lecture style.

3.1.1 Collaborative content in traditional Settings

During the Design Thinking Pipeline Course at Keio University's Media Design Masters program, in Japan, students, teachers and teaching assistants (TA) were observed. There were 24 students, 1 teacher, 1 assistant professor and 2 teaching assistants (TAs). The observation was conducted over 3 days (October 7, 8, and 14) throughout the design process, at various stages of interaction (i.e. team building, ideation, collaboration).

The class was conducted in a large rectangular room. It was equipped with 50 tables that could seat up to 2 people each, 4 screens and projectors, a podium at the front, an extra 2 screens as prompters and almost all sides of the classroom were recently covered with whiteboards. The classroom itself, while rather updated with the whiteboards and prompters, still was arranged in 5 rows of 10 tables.

On the first day the students were divided into 6 groups and briefed on their group work task. This went on for the first 15 minutes of class, with the professor standing at the podium. Once they were left to get into groups, students defined their space in one of three ways.

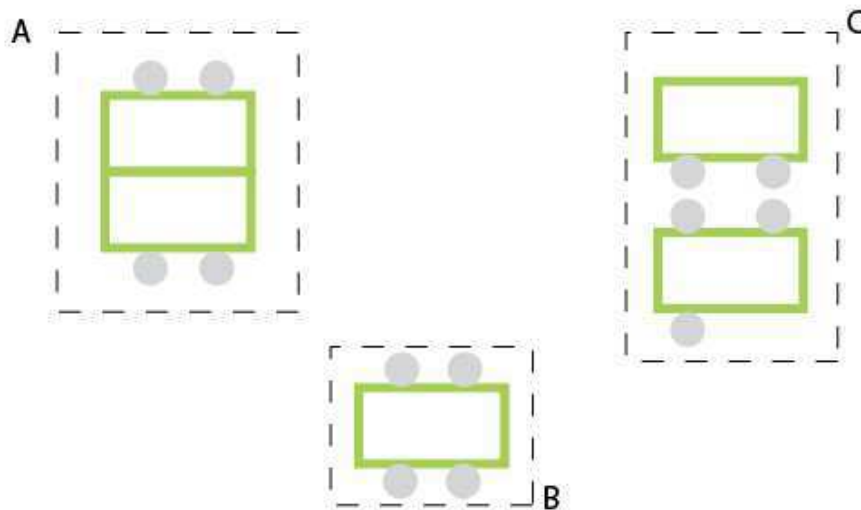


Figure 3.1: Day 1 - Students defined their spaces in 1 of 3 ways. There were 4 groups that used orientation A, 1 group that used B and C.

At first teams were working individually at their new arrangements and once prompted with worksheets by tutors, students began having self-introductions. In some groups there were a lot of verbal exchanges, while other groups wrote on paper to share with their group. There was lots of talking in some groups, others just wrote on paper to show to other members. In terms of body language, students had a lot of eye contact, leaning in, and nodding of the head.

As the groups continued their discussions, on defining their philosophy and vision, the teacher and tutors walked around the groups. Often times having trouble navigating through the unused tables and chairs. The number of actively used equipment was 11 tables.

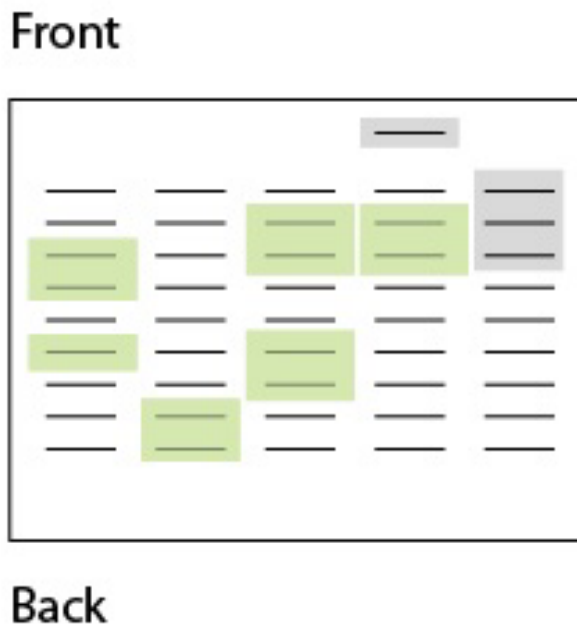


Figure 3.2: Day 1 - Depiction of unused or 'inactive' tables versus those that were utilized. Highlighted areas were occupied spaces.

In addition, other than the worksheets and the students' personal materials, there were no other materials available in the classroom. Likewise, for research, students used laptops, smartphones and tablets in fluctuation.

The second day of synthesizing fieldwork resulted in a number of behavioral changes. Once students were given post-its, large sheets of paper and markers,

there were more unique interactions and control of the classroom by students. No tables were used during this stage of the design process, students were standing and at the whiteboards instead. Also, the role of the teacher slowly shifted into a facilitator rather than a lecture. This allowed for more exchanges.



Figure 3.3: Day 2 - Students are standing and only using the whiteboards.

The third day of observations, during the ideation and brainstorming stage of the design process, illustrated and introduced several observations. At the beginning of the class the teacher took 15 minutes to explain the day's goals and the explanation of concept sketch. The teacher was at the front of the class again using the projector/screen. There were 26 students. Some groups changed locations, making groups closer together.

Once the students began their discussion, the teacher started taking a walk around the room to check on the student's progress. The teacher was again often limited in where and how to navigate throughout the room. This is especially the case when students have no choice but to occupy the aisles to interact with their group.

Students were provided with more materials along the way. At first they were only given markers, long sheets of paper, and worksheets. Later as the teams

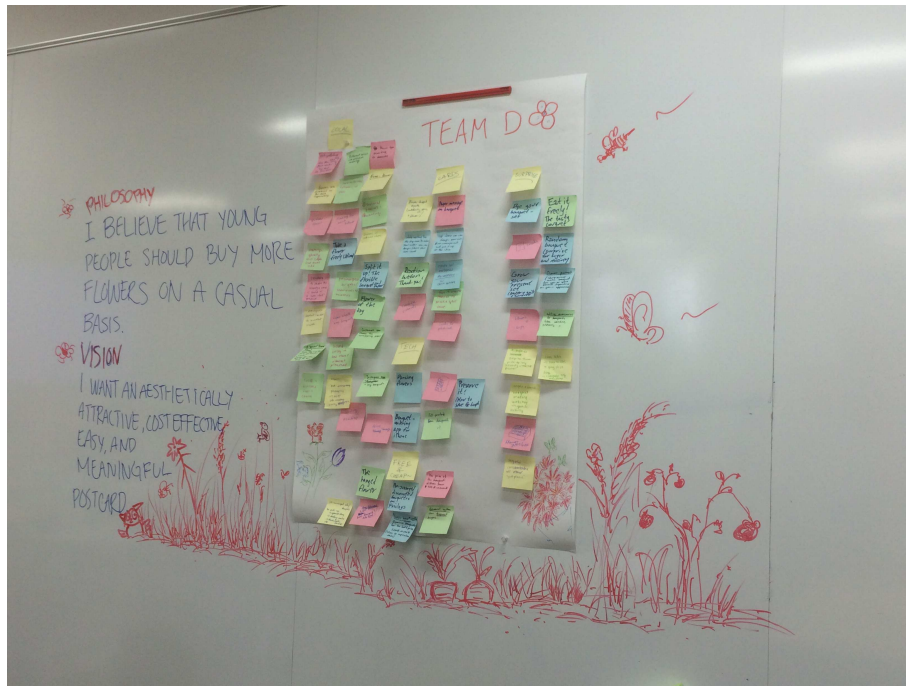


Figure 3.4: Day 2 - Students utilized both the temporary surface of the whiteboard and the poster itself.

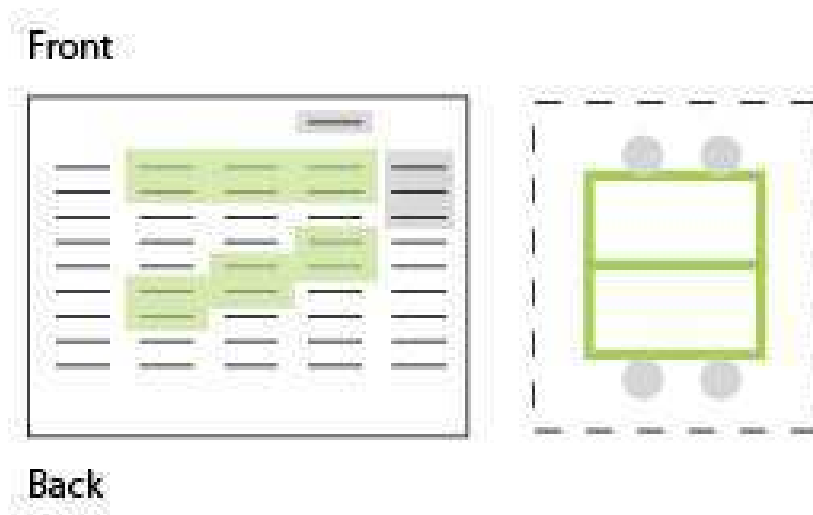


Figure 3.5: Day 3 - Location of where students occupied and the orientation they chose. The students have situated themselves closer



Figure 3.6: Day 3 - Image representation. Also, notice where the teacher is in relation to the students.

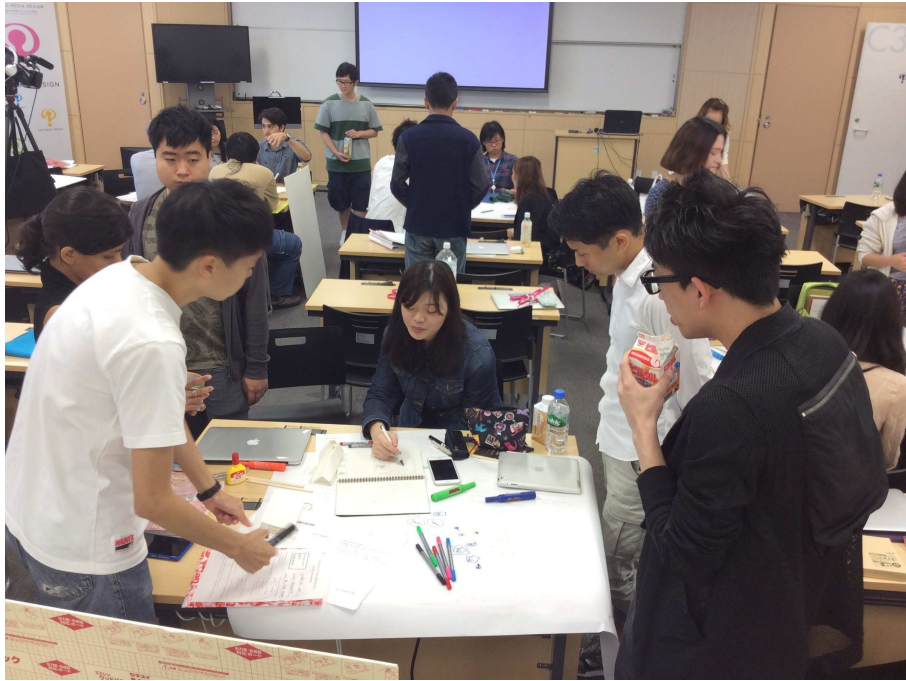


Figure 3.7: Day 3 - Group Interaction

ideation and brainstorming develops they were provided with more materials. All materials were brought into the classroom by the teacher.



Figure 3.8: Day 3 - Materials and Resources brought in by the teacher.

With the materials students' energy levels and the liveliness of the classroom increased. Students drew on each other's sides of the long sheet of paper. Some students communicated through images and others through text. Also, at times

creating what they are trying to express with the materials provided. The greatest distance between students was the width of 2 tables side by side. Also, unlike the first day all groups had the same arrangement of seating - around 2 tables put together. The behaviors of students varied, some students stood up and looked down at the work, others remained seated, and some groups had a mixture of both.

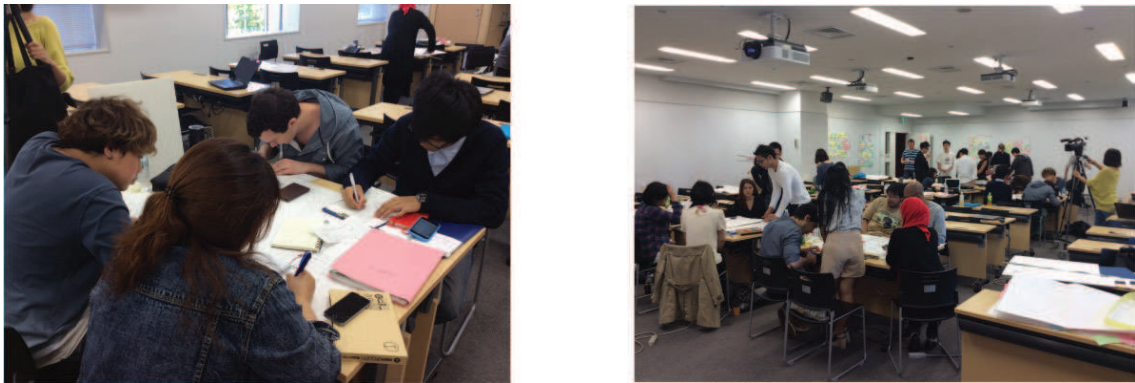


Figure 3.9: Day 3 - Different group dynamics.

However, again with this arrangement, while the students and teachers attempted to be more interactive and engaged, the ‘inactive’ equipment in the room made it difficult for navigating and maneuvering around the room. The unused tables and chairs made it hard for the teacher to access students and for the students to create collaborative spaces. Some groups even abandoned their own initial spots and created new areas. The number of active tables went from 12 to 19, as more space was needed by groups.

Some students even utilized free floor space, an interesting alternative.



Figure 3.10: Day 3 - Student interaction within classroom environment, with classmates, resources and space.



Figure 3.11: Day 3 - Floor space for making and ideation.

The observation of the behaviors, interaction structure and engagement during this fieldwork illustrated that more undefined space is need. With more ‘activate-able’ space the interactions during the ideation and brainstorming stage can be more fluid. Also, if there is clearly more usable space students would be able to create the shape of space they need, as was witnessed from the field analysis. Moreover, the issue of teacher engagement due to obstacles in the space (i.e. unused tables and chairs) could be avoided if there was more flexibility and relative perception between the space and the items in the classroom. As for materials, the observation supports the value it brings to engagement and interaction. The introduction of a variety of materials encouraged the facilitation and coordination of the class. In order to improve and re-establish a creative ecosystem within similar contexts, looking at related fields where creativity, exploration and discovery are embodied in the class environment.

3.1.2 Kindergarten and Global Kindergarten

The kindergarten fieldwork illustrated freedom and flexibility of space for students and teachers to use during lessons. Kindergarten classroom design demonstrated high levels of student engagement, interaction and discussion. This is a result of the versatility and ownership encouraged through the openness of the space.

The location of this fieldwork was at School Corporation Akebono Gakuen Ohno Kindergarten’s Ono Kindergarten. The kindergarten is located in Fukuoka Prefecture Onojo in Japan. Over 2 days (June 13 and 14th 2014), the kindergarten was observed; during a Global Kindergarten workshop (GK) and a typical school day.



Figure 3.12: Global Kindergarten Workshop - Remote interaction and sharing of cultures

Global Kindergarten is a project that explores how ICT (information communication technologies) in pre-school education can bridge communication and provide an opportunity for cultural exchange. The Global Kindergarten project utilizes ICT and distance communication technologies to connect 2 kindergarten classes. The activity aims at stimulating multicultural interaction and experiences of diversity elements of non-verbal interaction programs.

The 4th session of Global kindergarten on June 13, 2013 between Japan and France, introduced a new interactive session, 'Quilting Session', which allowed children from both locations to create art together using the screen as an interactive tool. In this session, there was a controlled yet freed interaction promoted. There were 2 interactive strategies utilized.

One would promote the exchange and sharing of cultural and situational information. The other would encourage student interaction with the remote site. The second interaction format allowed the students on either side to create art together using the projection screen as an interactive surface tool.

The Global Kindergarten workshop provided students with a level of involvement and engagement that could be achieved and experienced beyond borders and language barriers. The observation of this workshop illustrated the importance space and access to material and equipment is to facilitating the learning experience. Also, through creative utilization of material and space can result in the possibility of better interactive content.



Figure 3.13: Global Kindergarten Workshop - A child is color patching the Eiffel tower, while the French children are doing the same to mount Fuji.



Figure 3.14: Global Kindergarten Workshop - A teacher is helping in the facilitation of the interactive activity.



Figure 3.15: Global Kindergarten Workshop - A group picture.

More recent integration of space and utilizing various materials and tools illustrates a more interactive experience.



Figure 3.16: Children are able to be more interactive and communicate more effectively non-verbally with the access of more materials.



Figure 3.17: Fun and engaging.

In addition to the Global Kindergarten workshop, the Ohno Kindergarten's regular class time were also observed (Please refer to Figure 3.18 and Figure 3.19). The kindergarten classes were observed for design and student and teacher relationships. Kindergarten's represent a interaction dynamic of exploration and sharing driven learning. It was understood that the children were often guided by the teacher, through learning In addition to the learning interaction, the observation and examination of the environment demonstrated 3 key characteristics.

First is the displaying of student work, both completed and in progress. Second, the flexibility and ease of maneuvering in the classroom. Both students and teachers were able to easily change the setting of the classroom from activity time to reading time. In addition, the students and teachers did not seem to have any obstacles of equipment during the learning process.



Figure 3.18: Various configurations and layout flexibility within the kindergarten classroom.



Figure 3.19: A few ways the children and teacher occupied space and created an environment.



Figure 3.20: Flexibility of space for activities and utilization of floor space.



Figure 3.21: A few configurations for how the space is left when class is not in session.

Then thirdly, was the availability and access to various materials for crafting.



Figure 3.22: Availability and access to materials and resources.

In addition to the facilities and observation of the Japanese kindergarten, images and pictorial walk through of the other participating kindergarten illustrates the same principles.



Figure 3.23: A few of the classrooms and interaction dynamics at the partner kindergarten in France. Along with images of similar resource or materials.

Throughout the observation of regular kindergarten class routine and Global Kindergarten, it was clear that there was a connection between engagement and creativity with the characteristics of flexibility, availability of materials and student-teacher relationships in the classroom environment.

3.1.3 Workshops

Workshops are designed for encouraging students to interact and collaborate to produce ideas and solutions, within a condensed period of time. The workshops to be discussed in this section were conducted within University classrooms, with the intention to provide interactive content to students. Participants included both teachers and students. Workshop development often considers location or environment as much as content. This was also evident in the case of the workshops observed in this research. There is a consideration of space and how it can be best utilized and perceived. The two workshops observed were the *Global Citizen* Workshop and *GIGA* summer program.

The Global Citizen workshop was conducted in one a typical university classroom at Keio University's Shonan Fujisawa Campus (SFC). The workshop was developed to complement the existing content for the class but through a more activity based format. There were 3 goals to the workshop (1) defining 'global citizen', (2) looking beyond differences, and (3) awareness of what is global education. To reach these goals, 3 activities were developed and carried out during the classes allotted one hour and a half. The activities included (1) *The world as we know it* (2) *Looking beyond differences* (3) *awareness of what is global education*. While the first and last activities could be conducted within the initial context of the class, the second activity required engagement and high energy level.



Figure 3.24: The classroom layout. Picture taken from the ‘front’ of the class.



Figure 3.25: Illustrates how the first and last activity were carried out.

Therefore, for this purpose the second activity was conducted outside the classroom and in the open hallway utilizing pillars and walls as interactive surfaces. This allowed for bodily movements like walking and standing, which also encouraged discussion within groups and between groups.



Figure 3.26: A large hallway walk was utilized to have various groups integrate their ideas into one area.

Also, moving into a bigger open space gave the students and facilitators the ability to break spacial barriers and interact more intimately. Instantly, facilitators and students behaviour and level of interaction increased. There were more moments where students spoke up and responded to questions and participated in group discussion.



Figure 3.27: Engagement of all groups to discuss about the combined activity findings.

During the summer of 2013, the GIGA (Global Information and Governance Academic) Program, organized a summer workshop program for high school students in one of the newer classrooms at SFC.



Figure 3.28: GIGA - Various ways the participants interacted with the environment. Also, illustrates the flexibility of the space.

This short program organized by the GIGA undergraduate program on information technology and policy brought together high school student from all over the world. The theme *Explore the Future of Information Technology* aimed to provide students the chance to explore and shape how technology is shaping society and how information is accessed. The workshop consisted of both hands on activities in teams and lecture discussion with facilitators.



Figure 3.29: GIGA - Participants interactions with other students and facilitators.

The environment that was utilized had integrated screens on all the main walls so that content could be displayed. Tables were arranged into groups and facilitators were also at a nearby group of tables. The class was easy to arrange and rearrange according to the activity. During the GIGA workshop, the grouping of students in combination with the moving teachers and facilitators throughout the class illustrated no defined ‘front’ of class. This revealed that the teachers or facilitators interaction is the key strategy to shaping the students’ level of engagement and active discussion within the workshop.

3.1.4 Global Innovation Design (GID) Program Experience

Participation in the Global Innovation Design (GID) Program, in Collaboration with 3 other institutions provided the opportunity to both experience and observe different creative environments. The GID experience opened up different design approach perspectives that were well communicated within the design and utilization of learning environments. As GID was a joint exchange program with the Innovation Design Engineering department at the Royal College of Art in conjunction with Imperial College of London and the Industrial Design department at Pratt Institute in New York, this thesis benefited from observing and analyzing how spaces, meant for learning and development of creativity, are utilized by students and teachers.

GID provided insight into different interpretations of creative spaces and access of essential resources, accessible and available to students and teachers. GID environments were available for students to utilize for projects and lessons. The variety of classrooms promoted ‘build to think philosophy’. This philosophy was communicated through the availability and access to various spaces, resources and instructors.

Royal College of Art and Imperial College of London-London, United Kingdom

The Royal College of Art and Imperial College of London are both recognized institutions for their drive towards innovation and creative disruption. The two schools, which are within walking distance of each other, offer a variety of facilities and spaces that were accessible by both students and teachers. These facilities and spaces provided students and teachers with flexibility and resources for a ‘think through making’ learning style.



Figure 3.30: Different applications for using learning spaces, both for ideation and production.

During the observation at both London institutions there was an apparent flexibility and openness of interaction. In addition, there was an interesting engagement model between students and teachers. Teachers and teaching assistants were there as facilitators, they were available for advice or guidance. Their offices were amongst the students studio space, breaking perceptual barriers and instead providing an opportunity for interaction. There was also access to various ‘essential’ resources beneficial to facilitating communication and discussion. These always included but were not limited to various colored markers and A3 paper.

The learning spaces of the two institutions translated to a number of options of spaces and environments that could be utilized for learning or construction. In addition to physical spaces, collaboration was also conducted through an online platform, across borders.



Figure 3.31: Connection during a transnational presentation, while connected to Pratt Institute in New York and Keio Media Design in Japan.

Pratt Institute - New York City, United States of America

Pratt Institute is located in Brooklyn, has been known for its long history in the fundamental foundations of design. At Pratt, discovering the beauty of form and experience was at the core of their Industrial Design Program. This approach was also expressed and reflected in the spaces and environments made available to the students and teachers.

At Pratt the same characteristics of flexibility and maneuverability were observed. There was a mix of both traditional and open learning environments (Please refer to Figure 3.33 and 3.34). Also, studio spaces at Pratt were similar to those at the RCA and Imperial. They allowed for collaboration and interac-



Figure 3.32: Student-Teacher interaction, open feedback and discussion.

tion between students. However, the key characteristic that had a great influence was based on the teachers behaviour and ability to achieve a degree of movement within the environment.



Figure 3.33: Traditional learning environment found in the undergraduate Art History department.

In Pratt the teacher's movement and flow within the classroom helped direct and bridge barriers in the space. In almost all class interactions, teachers were always amongst the students (Please refer to Figure 3.35). There was no perceived hierarchy.



Figure 3.34: Teacher part of the discussion, there is equality. Emphasis on student involvement and engagement.



Figure 3.35: Professors are amongst the students. No perceived barrier of space.

D.School, Stanford University - California, United States of America

During the GID exchange program, Stanford University's D.School was also observed and explored, as it is a renowned facility known for its utilization of space to facilitate various design thinking workshops. The workshops are conducted in groups and require active participation, discussion, collaboration and brainstorming. All of which are behaviours that CreoSystema aims to foster within students, in existing University classroom environments.



Figure 3.36: Notable characteristics of the D.School Environment.

In addition to the physical characteristics that are consistent throughout the D.School, there is another feature referred to as the *Studio Reset* (Please refer to Figure 3.37). This communicates to the participants how the room should look like at the end of each use. This principle ensures that the environment can be recreated many times over to the needs of various workshops. This feature - constant reset and configure cycle - is possible for their workshop learning environment, since time can be allocated for it.

Along with the learning environments for interactive and collaborative workshops, there are also temporary collaborative spaces that can be utilized. These

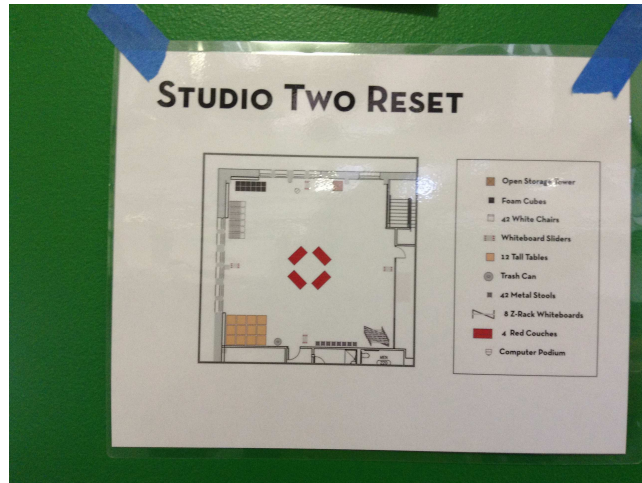


Figure 3.37: Studio Reset sign.

spaces' furniture also communicates the temporary status of the space. For instance, in some spaces the chairs and the height of the table can eventually become uncomfortable, because they are intended for short engagements (Please refer to Figure 3.38).



Figure 3.38: High table and stools. This area can also accommodate the use of the movable whiteboard and post-it posters.

Through exploring the D.School there was a lot of reference to access to materials, building temporary spaces, and various levels of interaction. The D.School's consideration for the environment and participants behaviour and actions within

the environment were considered throughout the various interaction spaces. In other words, the potential user experience and the value in understanding the purpose of the environment is essential for a successful learning environment. The analysis of fieldwork observations revealed consistent fundamental characteristics that were at the root of creating a creative ecosystem - flexibility, ownership, and perception. These form the foundations for CreoSystema.

3.2. CreoSystema Concept

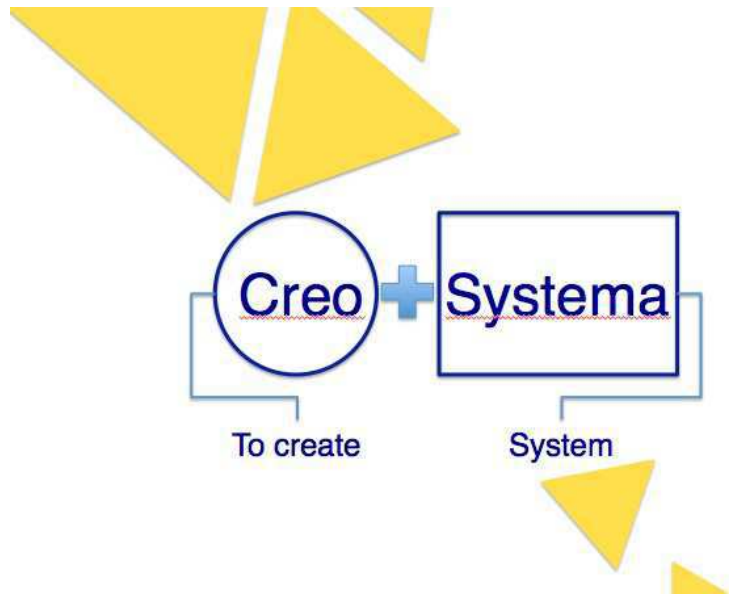


Figure 3.39: Possible interpretation: To Create a System, Creative System, Create in this System.

CreoSystema comes from two latin words – creo and systema. Creo, is a root latin word that is associated with to create, creative, creation. Systema, the root for ‘system’, is a word that signifies a set of interacting or interdependent components forming an integrated whole. Put together these words to encompass the aim of a reformed classroom. This ‘creative ecosystem’, CreoSystema, can intuitively encourage the facilitation of discussion and idea sharing. Improving the facilitation of discussion and idea sharing will provide students the opportunity to engage in collaborative learning and interaction.

CreoSystema is a proposed space adaptation that is rooted in the realization of three key principles - flexibility of things, ownership of space, and relative perception. These principles are realized through design considerations of characteristics, within existing classroom environments. This is established in the belief that classroom interaction and learning model should be re-designed with attention to experience design. The experience should ultimately produce an environment that encourages and engages students. Thus, forming a 'creative ecosystem'. CreoSystema is a proposed way to reboot or bring creativity back in parallel with education.

CreoSystema is an approach that originates from the desire to tackle two identified problems - contradictions of environment and barriers in space - which exist in current learning environments. Contradiction expresses a disconnect between the environment and content. In other words, where interactive contents (i.e. discussion based, teamwork, brainstorming, etc.) are being taught in traditional lecture classrooms. Barriers in space refers to the varying perceptions of 'distance' and proximity between students and teachers. This varying of perception results in hesitations and/or disengagement. The CreoSystema proposal is a tool that can be integrated by teachers with the same aims as the system was developed for.

This research proposes that through the integration of the three principles, identified from fieldwork analysis, traditional classrooms can adapt and sustain creative content. The aim of CreoSystema is not to rebuild a new classroom but instead work within the existing constraints of already established environments.

3.2.1 Principles Defined

Flexibility of Things

Flexibility of things is the ease of movability in available resources and negotiation of space, by students and teachers during lessons. The element of flexibility in available resources adds a value of interactivity by promoting active interaction between students, the teacher and space. In addition to table and chairs, available key resources include and are not limited to movable whiteboards, permanent whiteboards, post-its, markers, white foam boards, Internet, and projec-

tors. Available resources are accessible during lessons by students and teachers, within the University classroom. Access to available resources is essential to promote various forms of communication and interaction by utilizing the resources available.

Ownership of Space

Ownership of space speaks to one's needs to take claim of space. Student ownership is when students self-initiate the interaction in the University classroom during lessons. Student ownership is a characteristic that removes the hierarchical roles and structure, which are pre-existing in a classroom. This is achieved through allowing students to leave work in progress, or notes of class discussions/group brainstorming sessions. In addition, ownership of space is supported by providing resources, which students can access freely and at their own will. The act of taking initiative is another means of witnessing how students can 'own' their class environment. Ownership of space, will break down constraints and promote students to actively take part in their communication and build intra-personal skills.

Relative Perception

The element of relative perception, on the other hand, will foster communication and facilitate interaction between students and teacher-student. Relative perception is how students perceive their relationship between other students, the teacher, and essential resources. A student's perceived relative position has a psychological effect on how students interact and communicate. Relative perception will be attained through consideration of proximity. The key for this principle is to be mindful of distance and freedom of movement.

3.2.2 Concept Development: Visualization

Each characteristic – flexibility of things, ownership of space, and relative perception – carries a value that will be visualized in the design consideration of space. The contextual spaces, in question, for this research are the existing University level classes and the students and teachers who utilize the space. The specific

interaction that will be targeted is the time during class discussion and group work (i.e. brainstorming and ideation).

Limitations

While CreoSystema's aim is to help improve classroom engagement through supporting discussion and interaction. This proposal recognises that there are some limitations and considerations that need to be made in order for CreoSystema to be applicable. Firstly, the limitations to CreoSystema originate from the ability to uphold its principles. Thus, if an environment can not facilitate flexibility of things (i.e. movable tables, removal of podium) then the core principles of CreoSystema can not be implemented. In addition, there is a limitation of capacity, as the iterations and visualizations were only developed for a student number ranging from 16 to 32. In other words, CreoSystema is currently limited to cases where the principles can be visualized for existing tutorial sized (16-32) University classes.

3.2.3 Space Consideration and Model

CreoSystema is composed of 2 key components - space considerations and suggested model.

The space considerations help the teachers (the implementers) to better understand how the principles will be visualized in the environment. Space considerations to uphold the principles of CreoSystema are as follows:

A) *Flexibility of things*: The equipment within the classroom must be movable and re-arrangeable. This includes tables and chairs. There must be resources made available for students to utilize to help in the facilitation of their discussions and interactions. The resources suggested from this research are markers, post-its, posters, colored paper, scissors, crayons, clay, rulers, paper (A3 AND A4), and any other materials the teacher deems necessary for content. In addition to this, there needs to be a perceived flexibility in both students and teachers ability to maneuver within the space. This flexibility will be further discussed in the next two principles.

B) *Ownership of Space*: This is a principle visualized in the students comfort in

sharing the space with the teacher. In addition, it is the way students take claim to not only their working area but also the general classroom. In other words, do students navigate or utilize more space than just simply their table top. This is also a principle that can be visualized in whether or not students leave their work in progress or completed work in the environment. These behaviours also translate to sustaining the principle of flexibility. This principle aims for students to self-initiate the retrieval of resources.

C) *Relative Perception*: The principle of proximity and how students and teachers perceive each other in the integration of a layout model. The layout model promotes the principle of relative perception, in that it visualizes 2 key characteristics. Firstly, it places the teacher at the center of the class. In other words there is no podium and therefore, no 'front of the class'. The second characteristic is that students are put in to modules around the teacher. These modules are defined by ideally 4 students each. In other words, for example if the classroom has individual desks then one module would be made up of 4 individual desk units. The distance relationship was achieved with consideration of the socially accepted proximity of 1.5-3 meters. For the initial model this was calculated by 3 steps in all directions.

Figure 3.40 displays the CreoSystema suggested model for a class size of a maximum of 32. Please note that the distance between the center - where the lecturer will be - and the table is measurable through steps. The initial model illustrates the floor plan of guiding lines, modular tables, access to resources, lecture in the center, and possible locations of storage areas in relation to the available space.

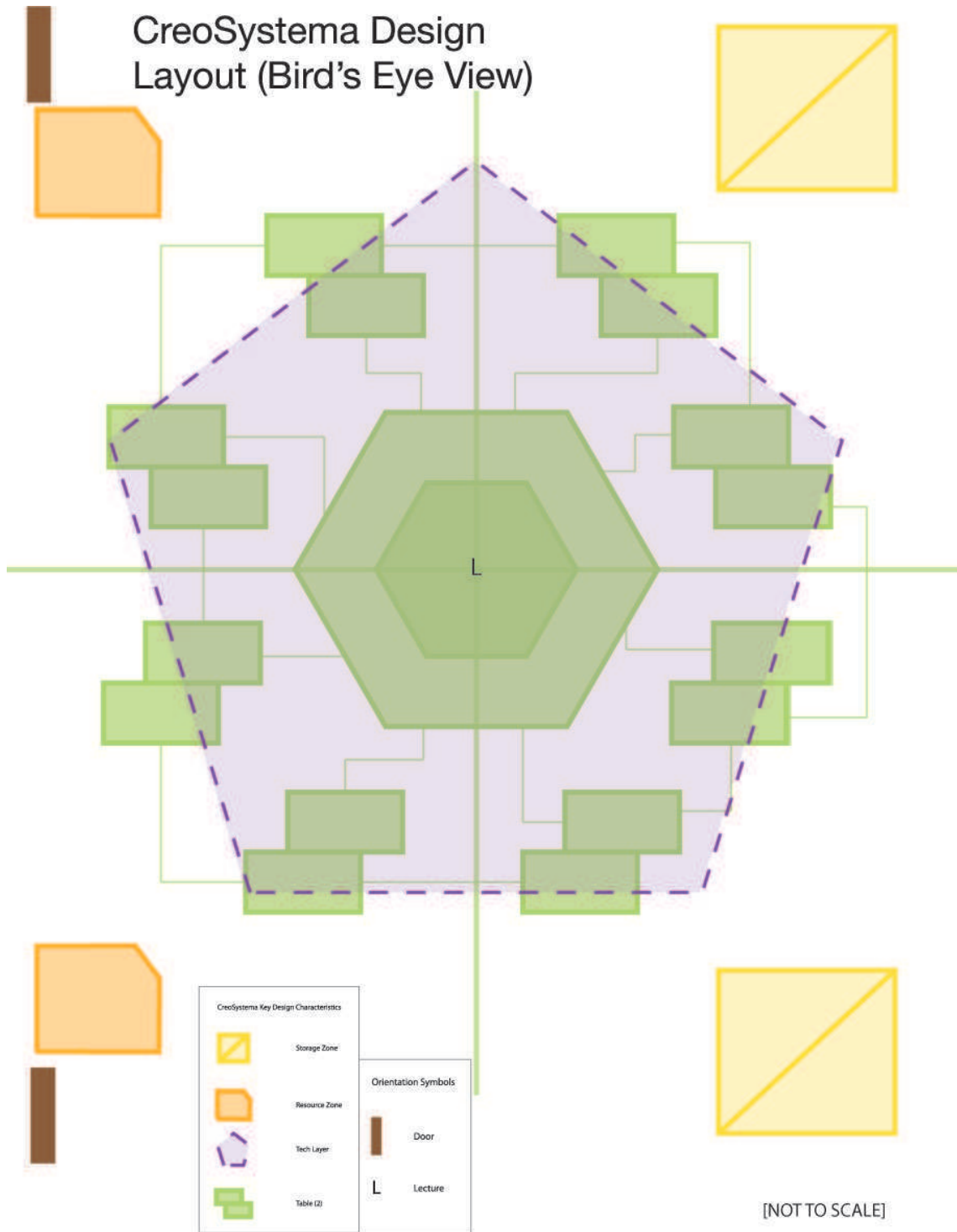


Figure 3.40: Initial Model of CreoSystema

3.2.4 Benefits for All Stakeholders

The CreoSystema proposal was developed to benefit both key stakeholders in the learning environment - teachers and students. Ultimately, to improve interaction and communication for the sole purpose of engaging all parties. Through CreoSystema students will be able to feel more immersed in the class content. More importantly they will have the opportunity to develop the skills and characteristics in demand by society. As for the teachers, they will be able to witness students active participation and facilitate more informal and comfortable interactions.

3.3. Preliminary Implementation

The preliminary implementation for the CreoSystema proposal was conducted in collaboration with AGORAsia workshop for youth in Asia by Keio Media Design's (KMD) Global Education team. AGORAsia Youth is an online network created to foster a community amongst youth's in Asia. The workshop is designed to stimulate dialogue, reflection, and collaborative learning with youth in Asia. The topics of AGORAsia are all global issues. The workshop is jointly connected to UNESCO, Connect Asia Program, and SOI Asia and utilizes ICT (Information Communication Technology) to bring opportunity to the participating youths in an environment that is culturally diverse.

AGORAsia Youth 2014 workshop was conducted in KMD's lecture classroom. The local Japanese participants were 12 and the remote participants consisted of 2 students from South Korea and 12 from Malaysia. The session topic this year was 'Building a sustainable Society' and the CreoSystema proposal was utilized. In conjunction with the model the considerations were identified and the space was created with these consideration. During the 3 day workshop CreoSystema underwent 2 iterations based on feedback and observations during the workshop.

In order to communicate the iterations of the CreoSystema proposal, each day of the AGORAsia workshop will be discussed in further detail. Images will be utilized to help communicate the actions and behaviours observed. The color coordination is utilized to help connect the images to the locations or areas they represent.

3.3.1 DAY 1 AGORAsia

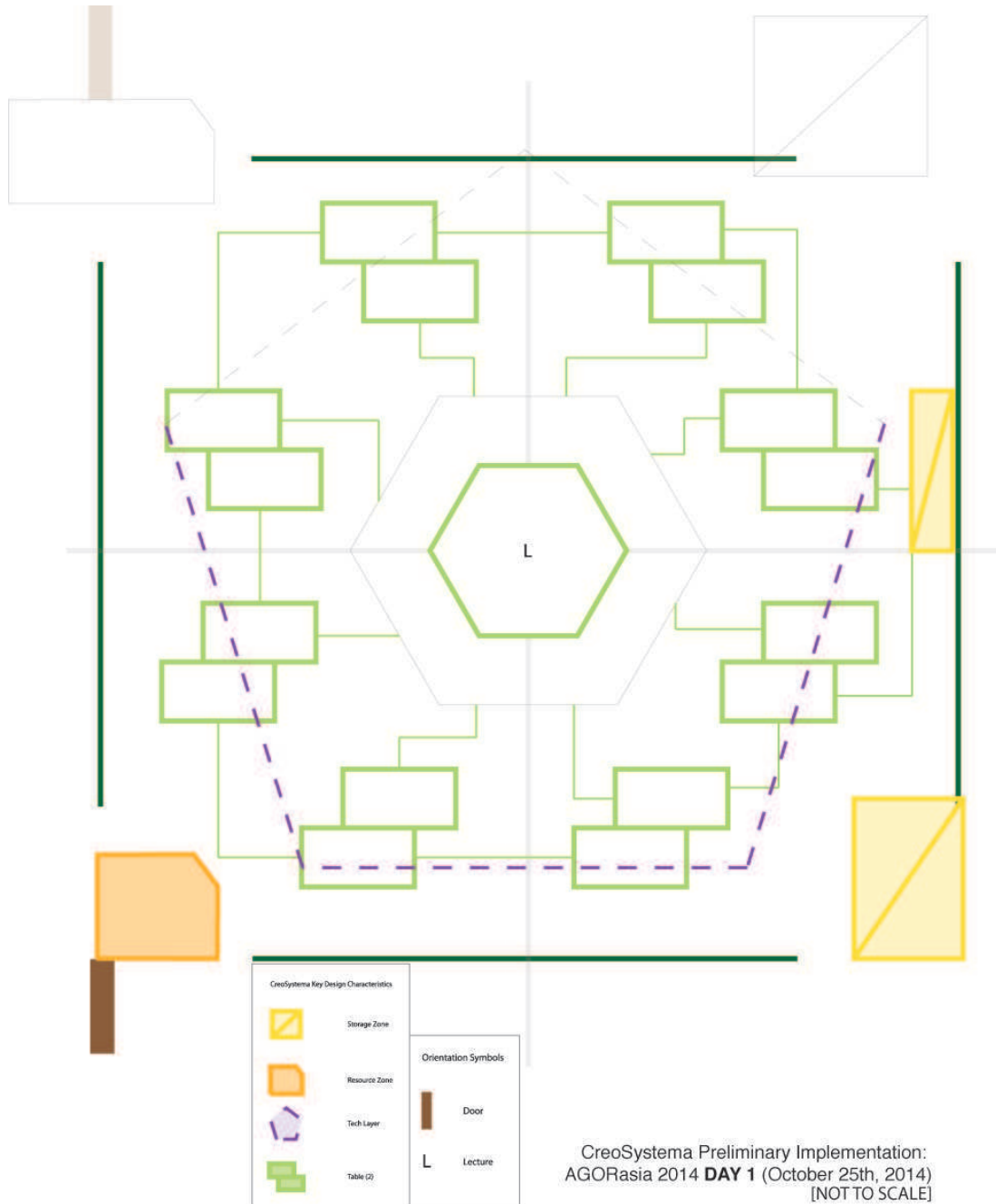


Figure 3.41: The floor plan and layout of Day 1. The dark green lines indicate the area used for the workshop.

The first day of AGORAsia 2014 was the initial implementation of CreoSystema. The classroom was reconfigured and adapted to the characteristics outlined by the principles. The distance between the lecturer in the center and the grouped tables was established based on taking 3 steps in either direction (i.e. North, South, East and West). The grouped tables on the diagonal planes were an additional half step from the center. However, it is important to note that this measurement is dependent on the teachers comfort and size of the classroom. In addition, the floor plan was indicated and visualized by simply using different colored tape to represent the various elements.

In reference to Figure 3.42, the images within the green background communicate a summary of the most frequently occurring behaviours and action of the students and facilitators. Through the pictures there is evidence of interaction and engagement by students, through their eye contact and body language and facial expression. As for the facilitators the images illustrates their movements and engagement. More specifically, a closer look at the pictures illustrate that often times the facilitators would gravitate to the screens nearest to them and lose eye contact with the local students. In addition, while the facilitators had lots of room to move and interact, their movements were minimal when lecturing. In regards to the 4 pictures at the bottom right, they communicate the various student-student and student-teacher interactions that took place and how the environment supported collaboration and bridging spacial barriers.

Likewise the storage environment was utilized for extra cables and technological equipment in case the tech infrastructure needed to grow. The resource center, which was originally near the door for easy access as the first image indicated, was eventually moved to within the module layout of the class. This was a decision initiated by the facilitators who were conducting the icebreaker.

Following the first day's AGORAsia workshop session, informal interviews and group discussion were held to receive feedback for iteration purposes. Both the facilitators and students liked the layout of the classroom and its ability to bring the teacher closer to the students and the students closer to each other. Several students and teachers commented on the ease of maneuvering and communicating within one another. There were, also, 3 consistent feedback regarding considerations of CreoSystema: (1) the distance from teachers position to students can be

CreoSystema Preliminary Implementation: AGORasia 2014 **DAY 1** (October 25th, 2014)



Figure 3.42: These images summarize the main observations noticed during Day 1.

brought in, (2) the guiding lines of the floor plan would get confusing, and (3) better integrate the remote site into the environment.

In order to address these three remarks, firstly the distance of modules (grouped tables) was brought in closer. Instead of 3 steps they were brought in to approximately 2 steps. Secondly, in regards to feedback 2, after asking the follow up question - *how do the lines create confusion, or make you feel, while you are speaking?* - the facilitator was able to express the deeper reason. According to the facilitator, “it is hard to keep track of the lines, I don’t want to be told how to get to a table or a good spot, but rather just tell me where is a good place to stand”. This response allowed for a better understanding of the speakers perspective and attention level while speaking. The response also pointed out that the prompts on the floor could just indicate points, locations, or spots that are best to stand at to achieve various forms of engagement - class versus table, or both. This translated into the development of ‘hot spots’ - positions where lecturers can stand to address the class or smaller groups. Finally, to help better integrate the remote sites into the class population, the facilitators utilized the unused tables and placed smaller monitors in between the local participants. This illustrated the understanding that the layout can be changed if needed for other forms of interaction.

3.3.2 DAY 2 AGORAsia

The feedback obtained from day 1 were implemented during the second day of AGORAsia 2014 workshop. The *hotspots* were added strategically within the inner zone and outer zone. The spots were defined after several participants walking around and identifying how engaged they felt at different locations. After which, the spots were marked with yellow tape. The difference in whether they are filled in or not indicate intensity and varying degree of interaction. In addition, the tech infrastructure was improved to integrate the remote students amongst the local students. The image of Day 2’s preliminary layout (Please refer to Figure 3.43) illustrates the screens locations. Each remote site had one screen, therefore 3 screens placed in a triangle opposite that of the local students. This was conducted to help facilitate teachers movement and eye contact with local and remote students. In other words, the professor could not have their back to

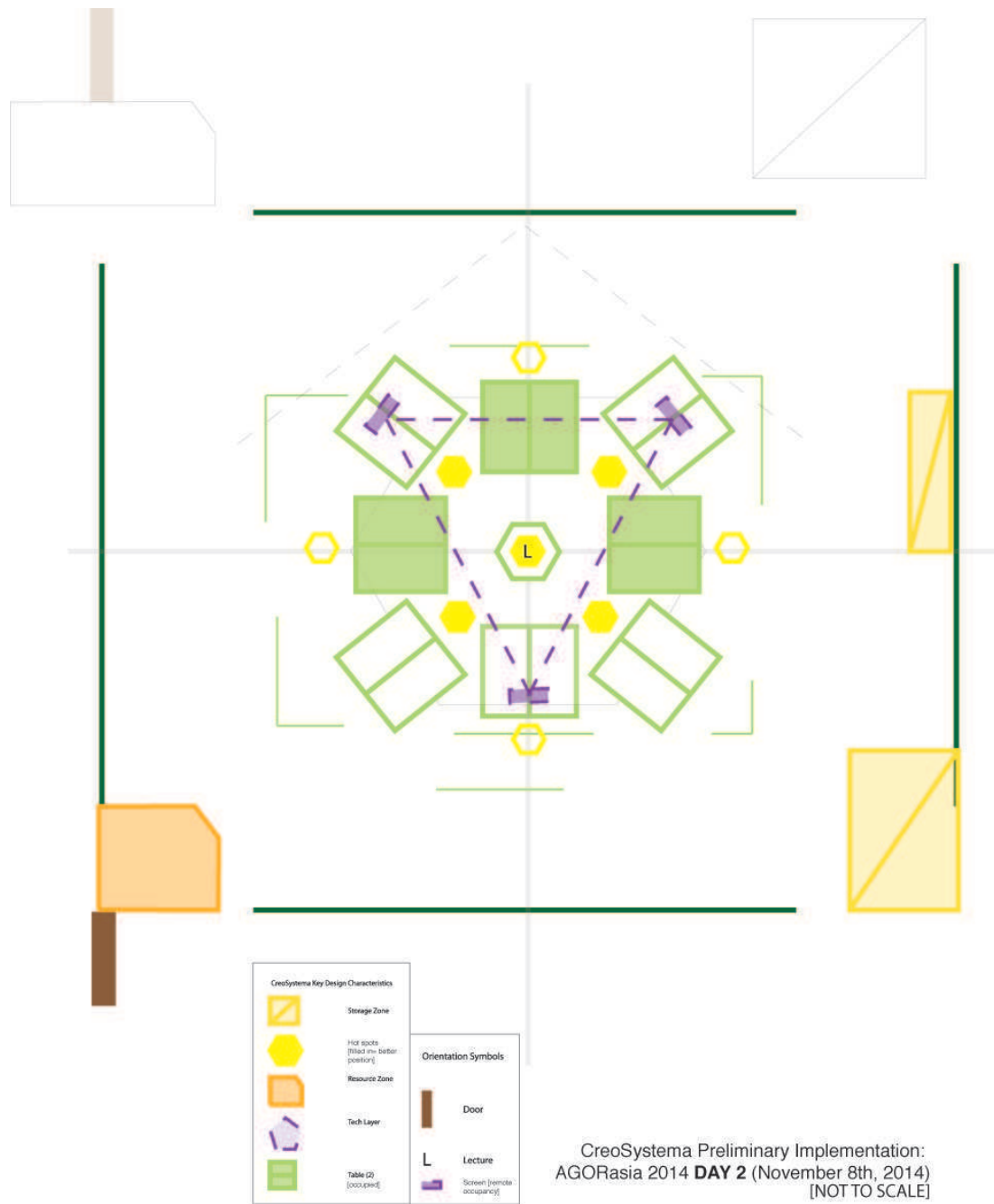


Figure 3.43: The floor plan and layout of Day 2. The dark green lines indicate the area used for the workshop.

CreoSystema Preliminary Implementation: AGORAsia 2014 DAY 2 (November 8, 2014)



Figure 3.44: Summary images of Day 2, with the iteration. Notice how the facilitators/lecturer maneuver through the space.

any group of students, whether remote or local.

Both of these iterations positively affected the interaction of the teacher and students. Due to the hotspots, all 3 facilitators subconsciously started to stand at the spots and slowly move around to the next one. This example is illustrated in the pictorial summary Figure 3.44. Also, with the screens, even the guest lecturer was able to pick up on the nuances of the environment without a brief. This illustrated a sense of intuitiveness to the concept. This can also be seen in the pictorial summary. The positive outcomes were also indicated by all facilitators and the participants who were able to conduct an informal interview.

The feedback from discussion and interview conducted on the second day centered around one main comment - whether or not it was possible for students who were present to better interact with remote sites more intimately. This comment led to the next iteration. This iteration was initiated by the facilitators their curiosity to how the engagement level could change.

3.3.3 DAY 3 AGORAsia

The third day of AGORAsia 2014, like previous days had a classroom that visualized the principles of CreoSystema. The only iteration conducted was an additional table added to each modular desk for the remote screen and the removal of unused desks. Each screen, however, did still display, different remote locations. This configuration throughout the workshop within each module group illustrated more behaviours and actions of interaction with their screen.

At the end of the workshop all the participants were able to take a group picture within the environment. The image at the bottom right of the pictorial summary illustrates how the picture was taken. Following the workshop, informal group discussion was conducted with students and then with the teachers, who were observing for the participating schools. Their comments included, “I like this style?”, “It’s is easier to speak with the teachers”, and “I like that it is open”. On the other hand, there was also an interesting response regarding the limit of numbers of students according to the model. Since class size varies that is something that should be considered in future adaptations. Overall, across the iterations it was clear that the CreoSystema proposal was adaptable to the facilitators needs. In addition, the availability of resources, although only extensively use on the first

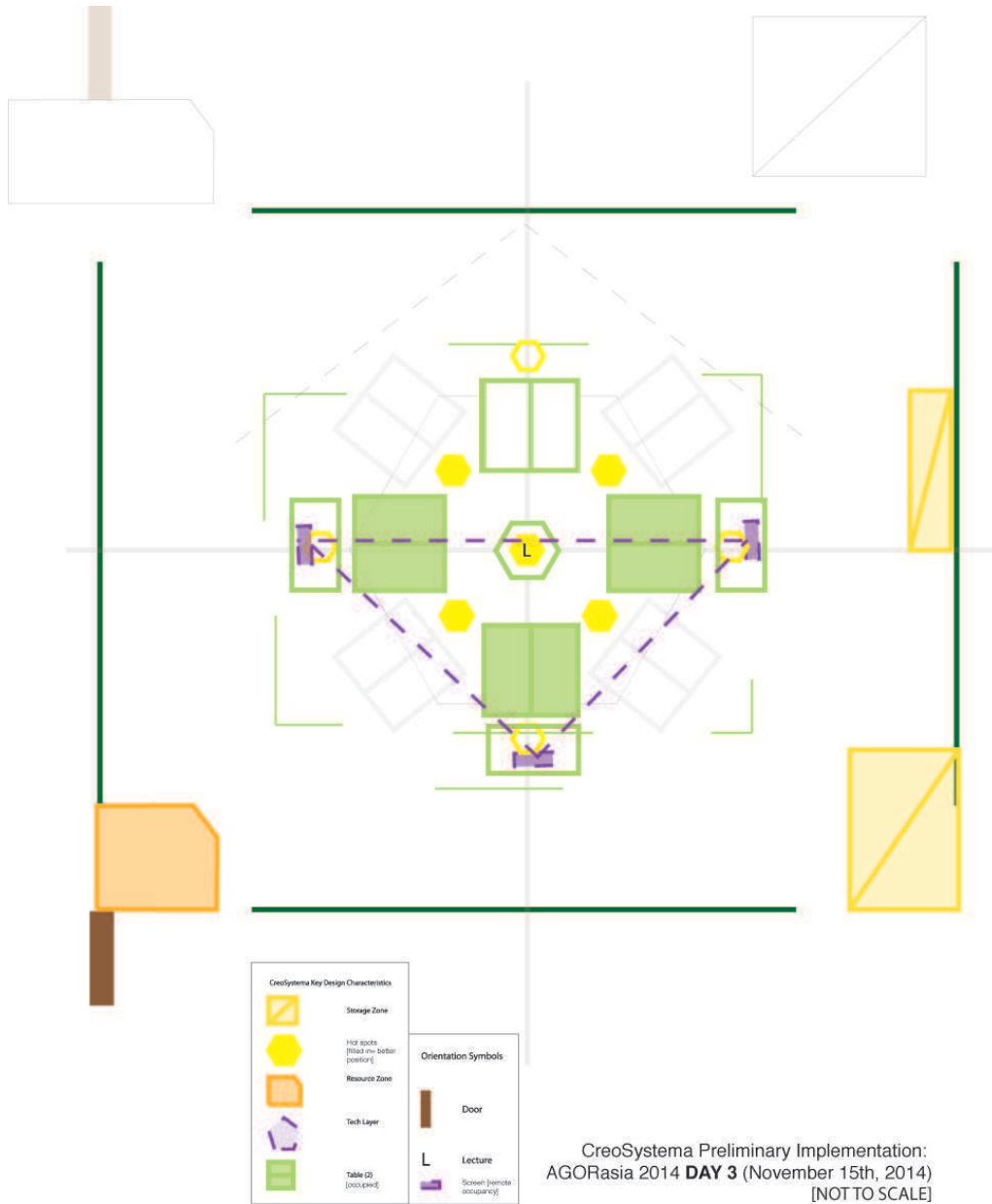


Figure 3.45: The floor plan and layout of Day 3. The dark green lines indicate the area used for the workshop.

day, was not received negatively as it was still used to facilitate local discussions.

The CreoSystema Toolkit was developed through the iteration process of the initial checklist and model. The revised details of CreoSystema as a Toolkit will be discussed further in the following section.

3.4. CreoSystema ToolKit

The CreoSystema proposal's initial implementation gave way to insights that were developed further to help realize the CreoSystema Toolkit. The toolkit is a result of reiterations during the preliminary experiment and evaluation of realized principles. The details on the implementation approach and findings of this toolkit will be further discussed in chapter 4 on Implementation.

This section will present the CreoSystema ToolKit and its contents. The CreoSystema Toolkit consists of 4 main components: (1) a checklist to help facilitators/teachers/lecturers evaluate their existing classroom and identify whether it meets the minimal requirements, (2) details on the essential characteristics that must be visualized within the classroom for it to follow the 3 core principles, (3) recommendations on additional features if required by the facilitators/teachers/lecturers, and (4) a model illustrating the basic floor plan of CreoSystema. (Note this toolkit is directed to teachers/professor.)

Classroom Evaluation Checklist

The Classroom Evaluation Checklist is necessary to ensure that all essential characteristics of CreoSystema can be implemented within the existing classroom.

1. Table and Chairs are movable
2. Projector and screen/wall
3. Interactive Content (i.e. discussion,idea sharing, brainstorming, etc.)
4. Ideally maximum of 32 students (If more requires the manipulation of the environment more. This can compromise the effectiveness in creating a CreoSystema configuration.)

CreoSystema Preliminary Implementation: AGORasia 2014 **DAY 3** (November 15, 2014)



Figure 3.46: Images of Final day interactions according to iteration.

[If number 1 is not met then CreoSystema will not be achievable as it is a core requirement.]

Essential Characteristics

1. Teacher/Lecturer in the center. (Note: measure out the modules using your foot steps.)
2. Access to various resources. (Recommendations available in following step.)
3. Modules (4 students/unite = 1 module) grouped around the teacher/lecturer.
4. Remove the *podium mental model*, by making the teacher's area movable. There should be "no front of the class".
5. Movable resources that can be utilized to create spaces within an environment or separate groups for more intimate discussions. (ex. movable whiteboards, bean bags, colored carpet, or any other elements that you believe can achieve this.)
6. Label and communicate that all areas are free to use. Encourage students to engage and be active with their environment.
7. Support the teacher and student interaction by moving within the circle and outside the circle. This way you can engage both intimate group work or the class as a whole. (If you feel as though you need support or *ques* refer to recommendations bellow)
8. Store away unneeded tables and chairs to free up space and encourage movement.

Flexible Recommendations

1. Items that can be used to create spaces (i.e. movable whiteboards, foam cubes, cushions, etc.)
2. Resources can include but are not limited to:
 - colored markers

- different sized papers (A3,A4,A5)
 - colored crayons
 - felt material for decoration
 - clay for building
 - tape
 - glue
 - scissors
 - large posters
 - different colored post-its
 - rulers
 - pencil crayons
3. if you need *ques* or prompts to help guide teacher student interaction implement the *hotspots* which are visualized within the model.
 4. Utilize a clicker to help you facilitate your movements around the classroom.
 5. Allocate storage areas away from entrances and windows.
 6. Use tape to draw simple links or connections between modular table and also within the center, where the lecture/teacher will be.

Model

Please refer to Figure 3.47 and Figure 3.48

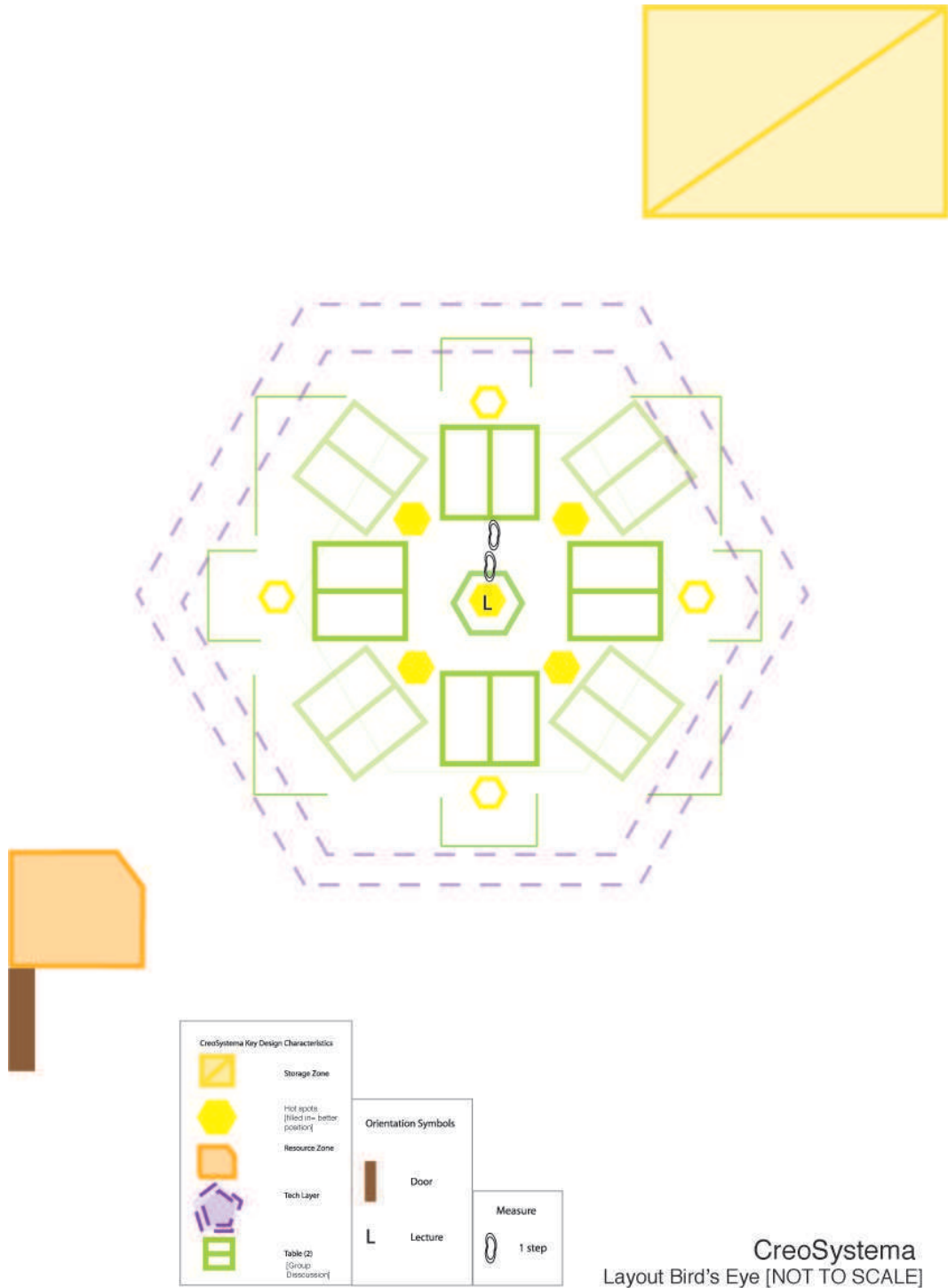


Figure 3.47: Suggested floor plan according to proposed principles. (Max 32 students)

CreoSystema
 (Alternative Layout depending on class size)

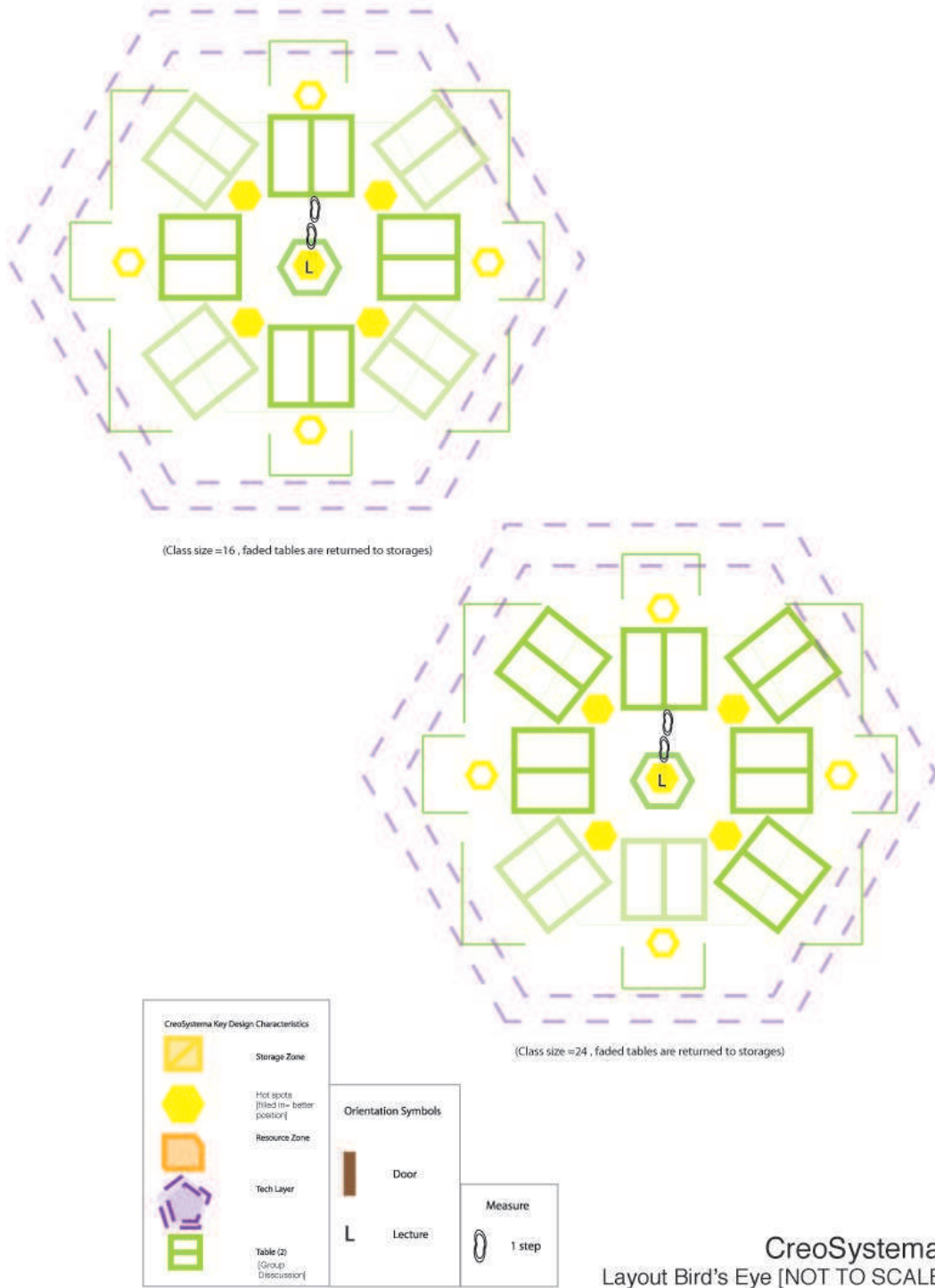


Figure 3.48: Alternative suggestion of floor plan, for less than 32 students. Again, according to proposed principles. 83

Chapter 4

Implementation



Figure 4.1: Final day of CreoSystema implementation and closing of class by the professor.

On 3 consecutive days in December 2014, during a creative contents class at Keio University's Media Design department, a test was conducted for evaluating the CreoSystema ToolKit. This research was based on qualitative methods. The University classroom at the Collaboration Complex, room CS02, was reconfigured using the Toolkit. The classroom was set according to the principles and with reference to the model. In addition, the professor was briefed on how the principles and how the CreoSystema Toolkit was visualized in the space. The classroom content consisted of storytelling, brainstorming, and ideation activities. The number of participants consisted of 22 students and 1 professor.



Figure 4.2: CreoSystema Toolkit realization.

The CreoSystema ToolKit proposes a strategy for better matching the needs of creative content and removing space barriers within a classroom through the integration of 3 principles - flexibility, ownership, and perception. CreoSystema ToolKit visualizes the principles of *flexibility of things*, *ownership of Space*, and *relative perception*. These principles were derived through a synthesis of the various fieldwork, discussed previously in chapter 3. The fieldwork observations, along with the multiple reiterations of the initial proposal, inspired the current adaptations. These visualization were communicated in chapter 3 section 3.4, where the CreoSystema Toolkit was outlined.



Figure 4.3: Storage area.



Figure 4.4: Resource center.

4.1. Evaluation Method

The CreoSystema Toolkit was implemented according to the characteristics and recommendations outlined in the kit. The concept of the CreoSystema Toolkit was carried out within a traditional lecture classroom that met the considerations and limits that were necessary to implement CreoSystema's core principles. The class content was an existing model that was developed for interactivity and engagement between students and student-teacher. The classroom once configured, according to the CreoSystema Toolkit steps, was evaluated based on qualitative research methods. This included surveys, in-depth interviews, observation, and focus group discussion. Also, in order to better understand the participants behaviours, actions, and beliefs the video cued-recall method ¹ was utilized. This method provided more opportunities to capture specific moments of action or behaviour that could later be formulated into a question for the participants. It also opened up deeper discussion and interviews with participants.

The components for evaluation consisted of (1) the overall experience of the environment, effectiveness of principles (i.e. the participants ability to maneuver, access materials, connect with teacher), (2) what kind of emotional word associates with the participants experience in the space, (3) how did the participants (i.e. students and teachers) interact and bridge barriers of space through the environment, (4) did the participants perceive a parallel connection between the environment and context. The 4 areas were evaluated through the combination of observation, surveys, focus group discussion, and in-depth interviews. These evaluation methods were all conducted on the final day of the 3-day module class, in the indicated order.

Since this research study was tested based on qualitative methods, the objectives of the evaluation was to better understand how and in what way participants behaviour could change due to the integrated principles. The data that resulted from the evaluation were textual. All surveys (total of 23) were completed and returned within the same day. Following the survey completion, a focus group discussion was facilitated to help develop preliminary understanding of the users behaviours, actions, and impressions. In addition to observations, surveys, and

¹(Costello, Muller, Amitani, and Edmonds 2005)

group discussion, in-depth interviews were also conducted. Through the interviews the interviewer was able to ask follow up questions to obtain a deeper and a more complete understanding into the participants thought process. In other words, the in-depth interviews opened up answers into identifying beliefs, values, perceptions, and overall justifications for certain behaviours and actions. The in-depth interviews also became a platform for where the video-cued recall was utilized to help stimulate the participants recall of details and rational. Samples of the questions from the interview included:

1. How would you describe your level of comfort in the CreoSystema classroom environment?
2. Did you feel more free in your interactions with the teacher, other students, and environment?
3. Did the label's communicate effectively and were you directed by them?

These questions prompted more specific questions based on the responses and answers from the interviews and surveys. For instance, (1) how did you find the height of the tables, (2) did you want storage for projects in progress and personal belongings, (3) why didn't you (the participant) utilize the extra table and chairs. In addition, these generated questions originating from the in-depth interview, overlapped with the group discussion that took place previously.

4.1.1 Evaluation Logic

The CreoSystema Toolkit is founded on intangible principles that are then translated into visual or spacial representations. Therefore, in order to assess the CreoSystema Toolkit an evaluation logic was defined as follows:

GOAL	Measurement (what)	Method (how)
Active Discussion and Engagement	<ul style="list-style-type: none"> • Interaction between students and student-teacher • Eye contact • Space Utilization 	<ul style="list-style-type: none"> • Observations • Questionnaires • Interviews

Table 4.1: Evaluation Overview

Principles	How it is visualized and observed?
Flexibility of Things	<ul style="list-style-type: none"> • Movable tables • Available Resources (Variety) • Individual navigation • Areas allocated for resources and storage • Option of 'hot spots'

Table 4.2: Evaluation Logic for Flexibility of Things principle.

Principles	How it is visualized and observed?
Ownership of Space	<ul style="list-style-type: none"> • Comfort in participation (i.e. raising hands) • Taking and using materials, self initiating interaction • Moving desks • Creating their own space • Interaction between students (both in their groups and with other groups) • Interaction between students and teachers

Table 4.3: Evaluation Logic for Ownership of Space principle.

Principles	How it is visualized and observed?
Relative Perception	<ul style="list-style-type: none"> • Communication channels with teacher • Modules (maintaining distance and interactions) • Location of teacher • Teacher and student dynamics (role exchange and discussion)

Table 4.4: Evaluation Logic for Relative Perception principle.

4.2. Context

The implementation along with the evaluation, both took place at Keio Media Design, Master's department's CS02 classroom. The original layout of the classroom had 5 rows of 10 tables. The room was equipped with 4 projectors and screens, one on all sides of the room. The room was also recently equipped with whiteboards that occupy the back wall and the long side wall opposite the windows. The chairs and tables were both movable. Prior to the class, the room was configured using the CreoSystema ToolKit, the classroom evolution checklist was referred to, then the essential characteristics were integrated with reference to the recommendations and the model included. Please refer to Figure 4.5.

4.3. Proof of Concept

Teacher Response

The overall feedback and advice from the Professor conducting the class for all 3 days was positive. The observations and responses from the survey and several interviews communicated the Professor approving remarks about CreoSystema's principles and how it was executed. The professor's opinion about the level of student engagement in traditional learning classrooms is that they "give passive expectations to both the lecturer and student". This statement coincides with the comments made at the beginning when this thesis paper was setting up the context of the research. According to the professor, the CreoSystema Toolkit was successful in highlighting behaviors that were necessary for creating a creative ecosystem within the limitations of existing classrooms. Feedback obtained, also indicated that the CreoSystema Toolkit ensured "better collaborative environment - [through] physical proximity". This comment was also echoed by follow ups about how he felt "intimate" with the students and resemble "family" like dynamics. Images in Figure 4.7, 4.8, and 4.9 illustrate observations that communicate the professor's remarks. Also, in regards to resources the professor himself acknowledged that "resource access is the key". Further discussions revealed that the element of resources availability will be more deeply considered by the professor as a permanent addition to classrooms. In addition, he frequently attributed

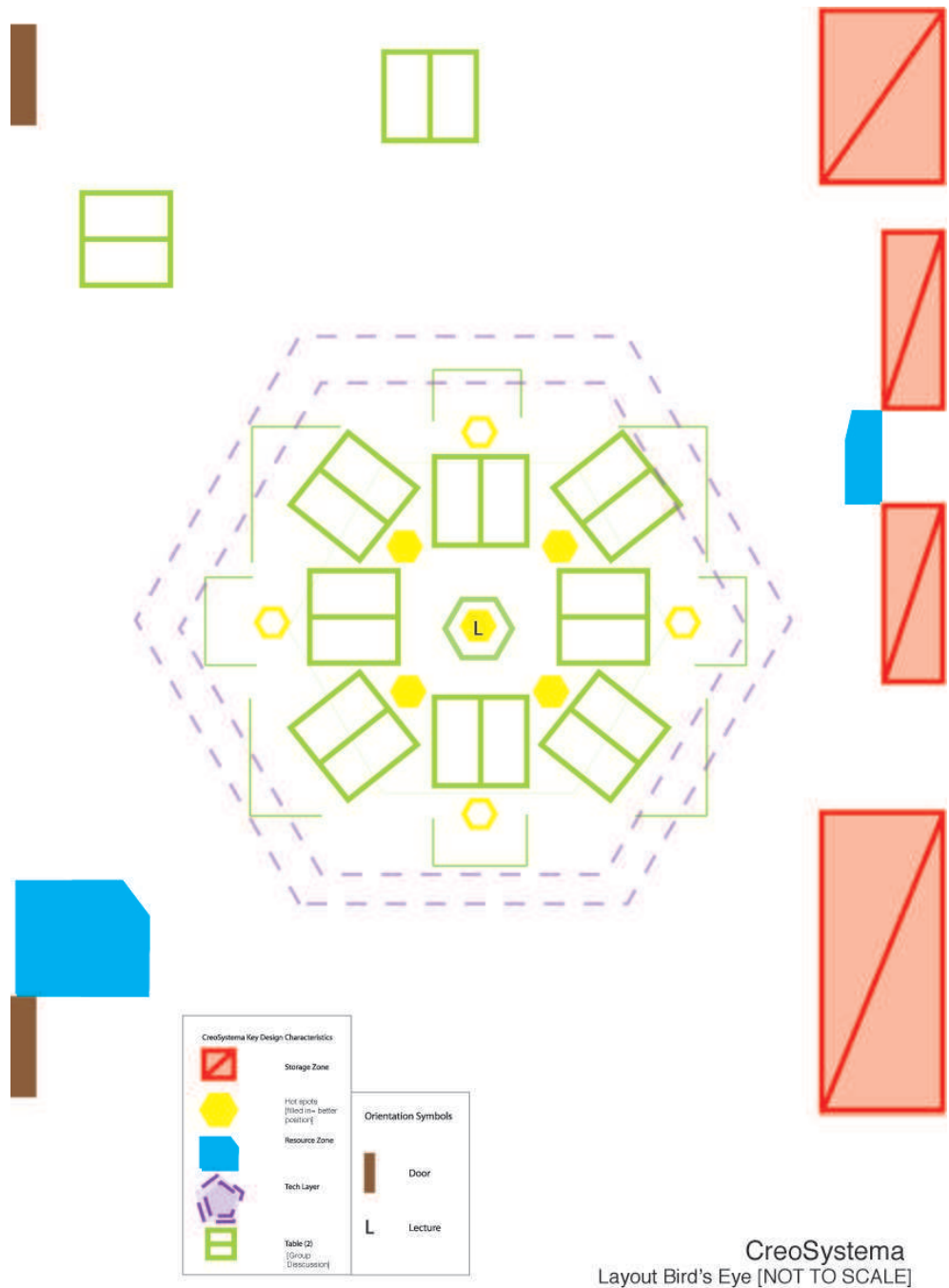


Figure 4.5: Floor plan of CreoSystema within this context.



Figure 4.6: Day 1 of CreoSystema implementation

the proximity and distance relationship to being the reason why he noticed students were more aware and demonstrated “better eye contact”.



Figure 4.7: The professor is sitting on the floor as a group is presenting.



Figure 4.8: Sharing ideas in a close group.

However, there was a one area of CreoSystema, according to the professor, that received mixed feelings - hot spots. Initially during the reconfiguration, the purpose for the hot spots was understood and positively received, however after the test the professor realized that it is a feature he didn't really need. Instead he suggested that it be a feature that can be dependent on each professor. When



Figure 4.9: Intimate, no visible hierarchy.

discussion about CreoSystema Toolkit's success in better matching the needs of his course content, the professor presented curiosity about the success rate in a traditional lecture class. It was something he would have liked to test and observe to see if CreoSystema Toolkit is flexible to various content. This comment was followed up with a remark that it was a thought, which first came to him as he was improvising how to facilitate student presentations. His solutions to engaging students to present in the new class environment resulted in what he called a 'presenters table' (Please see Figure 4.6). According to him, the presenter's table, which was an unused module table, was the best solution for groups to address the class in a more intimate way. Also, it was practical so that everyone could see without obstructions. However, what was more interesting was the professors decision to sit at the presenting groups module, as is shown in Figure 4.6 or even on the floor like Figure 4.7 presents. In either case, this behavior communicates this changing of roles and dynamic shift between teacher and student.

The professor's overall experience of the environment demonstrated the potential versatility, flexibility, and creative use. The new creative environment even provided more opportunities, as there was more available free space for spontaneity. For instance, as Figure 4.10 illustrates. In the picture the whole classroom transformed to an interactive game contest of paper airplane throwing (with man made sound affects).



Figure 4.10: Paper airplane start line.

In summary there was a positive parallel to the responses and the visualized characteristics. The only characteristic that the professor felt he could do without was the hot-spots, as he already has the natural tendency to move and walk away from the podium mental model. In addition to the hot-spots, his feedback also suggested to further test into more traditional lectures, so that the CreoSystema Toolkit could evolve to being effective despite content.

Student Responses

The student responses to CreoSystema reflected an overall interest and desire for the new configuration and principles. All students were able to engage and interact effectively. In addition to the questionnaires conducted, the focus group discussion and in-depth interview opened up the responses further. This provided more detail on the mental models and reasoning to certain behaviours or actions.

A brief analysis of the questionnaires indicated that 4 key words and phrases resonated “inspired”, “teamwork”, “most suitable for creative work”, and “practical classroom, everyone share ideas no... right or no... wrong”. These words encompass a lot of the topics of dialogue for the survey and interviews. As for the element of resources, feedback indicated that the resources made it: (1) “easy to express... thoughts”, (2) possible for “processing the discussion as well as brain storming”, (3) “easier for others to understand your ideas”, (4) “you can express

CreoSystema	Traditional
Interactive	Passive
Communication	Private
Collaboration	Single Direction
Practical study	Textbook
Innovative	Rules
Studio Classroom	Normal

Table 4.5: Word Associations to CreoSystema classroom and Traditional classroom

your ideas however you want”. 20 out of the 22 students shared sentiments along these lines. One of the two explained why they did not share the same thoughts and indicated that it was because the area or access point was the issue that instead if “the materials were separated in a different way ... students wont dig in the same place and crowed the area”. The element of perception and its relationship to engagement, students said that they felt more involved in the class. Responses from both the survey and follow up focus group discussion, revealed 21 out of the 22 students recognize that the proximity to the teacher and other students dictated their engagement (Figure 4.1). Some interesting responses from the students included: “I couldn’t open Facebook”, “no more hierarchy relationship between teacher and student”, “less of a disconnect”, and “a change to learn also from other students”. In other words, demonstrating the CreoSystema Toolkit’s success of achieving the aimed behavior and experience. Moreover, when asked to associate one word to describe the new classroom environment versus the traditional classroom, many interesting word associations were made. Table 4.5 illustrate only a few of the comparisons. (For more please see Appendix)

The characteristic of lecturer in the center, and ownership of space, were both integrations that effectively succeeded in supporting the creative ecosystem. The questionnaires and discussion indicated that having the lecturer in the middle broke the perceptual barrier of hierarchy. The students felt the dynamic was different and that the change was noticeable in the ability to engage eye contact and participate in the class. As for ownership of space, students mentioned that the layout and overall integration of principles allowed them to feel free to just “do”. Some students even stated that they felt the layout gave them freedom

“both physically and psychologically” to interact and collaborate with others. Also, for instance throughout the class many groups utilized different areas of the class to talk and discuss. One group in particular expanded their territory off their desk surface area to taking up floor space next to their table and the extra modular group added to the back of the class (Please refer to Figure 4.11 and Figure 4.13). When asked what prompted them to do so and how they felt, their responses were “why not, the space is there so we used it, unlike most of the time”. Members of this group and 2 others (approx.. 12) added that “this class is even useful out side of the scheduled class time. . . and we use it in the evening as well”. In other words, the utilization of CreoSystema Toolkit provided an added value to the environment that was valuable for use for more then just during class but other times where groups what to collaborate or have a place to work.



Figure 4.11: Territorial expansion.

On the other hand, some students revealed during discussion that maybe this implementation might not work in a typical lecture format. Also, 1 group brought up that on the final day they felt a little disconnected. More specifically, they stated that they felt more out of the ‘group’. After closer examination it was discovered that their module had shifted out more, over the course of the 3 days. This further indicated that distance and spacing are sensitive in order to experience inclusion and engagement.



Figure 4.12: Expanding to use floor space.



Figure 4.13: Territorial expansion.

The overall observation of the various interactions and forms of discussion that took place in the classroom illustrated a consistent sense of fluidity of exchanges between students and the students-teacher. Also, no matter how the groups liked to discuss, brainstorm, ideate, or develop, the environment was adaptive to their needs. They could change it as they please or define new areas.



Figure 4.14: Creosystema environment realized without students



Figure 4.15: Creosystema environment realized without students

Other general observations of Creosystema's implementation highlighted that there needs to be consideration of personal items. During some instances personal

belongings (i.e. backpacks and jackets) became an obstacle. Moreover, there were several remarks and observed instances where the height of the table became an issue. However, since the concept is founded on working within the limits of the classroom equipment, it was not a factor that was evaluated. Nevertheless, it is an observation that was valuable in understanding the importance of comfort.

Chapter 5

Conclusion

5.1. Conclusion

The aim of this research study was to illustrate CreoSystema's ability to re-boost existing learning environments and provide a classroom that it is better suited for creative content (i.e. group-work, brainstorming, ideation, etc.). CreoSystema produces a creative ecosystem that has been observed to encourage interaction and engagement between students, teachers, and space. This dynamic of considering space and the powerful influence the environment has is at the core bases of this research. The classroom, or rather educational institutions for that matter, are environments inhabited by people for a large majority of their lives.

The in-depth fieldwork into various creative learning environments was instrumental in identifying the 3 foundational principles of the CreoSystema Toolkit. These principles, within the constraints of existing educational spaces has re-strategized the interactivity and creativity that can take place in previously traditional learning classrooms. The CreoSystema Toolkit was able to match the environment experience to the creative content. It also broke perceptive barriers within the classroom. Students were able to engage in classroom discussion and actively participate in the learning experience. Results from the qualitative method indicated a consensus that both stakeholders felt intimately engaged in active discussion. The CreoSystema Toolkit was able to realize an environment that meets the needs of a creative content class. In addition, throughout the classroom interactions, the CreoSystema Toolkit was able to break perceptual barriers and

produce meaningful discussion and student engagement.

Through CreoSystema, exiting Universities have the opportunity to potentially redefine the space ecosystem within the classrooms. Ultimately, providing a more interactive and engaging experience for students. The CreoSystema ToolKit empowers teachers/lecturers/professors/facilitators with an environment that can liberate students to be more creative. It achieves this by first allowing teachers to understand their environment, what CreoSystema proposes, then inspires them on how they can adapt the fundamentals into their own environments and finally, create an improved interactive dynamic in the classroom. Thus, engaging more students and breaking the barriers of space and discontinuity between space and content.

However, not only does the toolkit achieve its goal, it also brings awareness to the influential power and value the environment has on people. While it is a key factor recognized for altering individual behaviour and experience in other sectors of society, it has for far too long been forgotten in the context of learning. Now, more than ever, as the need and demand for creative skills increases, consideration for how space and external environment can stimulate and support emotions of freedom and exploration is very important. An environment that encourages these emotions gives way to behaviours that develop and reignite creativity within people.

5.2. Future Work

While CreoSystema has achieved much of what it has set out to, it is still very much an evolving framework. Next steps for the development of the CreoSystema Toolkit, in the short term, is to integrate and implement in a more diverse range of classroom environment types and content formats. This will help identify the flexibility and adaptability of the toolkit. Also, while implementing into these new fields there is an opportunity to explore resource material variety expansion. Furthermore, exploration into these areas will provide an opportunity to initiate research into how the integration of color and personal storage spaces can better improve the flexibility and experience of the learning environment. Color has links to perception, therefore the incorporation of color could potentially support

stimulating the mind and emotions. Meanwhile, integration of personal storage compartments can free up floor space.

Next, the creation of a community of teachers who have adopted and adapted its core principles, can spread and expand the reach of the CreoSystema Toolkit. The development of an online community will connect the spaces together and foster collaboration across different learning environments. This community will also represent a database where educators can share their adaptations of the principles and get inspired by others.

Another area of future development is exploring ways to grow the maximum size of the student capacity for the suggested model. Further tests and exploration needs to go into how the model can be adapted to include more students without affecting the harmony of the 3 foundation principles. The main behaviour that the research needs to be mindful of is how to motivate teachers to move more dynamically when there are more modules of students. Inspiration for this can be derived from a look into biomimicry (i.e. looking to nature for strategies and sustainable solutions relating to movement and interaction), in combination with more involvement from students towards creating their own experience in the learning environment.

“Creativity in education is as important as literacy in education, and as we should treat it with the same status. ” - Ken Robinson

Acknowledgements

b-ismi-llahi r-rahmani r-rahimi

“In the name of God, the Most Gracious, the Most Merciful”

At home education and the desire to seek out knowledge has always been encouraged by my parents. For my parents, who grew up in rural Ethiopia, growing up had its challenges. For one, they both were unable to complete high school and pursue higher education. Their dream from then on was for their children to have the opportunities they did not have. Their belief is why I am so lucky to be able to receive an education. My parents always said, “Knowledge and education are powerful tools to help you change the world”. These are words I hold dear to me and are what motivate me to chase after my dreams. I want to use my education and knowledge to shape a better world. So, to my dearest parents, thank you. Thank you for all your love, support and prayers, I am grateful to God to be you daughter. Alhamdulillah.

To my sister and brother, I am lucky to have siblings like you. Just like mommy and daddy supported me, I will always be on your side. I love you and believe that both of you can achieve anything you set your mind on. May God always protect you.

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Until our paths cross again, thank you all once again for being a part of my family.

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Appendix

A. Student Questionnaire Summaries

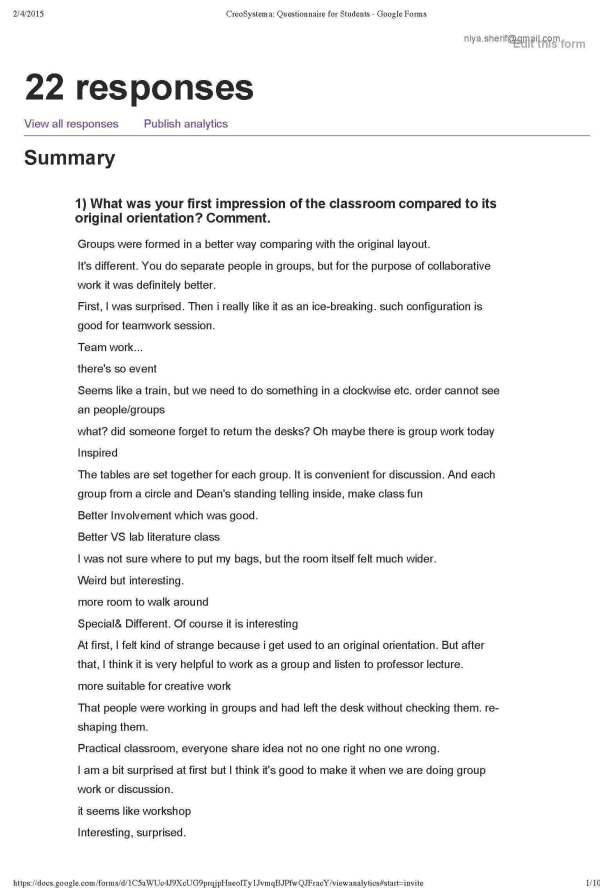
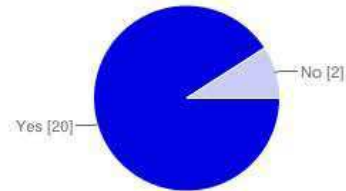


Figure 5.1: Student Page 1 summary

2) Was having access to various resources helpful for you?

Yes	20	91%
No	2	9%

Reason for your Answer:

Different resources processing the discussion as well as brain storming.

Know where to find what I want.

Easy to express our thoughts.

You can express your ideas however you want.

-

I'd think it would be easier to have it in the middle way, he also separate the material in a different way so students won't just dig in at the same place and crowd the area.

It is very helpful when I need something and I can find it inside the classroom.

Accessible, convenient

Easier for others to understand your ideas.

easy to start working

It was interesting to have a more interactive lecture than just powerpoint slides.

I have no pen.

For paper prototype. It is important to get access to resource center in a class distance.

helps thinking with hand

It stimulated me to do something. I almost felt compelled to.

I don't really need this much resources for this class

I used some resources, no need to go else to take it.

Better and more ways to express the idea

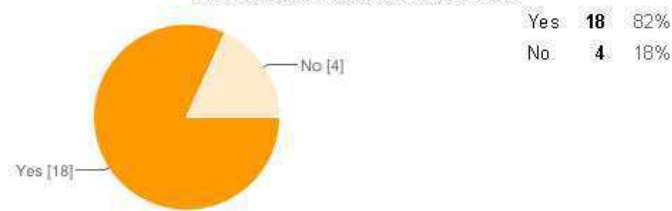
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I can take any resources I want to use. It is so convenience.

we would use materials for these 3 days anyway so it was fine for me

3) Did access to the resources in the resource center help you better communicate and share your ideas?

Figure 5.2: Student Page 2 summary



Reason for your Answer:

We can share our idea by not just drawing but another techniques.

It does but it can get crowded in the area, spare time checking where is what, maybe divide them into two/three categories.

Make the talking and items space become separat.

-

Same as above. It helped illustrate our ideas.

As said before, such huge variety help me to do more and boosted my creativity. It was easier to show something with a prototype.

same as 2)

Marker of different colors are very useful.

I talked with another teammates.

Given does not help on the communication part that much

We can show whatever we think and idea easily.

we need stickers!

We usually shared ideas there what kind of resources that we are going to use.

Same as above

It's easier to communicate with images.

Better access for resources, processed the discussion.

[blank]

"save as above."

Especially for a design school. I think it is important to visualize your ideas through other mediums.

easier to get resource, save time/ effort

4) Is there a resource you wished you had, if so what is it?

no

ribbons color stickers etc

no, it is enough.

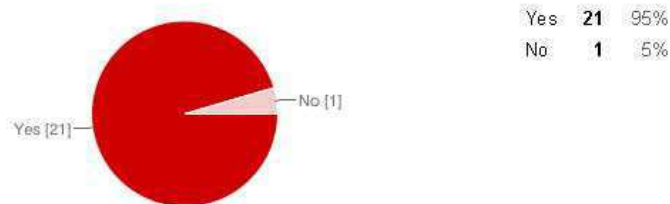
-

No.

Figure 5.3: Student Page 3 summary

personal presentation monitor
 Possibly instant camera (Cheap one)
 I was quite satisfied with the working ambiance.
 No.
 Trigger paper cups and any kind of balls
 Snack, beverage, coffee
 App interface template (PICTURE) Like this
 Yes, I want to have color pet set seriously.
 No, for this class this was fine!
 Nope, paper and color pen is enough.
 Color pencils, COPICS
 Pencil+eraser at least didn't find them good for initial sketch
 perfect now

5) Did you feel engaged with the teacher and other students due to the layout design and consideration of distance and proximity?



Reason for your Answer:

I couldn't open the facebook.
 We form a circle. it is a great idea for each student to engage.
 i feel engaged
 It is no longer hierarchy relationship between teacher and student.
 Teacher always give a guidance for students and he give us a chance to learn from other students in class.
 -closer to each other - can express and understand easily
 Should be like this in all workshop class as well as presentation class.
 Closer together. There is less of a disconnect. Normally it is really easy to get distracted. This layout also stimulated more communication.
 I think it's good layout to create a circle in the middle and let Prof. to be in the center of the students.
 We can talked, shared ideas, made something I means group work together easily with this layout. I am also concentrate to lecture
 But only inside my group

Figure 5.4: Student Page 4 summary

kind of sitting w/ group may give me a better sense of "team"

In a several way, Yes. But there are still some desk put it the behind which are for far from the front.

closer proximity

Such layout also stimulated me to be more obedient. it is harder to do something (as using smartphone) when prof is near and having eye contact with me.

More interaction, Easy to talk

Sitting in groups and circle form helps.

It feels like the professor is personally engaging you so you can't be distracted by the internet etc.

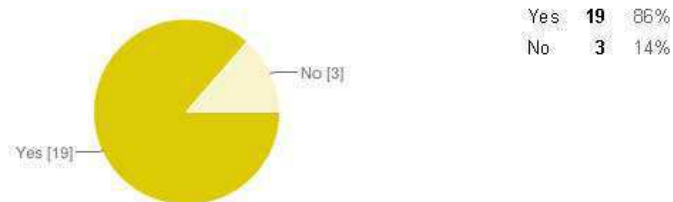
Had to turn around a bit too much.

Nice for group discussion/working. If the teacher/lecturer stand in the middle, it is also an interesting lecture experience.

[blank]

You feel much closer to the teacher, who more extensively, thus forcing you to follow him more.

6) Did you feel like the space (ex. layout and resources) gave you more freedom to interact and collaborate with other students?



Reason for your Answer:

Yes, Everything is perfect (resource and layout) I fell like come to a fun space not a classroom where it is full of inspiration.

-

we were very active as well

We have more space to move and share our ideas/ prototype/ gossip with friends.

...but only with kay group

Same as 5

Same as 7

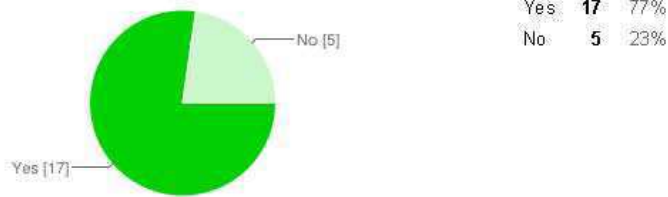
This layout gave me more space than an ordinary one and can go to talk with another students in another group.

The configuration makes the class more dynamic. I don't need to twist my neck to see or talk to to someone.

Figure 5.5: Student Page 5 summary

It was a bit crowded to move around.
 Closer to each other.
 Because we faced each others and used resources to make it more clearer when we shared ideas.
 I like that there is a big space in the middle of the class. we can move between groups/people more easily.
 Both physically and psychologically
 Easy to work around and find everything you need.
 The space is wide. we can do anything freely.
 Same as above
 No tables to obstruct my movements
 I could ask to other team member easily
 [blank]
 we have been interacting from pipeline 1

7) Did you feel more apart of the class and engaged with the teacher in the center?



Reason for your Answer:

Distance/Approximately
 I can concentrate to lecture more than simple layout.
 Cause no time to play with my phone...and computer.
 A lot of session with moving around.
 i am always engaged in class
 neutral
 -
 Teacher in the center was good.
 I usually sit on the front, so perception changed just slightly, but I felt that.
 -
 Everyone has to participate in his workshop
 Same as 5
 The teacher is closer

Figure 5.6: Student Page 6 summary

Everyone is facing inwards and the teacher is talking directly with the students.
 Again, it is closer. It is easier to have eye contact, or ask a quick question while the teacher is walking around.
 It's easier to keep eye contact with professor and the distance between me & prof. are shorten by this layout.
 For reasons stated in question 2 and 5
 [blank]
 I like it

8) Did you like the cluster of desks in modules around the teacher, with floor space around available for other interactions?



Reason for your Answer:

I feel like we can even get rid of all desk and chairs and just sit on the floor.
 More interaction and fun
 -
 It does but maybe a bit more space.
 Good for presenting
 It depends. Sometimes we need to turn around to see the slide by a better more clear projector.
 forces interaction
 I think it makes a lot of sense to add more space to a room. otherwise, it is easy for student to disengage from a class or other students by creating their own individual space within a classroom.
 I could concentrate well
 honestly it does not make that much differences. we move tables around if we want to during ordinary classes.
 Good way to crate a classroom to get more attention from the students.
 I wish classroom could stay this way during every pipeline class
 Thinking when we are doing in same task, we can moved freedom to help and finish it.
 sometimes it hard to keep following the teacher
 It's easy to work with other group members and we can share our opinion easily.

Figure 5.7: Student Page 7 summary

[blank]

Same as above.

I simply liked the solar system thing. It seemed that inakage-sensei was irradiating knowledge.

9) If you were to associate this new classroom environment with one word, what would it be? And what word would you use to describe a traditional classroom?

New: Interactive Traditional: passive

New: communication Traditional: Private

new = clusters traditional = grid

NEW: Train Traditional: sphere

New: Engaged Traditional: Seperated

New: Horovod (russian dance) Traditional: Prison

New: Communication Traditional: old-fashioned

new = team traditional = easy

New:Brainstorm classroom Traditional: Normal class

New: Fantastic Traditional: Normal

New: New Traditional : Old

new = visually relaxing traditional = a classroom

New: Fun Traditional: Boring

New: Dinner show Traditional: Grid

New: Groupwork Traditional: Boring

New Involvement Traditional: Old-fashion

New: Active Traditional: boring

New: Studio classroom Traditional: Normal

[blank]

new = innovative traditional = rules

New: Collaboration Traditional: Single-direction

New: Practical study Traditional: Textbook

Reason for your Answer:

New classroom makes me feel like going back to kindergarten which is fun.

-

I want to drink wine and beer with the new classroom setup.

The environment or design forces the students (in a good way) to do something.

stop asking this stupid question

I think it is self-explanatory. The new layout stimulates interaction, whereas the old one is for traditional listening classes.

Figure 5.8: Student Page 8 summary

The shape remind of a train/carriages going in circle
 New way of thinking it is better than ordinary one.
 Because the new one would be use for group work
 I feel engage with new classroom environment that everyone must share their opinion
 and be active no boring classroom to learn from only lecture and read many
 textbooks without understand what am I doing?
 New environment is better for communication.
 More interaction between ppl engaged in this classroom.
 placing of tables
 The set up of the desk idea for groups/ teamwork. Traditional set ups evoke "boring
 lecture" feelings.
 It's new
 [blank]

10) What are your overall perceptions of the experience of the new classroom?

Very positive. If I would every be a professor, I plan to use this layout.
 I think it is very smart and fun use of space. I wonder i it would work outside of non-
 interactive classes--> would be interested to see the result!
 Increase communication. Decrease Distant.
 I like it I think it make for group work
 for me. I like to sit together as a group when doing teamwork like pipeline 2. but I
 would still prefer regular layout if there's lecture. Too much other distracting things.
 Great!
 It is a very nice layout. Suitable for discussion an activities of lecture!
 I felt like I am in the design studio that I used to work in my country. And I think it will
 inspire student a lot.
 Better in all senses. My behavior changed abruptly for good. Yesterday, a (during the
 afternoon) professor changed the configuration to the traditional one and I was
 another student less focused.
 i feel more engaged within the class and more engaged in teamwork. I don't know if
 you noticed but the teams seem to sit in the same table for 3 days
 Just a new layout, no choice/need to adapt, we were not suggested to move around?
 Better then most of past class.
 relaxed
 Positive. It may depend on the topic, though. Since we had to work in groups now
 anyway this was great, but it might not work for every class.
 I like this layout.
 Great for workshop
 May help for group activities.

Figure 5.9: Student Page 9 summary

adds more value to space encourages group work makes students/teachers more active

I really like this classroom. More inspiration here in classroom. We learn not only from teacher but also from classmates.

I like this layout but only one problem: Some of the tables looked a little bit away from the circle so that you feel like you are not in the process or just practically.

I like it. and it is fun and interesting.

it gives me a chance to engage and participate with the group.

Number of daily responses

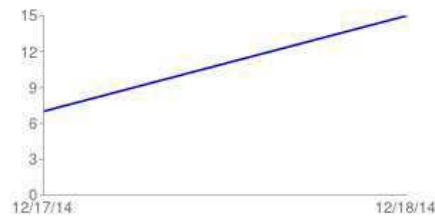
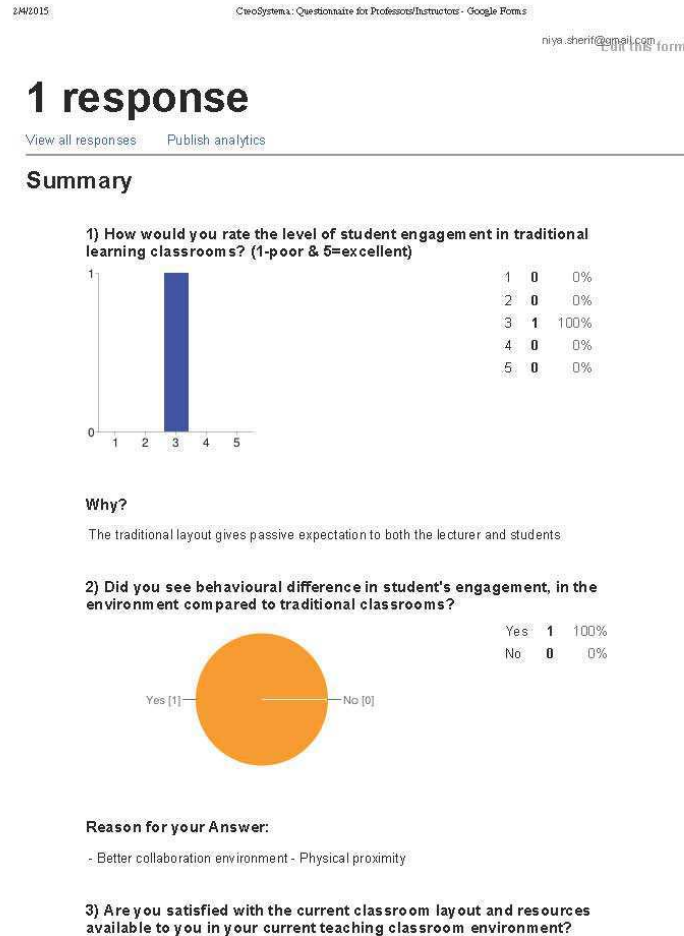


Figure 5.10: Student Page 10 summary

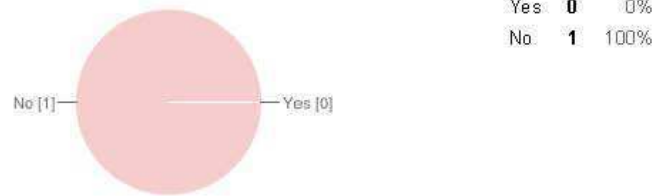
B. Teacher Questionnaire Summary



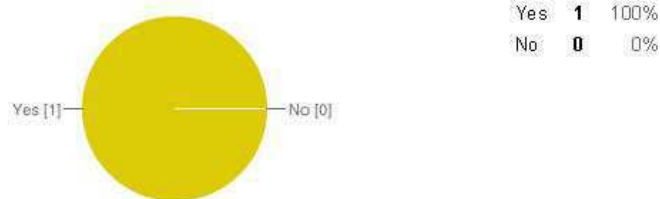
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1/4

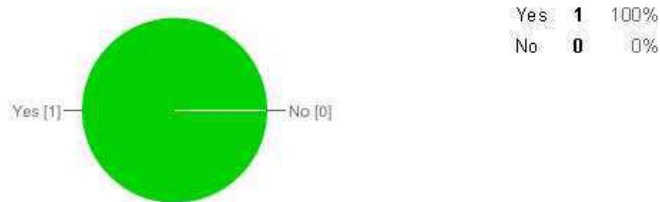
Figure 5.11: Teacher Page 1 summary

**Reason for your Answer:**

I always try different layouts to increase student's participations.

4) Would you like a new layout for the typical classroom you teach in regularly?**Reason for your Answer:**

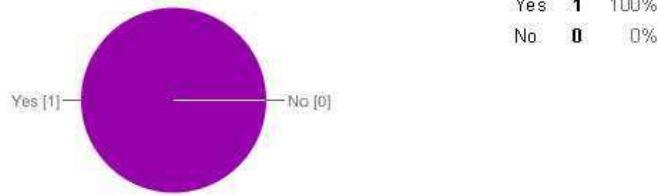
More suitable for workshop.

5) Do you like the access and availability of resources being in the classroom at all times?**Reason for your Answer:**

Resource access is the key.

6) Do you believe the layout, specifically the consideration of distance and proximity, helped encourage a better social interaction than you would witness in typical traditional classrooms?

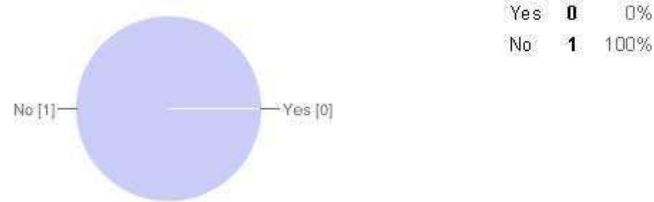
Figure 5.12: Teacher Page 2 summary



Reason for your Answer:

Better eye contacts

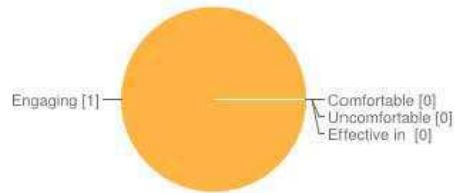
7) Did you find the "hot spot" (yellow hexagons) in the classroom as good navigation tool for acquiring a good location to engage the class?



Reason for your Answer:

You naturally approach regardless of the work

8) How did you find conducting your lecture and facilitating discussion from the center of the classroom?



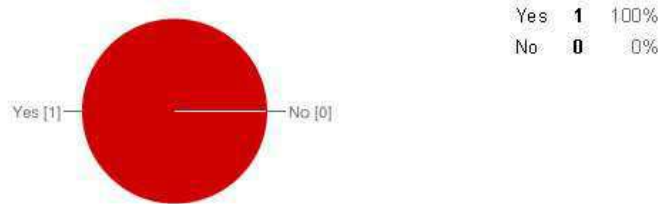
Comfortable	0	0%
Engaging	1	100%
Uncomfortable	0	0%
Effective in connecting with students	0	0%

Reason for your Answer:

Figure 5.13: Teacher Page 3 summary

likely ambiance

9) Did you find the energy and dynamic of the class better than in a traditional classroom setting?



Reason for your Answer:

Students participation

10) If you have any other comments with regards to overall experience or recommendations for future improvements feel free to share below.

A bit challenging to conduct "lectures"

Number of daily responses

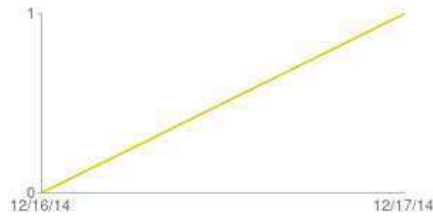


Figure 5.14: Teacher Page 4 summary