Immersive Learningscape 2.0-
A Pattern Language for the design of the Learning Revolution Environments

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"The dogmas of the quiet past are inadequate to the stormy present. The occasion is piled high with difficulty, and we must rise with the occasion. As our case is new, so we must think anew, and act anew. We must disenthrall ourselves, and then we shall save our country"

Abraham Lincoln –
Annual Message to Congress -Concluding Remarks, Washington, D.C., December 1, 1862

As we proceed into the Learning Revolution Age, how are we to provide an education to our children that adequately prepares them for the uncertainty of future needs? How are we to design environments that address the evolving methods by which students acquire knowledge? And how are we to design those spaces to effectively support a changing paradigm that emphasizes collaborative, active, inquisitive, self-driven, and trans-disciplinary learning?

The *Immersive Learningscape* is a concept that **integrates** 4 key challenges to today's education (multiple modalities of learning, new technologies, customization of education, and the teaching and learning of 21st century skills) into a flexible, adaptable, active, and engaging learning environment. The *Immersive Learningscape* is designed as a landscape of various learning environments that address what we see as 5 typologies of learning: Think, Create, Discover, Impart, and Exchange. Each of these typologies requires very specific needs (space, technologies, furniture, acoustics, etc...) in order to be effective for today's students' learning process. The main goal of the concept is to respond to the needs of our future leaders: encourage and facilitate teamwork, interdisciplinary learning and research, communication skills, critical thinking skills, problem solving, creative thinking, technology skills, and the passion for learning.

As a follow up to the original Immersive Learningscape article, published on volume 45, issues 1&2 of the CEFPI's *Educational Facility Planner*, this article will expand on three main questions asked by the audience: first, why the Immersive Learningscape, and why now?; second, how do you design and what are the characteristics of an Immersive Learningscape?; and third, has the concept been implemented?

Addressing the first question, this article will briefly introduce 10 factors that have led us smack into the middle of a Learning Revolution; second, this article will introduce a pattern language for designing an Immersive Learningscape. This 'language' is characterized by, first, the patterns necessary for the environment to support, encourage, and facilitate a future-focused education, and, second, by the creation of 5 kinds of spaces that address the 5 typologies of learning. Third, this article will present a case study of the Classroom of Tomorrow at Sarasota County Schools in Florida. That project has blended the concept of the Immersive Learningscape, with a new curriculum design, and an implementation team that has created a very successful model for education.

Why the Immersive Learningscape and why now?

Education has become one of the most stressed topics of attention in the last few years. Various indicators have accelerated this attention: from the awareness of a global competitive world in which we now live in[1] , to the exorbitantly rising cost of higher education (1120% since 1978)[2], to the explosion of digitals tool for learning [over 500 educational technology companies ranging from hardware to software and everything in between, exhibited during this years' Florida Educators Technology Conference (FETC 2013)][3], to the understanding of the urgency to improve to be competitive globally – it is a National Security Issue" [4],we are in the midst of a fast evolving Learning Revolution Age.

Here are 10 factors are supporting this Revolution:

1. The skyrocketing demand and supply for **technology in learning**.
   In the 2013 FETC conference I attended, the showroom highlighted hundreds of booths of technology companies that are involved in education, but most importantly, it highlighted the tremendous change that is coming to education over the next few years. One-to-one tools, haptic screens, share technologies, collaborative software, student management systems, real-time assessment tools, adaptive instruction software, classroom management systems, and countless other technologies are transforming the learning process the way we know it.

2. The quickly evolving research and learning about **the brain**.
   "Scientists have learned more about the brain in the last 10 years than in all previous centuries because of the accelerating pace of research in neurological and behavioral science and the development of new research techniques." [5] We are finally starting to seriously consider in our learning methodologies what we have known for many years: that not 2 students learn alike.

3. **Customization of education**.
   The combination of understanding our brains better and having the available technologies is allowing us to differentiate education based on the child's *best* learning methodology and their pace: the power of 1.

4. **Active Learning**
   Learning by doing rather than learning by listening is becoming more and more the norm in schools, and that is being accentuated by the rise of STEM (and STEAM) education , which requires a much more hands-on approach to learning by tinkering and creating. A great example is Ormondale Elementary School's approach to education which is highlighted in their philosophy statement: *"This approach would address students not as receivers of information, but as shapers of knowledge"[6]*

5. **Industrial Age vs. Conceptual Age**
   If education in the 20th Century highlighted mechanization & sequentiality, in the 21st Century it is being characterized by instant access to Information and simultaneity of thinking[7]. As we enter the 'Conceptual Age" as proposed by Daniel Pink in his book 'A whole new Mind' [8]and beautifully diagrammed in the drawing below, how are we to rethink our education to raise creative, problem-solving, critical thinkers? What changes need to occur in curriculum design, scheduling, and methodology of teaching and learning to prepare students for an uncertain future?
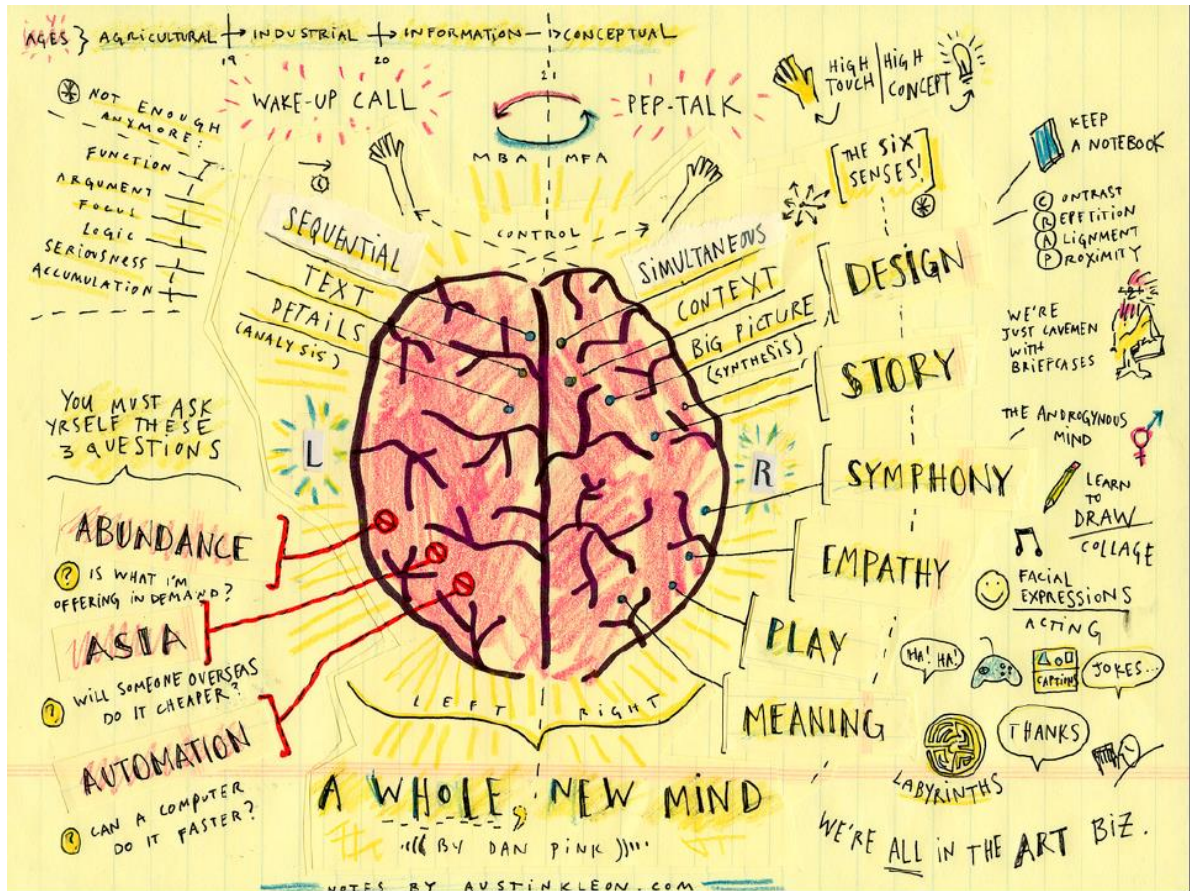
Diagram of A whole new Mind, by Austin Kleon

6. Interdisciplinary Learning

If the 20th Century education could be described as Linear Learning Methodology (1 isolated discipline per hour), learning in the future has to shift to a Transdisciplinary Learning (Multiple disciplines simultaneously). In "The Transdisciplinary Evolution of Learning", Nicolescu argues that we ought to provide our students with the time, the space, and the methods to understand our world trans-disciplinarily[9]. That requires rethinking the curriculum and the class schedule.

7. Relevance

It is imperative that we approach learning as a philosophy of "Learn here, apply there". Learning ought to be experiential, or as Ben Johnson stated: *"The problem solving process cannot be taught; it has to be experienced"[10]*. Application of knowledge, what to do with the knowledge, is the differentiator as acquisition of knowledge will no longer be the challenge for the 7 plus billion inhabitants in the world.

8. The redefinition of the role of the teacher… and the student.

Lack of engagement has been cited by both teachers[11] and students[12] as the mayor reason for giving up learning, boredom, and irrelevance. There is a huge disconnect between how teaching happens in the classroom, and how students would like learning to happen in the classroom. Increased engagement has to be one of the priorities in the reshaping of our educational system.

9. **The redesign of the curriculum.**
   If we are to lead in a world where the best ideas flourish and the complex global challenges of our future can be solved, a holistic approach to thinking, learning, and problem solving has to be adapted at schools, and visualizing the future has to be part of the equation. Are we learning for the past, or should we be learning for the future?   If we look at the following 2 articles, "10 jobs that did not exist 10 years ago"[13] and "8 New Jobs People Will Have In 2025"[14], it quickly becomes evident that teaching knowledge (when it is so readily available and at your fingertips anytime, anywhere) may be an inadequate use of our students' time, and that teaching thinking, doing, creativity, collaboration, communication skills, finding, summarizing, and editing information, and learning processes, maybe a much more effective way of preparing our students for the uncertain future.

10. **The redefinition of the learning environment.**
    Planners, designers, architects, and educators are trying to rethink what the learning environment should be like to address learning in this new revolution. The physical environment has the potential to inspire, encourage and facilitate the learning process, or on the other hand, hinder learning. The Immersive Learningscape is an attempt to answer that question. The next section will describe how and what makes the Immersive Learningscape a unique experience

A pattern Language for designing an Immersive Learningscape

The Immersive Learningscape squarely addresses all the issues presented above under a reshaped student and teacher user experience, one that facilitates learning for the future. Inspired by the work of Christopher Alexander "A Pattern Language", the characteristics of this new learning environment, or landscape of learning moments, are identified in the following 8 patterns that create a roadmap for its implementation:

1. **Pattern 1. Sketch-Scape.** *Crosspollination of Ideas*
   Learning Institutions should use the whole learning environment as a repository of brainstormed ideas. When thoughts are recorded and visible and available to all, there is a much higher probability that information will consciously and unconsciously influence the spark of an idea, or the tangentially influence the development of a started thought. The D-School at Stanford University (see below) is a great example of this strategy. Amid the chaos of writing on whiteboards, floors and sticky notes, a person walking on that environment has the chance to run into a clue that may trigger the beginning of a solution to a challenge. As Steven Johnson said "chance favors the prepared mind"[15]

Stanford University's D.School

2. **Pattern 2. Transparency.** *Knowledge Sharing.*

Transparency is the perfect strategy to energize a learning environment into a truly idea-sharing environment. It creates a sense of accountability, collaboration, and a mindset for trans-disciplinary thinking and sharing. A similar philosophy drives learning and sharing of work and ideas at High Tech High in San Diego. Director, Larry Rosenstock beautifully describes the role of space and transparency in the first person in this video:
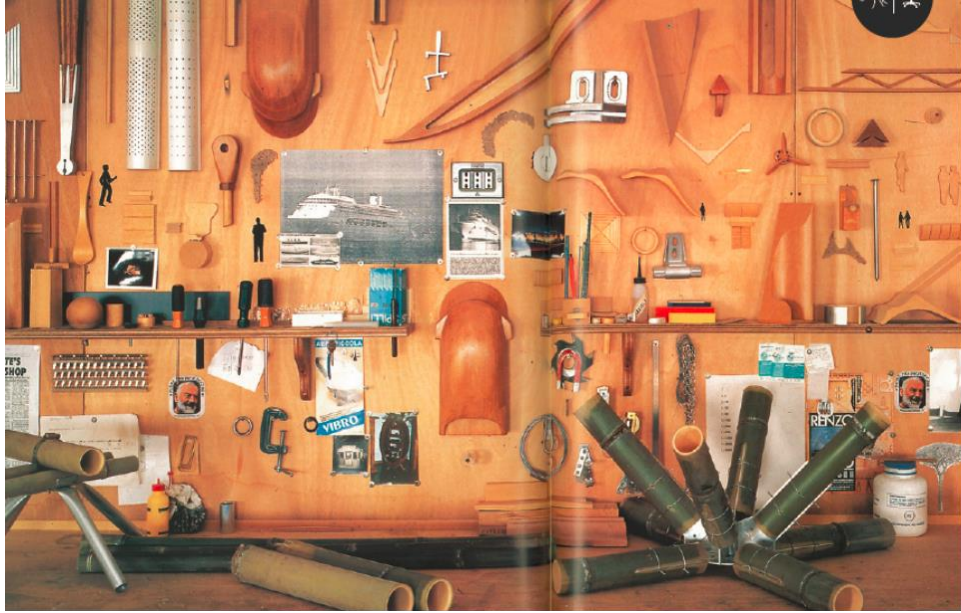http://www.youtube.com/watch?v=xfP53Alnbhk&feature=player_embedded (min. 7.12- 9.39)
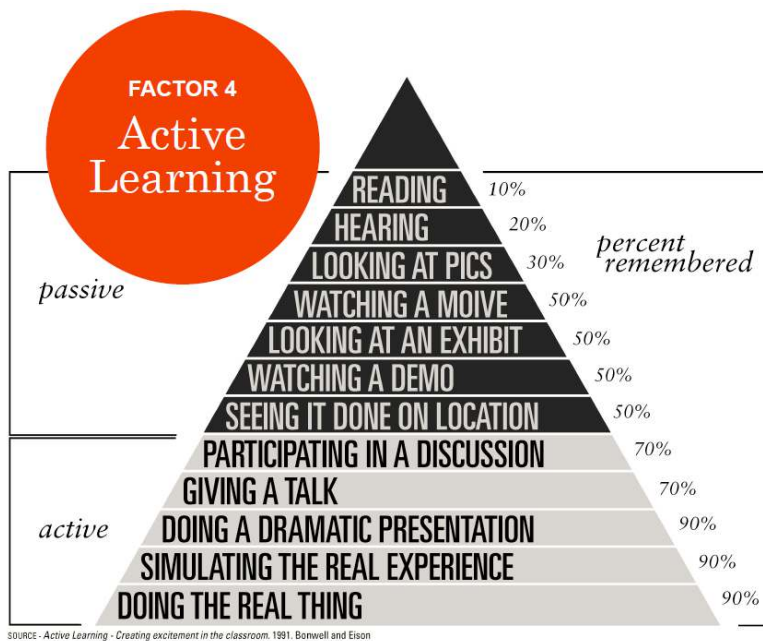

Janelia Farms Research Lab

High Tech High School

3. **Pattern 3. Tinkering Space. Creativity**
Another critical pattern of an Immersive Learningscape is the creation an active and creative experience, a place that encourages tinkering, manipulation of materials, hands on experiments, and technology-infused experimentation, such as Lego labs. The more active learning is, the more students are engaged. The more they are engaged, the more they will retain.

Renzo Piano Workshop

FACTOR 4
Active Learning

passive

READING	10%
HEARING	20%
LOOKING AT PICS	30%
WATCHING A MOIVE	50%
LOOKING AT AN EXHIBIT	50%
WATCHING A DEMO	50%
SEEING IT DONE ON LOCATION	50%

percent remembered

active

PARTICIPATING IN A DISCUSSION	70%
GIVING A TALK	70%
DOING A DRAMATIC PRESENTATION	90%
SIMULATING THE REAL EXPERIENCE	90%
DOING THE REAL THING	90%

SOURCE - *Active Learning - Creating excitement in the classroom.* 1991. Bonwell and Eison

4. **Pattern 4. Immersive Space. Connecting the dots**
   Kids want to learn by doing the real thing, visiting a real place, and in-situ, having the full experience of an adventure. The image below of the manufacturing of the Boeing 787 Dreamliner is the perfect example of an Immersive environment. Designers, engineers, parts, assembly, and all the other individuals in charge of creating the plane, are all in the same space for one reason: to create an amazing flying machine. Each and every one of those workers understands the relevance of their job, small as it may seem, in relationship to the 'big picture'. They understand the relevance of their job, and how their dot connects to the rest of the dots to create a 'whole'. Schools should replicate this model.

Boeing 787 Dreamliner Manufacturing Hangar

5. **Pattern 5. Unifying Space. Collaboration**
   Similarly, the image below, of Mother fashion agency in London, uses an enormous table to unify all the staff (or learners). Upon closer look, the working 'desk' doubles up as a fashion runway, and as a photography set. Collaborative work sprouts into action within the same space. Employees are within visual connection to each other facilitating interaction and collaboration. Learning environments should learn from this model. Creating research, collaboration, individual space, and share space, all within the same space.
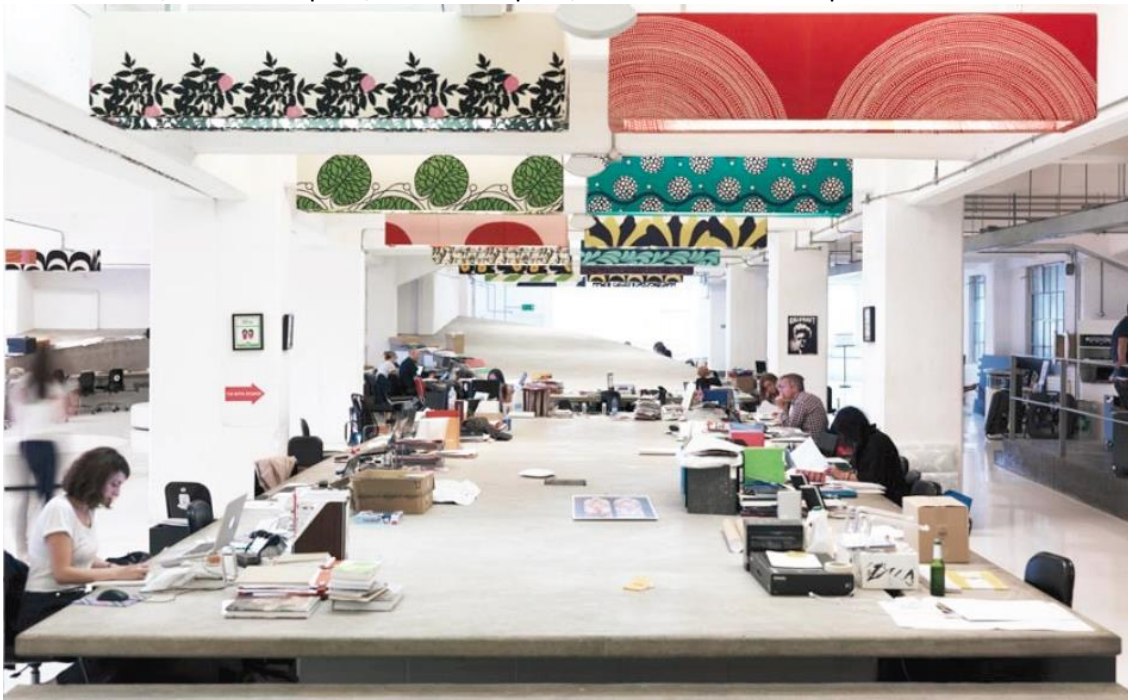
Mother Fashion Agency

6. **Pattern 6. Play-Scape. Fun in Learning**
   Learning ought to become fun. It is when learning is fun that it becomes a passion. Our schools have become sterile environments, resembling more a prison that an inquisitive place to discover, wonder, and explore. Google Headquarters, seen below, is a great example of an environment that oozes fun, personal discovery, knowledge sharing, and creativity.

Google Headquarters

7. **Pattern 7. Flexibility and Specificity of Learning Spaces.**
   The trend in design from workplace to learning environments is to create highly flexible spaces that can adapt to various uses, yet we also see the need for highly specific spaces that do what they need to do very well. Both images below are successful, but for very different reasons. The first one shows how a space can be configured in multiple ways, allowing extreme flexibility, while the second space shows a nicely equipped recording lab at a School in Singapore which does a few things very well.

Flexibility of a learning space at University of South Australia

Recording studio at Beacon Primary School, Singapore

8. **Pattern 8. Digital Integration. Technology infused learning.**
   The use of technology to engage the digital natives is a must. As quoted by a student: "You think of technology as a tool. We think of it as a foundation -- it's at the basis of everything we do." [16]

Purposeful use of technology has the potential to truly facilitate student-centered and self-directed inquisitive learning.
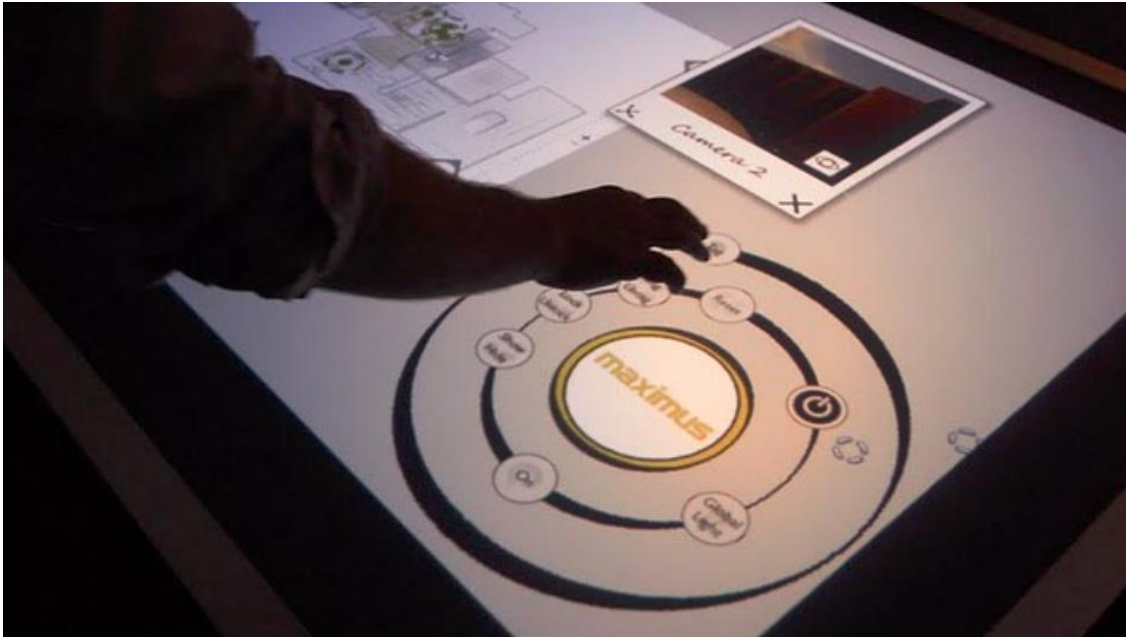

Haptic tables

5 Typologies of Learning

Responding to the need for a richer and more engaging student and teacher user experience, the Immersive Learningscape is spatially configured by mixing 5 typological learning experiences in a 'landscape' of learning moments. Each of these typological spaces serves specific needs that a student would need while learning during a given day.

21st CENTURY SKILLS IN THE IMMERSIVE LEARNINGSCAPE
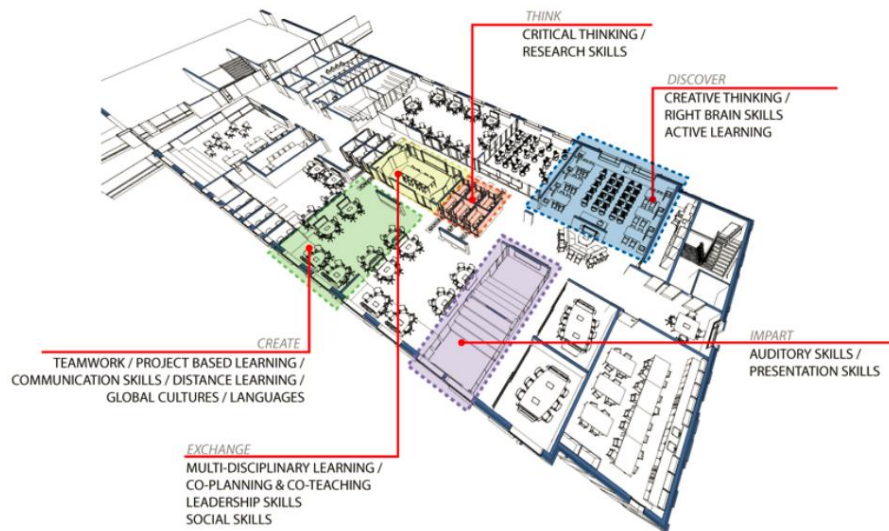
Think, Create, Discover, Impart, and Exchange spaces provide students with highly differentiated environments for learning in a variety of ways. Below, they are further described:

1. **Think-scape**
   Conceived for individual learning, Think spaces provide students with areas of acoustic isolation to conduct research and investigation take a test (and receive immediate assessment), focus on an AR reader session, to expand learning via enrichment exercises, or carry a foreign language listening session. Think spaces could also be both video and audio recording sessions, individual Skype conference rooms, brainstorming rooms, or spaces for children with learning disabilities to focus on a specific material.

The Immersive Learningscape

The Immersive Learningscape
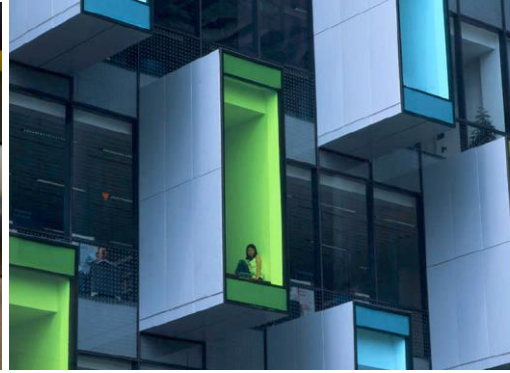

Microsoft's 'Garage'

Source: Pinterest

Source: Pinterest   Bishan Public Library, Singapore

2. **Create-scape**
   Conceived for team and collaborative learning, Create spaces provide students with areas for teamwork, infused with technology. Specifically designed for project –based learning (PBL) opportunities, these spaces would facilitate the acquisition of critical 21st century skills: communication (both auditory and oral), collaboration (leadership, persuasion, argumentation, and compromise skills), and group brainstorming skills.

The Immersive Learningscape

The Immersive Learningscape

Sarasota County Schools' TechActive Classroom of Tomorrow

3. **Discover-scape**
   Conceived for hands-on, large, investigative, experimental, and trans-disciplinary learning,
   Discover spaces are highly flexible spaces where arts, science, language, and math meet. These
   spaces are seen as a mix of highly adaptable and profoundly specific spaces that can change on a
   weekly, monthly, or yearly basis. Analytical skills, problem solving skills, and art and science skills
   are acquired in these immersive spaces. Discover spaces can be transformed from an art lab, to
   a robotics lab, to a machinery lab and beyond, for large scale and collaborative learning. They

are used to test ideas, apply concepts to real applications, tinker, create, produce, fail, and imagine.

The Immersive Learningscape

The Immersive Learningscape

Google Headquarters

4. Impart-scape

Conceived for class-sized gatherings, presentations, "modeling", and introduction to concepts. Impart spaces are designed to accommodate a large group of students in an acoustically designed tiered environment. A space to enhance large group presentation skills, auditory skills, and problem definition, these spaces can also be equipped with video conferencing for large group distance learning Skype sessions and direct knowledge sharing.

The Immersive Learningscape

The Immersive Learningscape

Source: Pinterest

Source: Pinterest

5. Exchange-scape

Conceived for large gatherings, sharing knowledge, peer-to-peer, teacher-to-teacher, and student-teacher interactions, Exchange spaces are environments where school knowledge is exhibited and shared, where teacher planning occurs, 'neighborhood-wide' troubleshooting sessions happen, where intersectional thinking occurs, and where social learning meets academic learning.

Source: Pinterest

Source: Pinterest

Implementation of the Immersive Learningscape:
Sarasota County Middle Schools: TechActive Classroom of Tomorrow.

Sarasota County Middle Schools, through a partnership with the Gulf Coast Community Foundation (GCCF) in Venice, Florida, and Senior Vice President for Community Investment, Mark Pritchett, are transforming learning in middle school science and math classes. Led by Dr. Page Dettmann, Executive Director of Middle Schools, middle school administrators, science and math teachers, an environment of student engagement and technology integration is spreading renewed excitement for teaching and learning. The facility redesign to support a new way of STEM learning was planned and jump-started by former Director of Construction, John Dougherty.

Here is a more in depth description of the TechActive Classroom of Tomorrow:

Overview

The Classroom of Tomorrow seeks to help students develop skills needed for a more complex, technologically advanced and competitive world through the integration of technology within science and math content and daily collaborative learning activities that require critical and creative thinking. Sarasota County Middle Schools developed and introduced 50 TechActive Classrooms of Tomorrow throughout the eight middle schools for the 2012-13 school year. Twenty-five were added this year for a total of 75 TechActive Classrooms of Tomorrow. These science and math classrooms integrate sophisticated, interactive technology and hands-on learning in a laboratory environment, where students collaborate in small groups to solve problems. Students in these classes do not sit in neat rows of desks or tables, all facing forward to listen to a one-way lecture, take notes from a teacher, or watch a nature documentary with the shades drawn. In the TechActive Classroom of Tomorrow, students huddle and move around their lab tables on chairs with rollers while they access information on large, touchscreen computers networked to their teacher's computer and the room's ActivBoard. Here, students discover, analyze, and produce information together, much like working scientists.

Reflecting the functional realities of the 21st century workplace

The middle school TechActive Classroom of Tomorrow combines the latest teaching methods with state-of-the-art instructional technology to create lab environments specifically designed to involve students in meaningful and engaging inquiry and problem solving. Teachers demonstrate their own high-level analytical skills and engage students every day in small-group collaboration and project-based discovery learning. Science and math classes are lively, interactive, team-oriented settings where students discover, analyze and produce information together, much like working STEM practitioners.

The new labs and instructional methods are designed to spark student interest in STEM subjects and to lead more students to pursue STEM-related careers through hands-on experience, problem-solving opportunities, collaborative work and learning from one other in teams. The TechActive Classroom of tomorrow includes a refined instructional model that fosters creativity, critical thinking, problem solving and collaboration.

TechActive Classroom Environment

Designed to inspire curiosity, deep thinking, and a love of learning, the TechActive classroom of Tomorrow has become a "magnet" for student learning. Key components of the 21st century learning environment include:

1. A new lesson format where teachers design rigorous, complex, relevant learning opportunities and teams of students immerse themselves daily in the hands-on, inquiry activities, learning collaboration and communication skills and applying content knowledge

2. State-of-the art technology fostering student exploration, manipulation, and interaction and connecting abstract concepts to the real world.

3. Furniture supportive of team collaboration, data collection, and manipulation

4. Classroom space designed for flexibility of teacher-student and student-student interaction

TechActive classroom resources

The TechActive Classroom of Tomorrow includes the following collaborative learning technology and resources:
- Tombstone-shaped computer/lab tables (6 per room, or 1 for every 3 - 4 students), providing a large work surface for hands-on learning
- Student chairs with wheels to promote collaboration around the circular table (24)
- 23" touchscreen computers mounted on heavy-duty arms, so each student at the table can see and manipulate the computer (6 per room, or 1 for every 3 - 4 students)
- Slate computer (for teacher), to share resources with student computers and assess group and individual student progress
- LanSchool software, to let teacher move images from touchscreens to ActivBoard and communicate remotely with students
- Mobile presentation station (for teacher), to demonstrate to small and large group
- Digital microscopes and digital scales (6 per classroom)
- Digital probes for data-gathering (6 per classroom)
- Motion sensors, Temperature probes, Microphones, Photogates
- TI-Nspire wireless handhelds
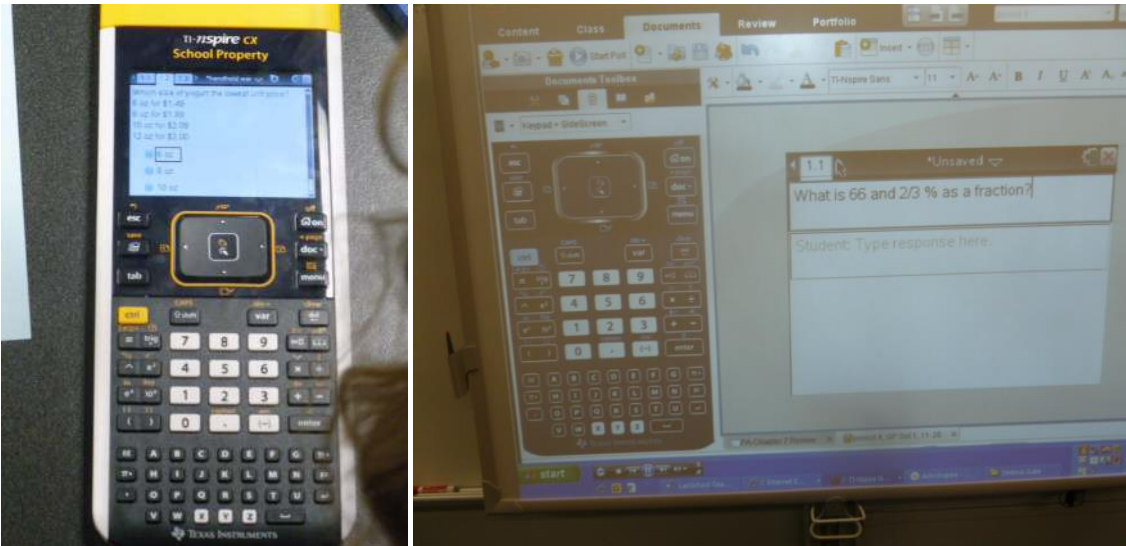
Implementation model

Students are seated in teams at circular pods around the room. The iEngage Lesson Design allows for continual student interaction and movement within and between student teams.

- Student teams engage and interact on daily collaborative tasks.
- Accountable student talk is expected
- Accountable Talk: As a team, students build accurate knowledge, connect to prior learning, and empower one another's rigorous thinking
- Student team collaboration allows:
- Trying new techniques
- Testing ideas
- Uncovering misconceptions
- Making mistakes
- Working out details
- Practicing academic language
- Innovating, questioning, speculating
- Consolidating thinking and understandings
- Student movement is flexible within the classroom learning community


Technology is state-of-the-art
- Touchscreen computers anchor each student table of 3 - 4 students.
- Specialized software moves images from ActivBoard to touchscreens
- Digital equipment augments learning
- Microscope/digital camera, TI handhelds, digital probes

TechActive Classroom of Tomorrow iEngage Lesson Design for Enhancing Learning:

- Clear Content Purpose and Language Purpose posted daily to guide learning activities
- Teacher expert modeling of thinking and reasoning
- Student Accountable Team Work to empower collaborative, rigorous thinking
- Teacher guided instruction to facilitate student learning
- Independent student learning to build expertise
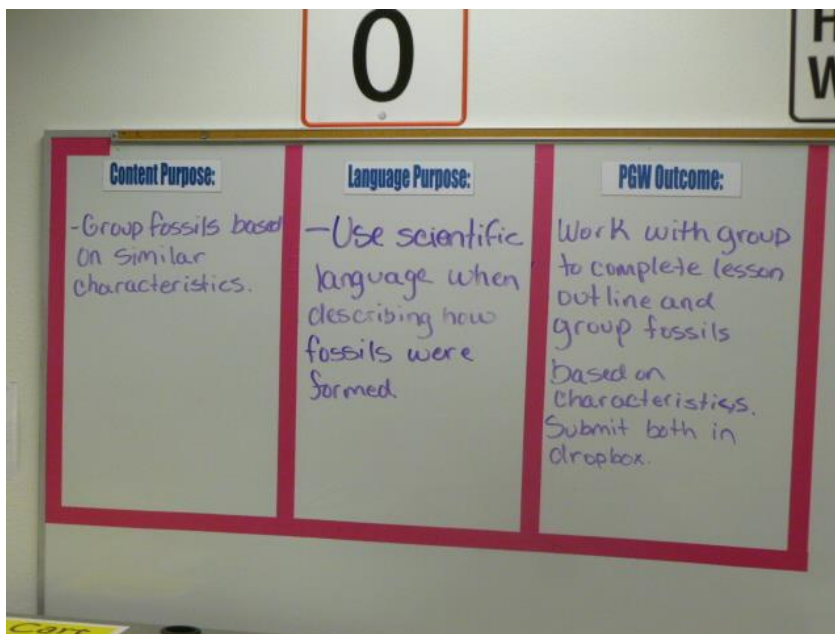
Daily Accountable Team Work

An active, collaborative process where groups of 3 – 4 students work together to build mutual understanding, pursue joint goals, solve problems, and use a variety of resources to critically and creatively experiment with concepts and apply their knowledge. In the TechActive Classroom of Tomorrow, students collaborate with one another, with their teacher, and can access people outside the classroom through virtual communication.

Using technology to enhance learning

- Quickens access to current information
- Simplifies recording of data and information with accurate digital data collection, quick note-taking and storing of data accessible to all team members
- Simplifies retrieval of stored information
- Encourages collaboration
- Enhances visualization
- Fosters virtual communication within and outside the classroom
- Simulates real-world situations, especially with virtual labs
- Stimulates construction and reframing of information
- Eases assessment of learning
- Makes learning more fun

Professional Development and Training

Research reveals that what happens in the classroom between teachers and students is central to high levels of learning. Building effective teaching practices and seamlessly integrating technology involves powerful, high-impact training that consists of a blend of face-to-face workshops, observation of model teachers, collaborative lesson design, and Lesson Study, reflective study of effective classroom practices. TechActive teachers and administrators provide the majority of teacher training.

Professional development helps teachers refine their instructional practices:

- Building teacher leadership and capacity
- Supporting and sustaining rigorous and relevant student learning
- Establish learning purposes aligned with the curriculum and student needs
- Implement and monitor effective instructional strategies of iEngage lesson design
- Provide appropriate support during guided instruction to hold all students to high expectations
- Plan rigorous and relevant Accountable Team Work
- Develop authentic assessments to determine student mastery and to drive further learning
- Integrate technology naturally within lesson activities

Evaluations

One year after the beginning of this pilot project, the teachers were surveyed. Below are the observations:

EVALUATION RESULTS: YEAR 1

Teachers report ...

- **Increased** use of **inquiry-based** practices

- Inquiry approaches **deepen** student **understanding**, **improve problem solving,** and **communication skills**

- Inquiry practices **increase student motivation**

- They've never **worked so hard** and had **so much fun!**

Students were also asked about the Classroom of Tomorrow. Below is a summary of those findings:

EVALUATION RESULTS: YEAR 1

Students report ...

- More **collaborative** learning in classes

- Increase in **team activities** and **experiments**

- Increased interest in **science**

- **Enjoying** STEM learning

Results
(As per Research, Assessment & Evaluation and School Improvement – Sarasota County Schools:)

FCAT Science Results:

- 19 Grade 8 TechActive Science teachers taught students who participated in the Grade 8 Science FCAT in 2012-2013.
  - In more than half of these classes, over 90% of the students demonstrated proficiency on the Grade 8 Science FCAT as compared to an average of 59% for the District and 47% statewide. In four of these classrooms, 100% of the students demonstrated proficiency.

FCAT Mathematics Results

- In SY 2012-2013, 68 percent of all middle school students were proficient in mathematics while 91 percent of middle school students in TechActive classrooms were proficient in mathematics.

- In half of the TechActive classes, 100 percent of the students were proficient on the FCAT in SY 2012-2013.

Algebra Results

- 10 Algebra teachers instructed within TechActive Classrooms
  - In 9 out of the 10 TechActive Algebra classrooms, 100 percent of the students were proficient and passed the Algebra EOC in 2012-2013 as compared to a District average of 73% and a statewide average of 64%.

Summary

The ideas behind the Immersive Learningscape are driven to radically change the student experience in the learning environment to be engaging, hands on, collaborative and exciting. They are meant to retain students in school, instill a passion for lifelong learning. For additional information and videos on the Immersive Learnigscape, please visit: http://www.littleonline.com/ImmersiveLearningscape/
As Abraham Lincoln said, "*As our case is new, so we must think anew, and act anew. We must disenthrall ourselves, and then we shall save our [education] country".* We are at an unprecedented crossroads in the world of education. Moving forward means innovation, at the curriculum level, at the teaching and learning level, at the technology, and at the learning environment level. They are all intertwined, and the Immersive Learningscape is an attempt at tying them all together.

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