

innovation + creativity

# STEM & STEAM Learning

eSTEM Academy in Corona Norco USD  
& S.T.E.A.M. Initiative in Hayward USD



Wayfind  
Education



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Wayfind Education



# WHO'S IN THE ROOM?



## “North Star” Question for Today

How is the design of  
a **robust** STEM  
learning environment  
actually an ***exercise in  
change leadership?***

... and how do we lead the  
change of this educational  
reform?



**teaching + learning for STEM/STEAM EDUCATION**

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eSTEM High School  
Cornona Norco, USD

93K SF new build

STEM 9-12

under construction



Monarch Launch Pointe  
San Diego, USD

6K SF renovation

STEAM 6-12

completed 2017



Tarbut V' Torah  
Irvine, CA

5k SF New Build

STEAM K-6

completed 2018

## PROJECT FOCUS



# From STEM to Robust STEAM...

It is more than four disciplines.  
It is real and fascinating.  
It engages a student's FULL SELF.  
It's a process to change the world.

(PS It involves the art of being uniquely human)

**GUIDING PRINCIPLES for STEM/STEAM EDUCATION**

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# #SparkTheLearning @A4LE2

## INDIVIDUALLY PAUSE AND THINK ABOUT...

A time when a toy or childhood activity sparked a fascination about learning something new or mastering a new skill

- Anytime, Anywhere, Anything
- What did you do? How did you feel? Who were you with?
- What CONNECTS you to the “spark learning moment?”



Significant learning... where you learned something new, it stuck with you, and made an impact.

## When time is announced

- Share your SparkTheLearning moment with those around you
- Careful of time, so everyone can share
- Optional: tweet out your significant learning moment with #SparkTheLearning @A4LE2

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# Readiness for robust STEM spaces

Culture of School

>>>> shift in mindset >>>>

Culture of Innovation

## Culture of School versus Culture of Innovation

- Individual Achievement versus Collaboration
- Specialization versus Multi-disciplinary Learning
- Risk Avoidance versus Trial and Error
- Consuming versus Creating
- Extrinsic versus Intrinsic Motivation
- Play, Passion, Purpose

Wagner, T., & Compton, R. A. (2015). *Creating innovators: The making of young people who will change the world*. Simon and Schuster.

## Now innovation is hard.

It requires taking chances. It requires challenging those things we thought we knew with certainty. Taking the risk and breaking the rules.

~ Carl Bass, CEO, Autodesk, Inc.  
TEDxBerkeley

A shift in mindset requires leadership

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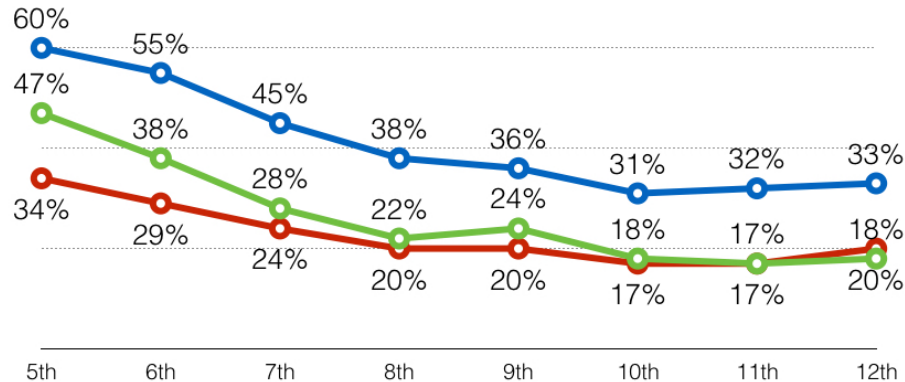
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# Research Highlights a Critical Challenge...

Percentage of Students Who Strongly Agree, By Grade (n = 928,888)

- In the last 7 days, I have learned something interesting at school
- I have fun at school
- At this school, I get to do what I do best every day



Gallup. (2016). Gallup student poll. Engaged today - Ready for tomorrow. Fall 2015 survey results. Washington, DC: Author.

@mcleod | dangerouslyirrelevant.org

Students need places that

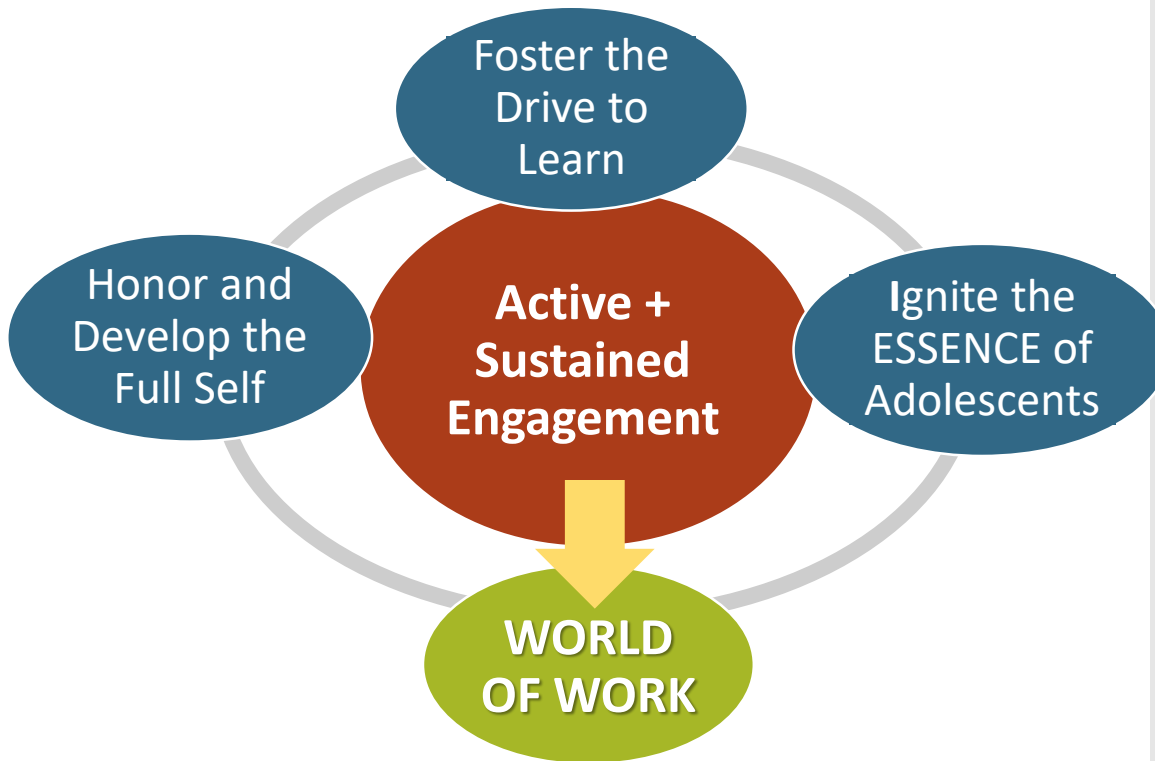
*activate  
sustained  
engagement*

*“Spark + Stick”*

**GUIDING PRINCIPLES for STEM/STEAM EDUCATION**

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## *Importance of Intrinsic Motivation, Identity Formation, Cultural Context, and Adolescent Development*



- Aguilera-Black Bear & Tippeconnic (Eds.), 2015
- Cohen & Garcia, 2014
- Csikszentmihalyi, 1997
- Immordino-Yang, 2011
- Murphy & Zirkel, 2015
- Paris, 2017
- Powell, etal. 2016
- Ryan & Deci, 2002
- Shernoff, etal., 2003
- Siegel, 2014
- Toshalis & Nakkula, 2012
- Murphy & Zirkel, 2015

## *And, Space Matters!*

- Abbasi, 2013
- Barret, etal., 2013
- Uline, 2008, 2009

**Research >> About Young Humans**



# Design with the Student in Mind!

The journey of learning space design begins in the *context of community.*

It is led by deeper inquiry into the question, *Who Are Our Learners?*

**How do we create spaces that SPARK + STICK**

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# Finally, have bold conversations during the process with stakeholders and the design team about how...

- #1 Historically under-represented students are sought out to participate.
- #2 Learning opportunities reflect students' lives.
- #3 Professional development equips educators to lead.
- #4 Students develop scientific skills and understanding across concepts.
- #5 Multiple settings enable young people to build complex skills.
- #6 Students develop a “STEM identity.”
- #7 Parents receive consistent guidance to support student’s STEM success.
- #8 Students demonstrate mastery through competency-based assessment.
- #9 Opportunities are created to build mentoring relationships.

Learn more at [www.stemecosystems.org](http://www.stemecosystems.org)

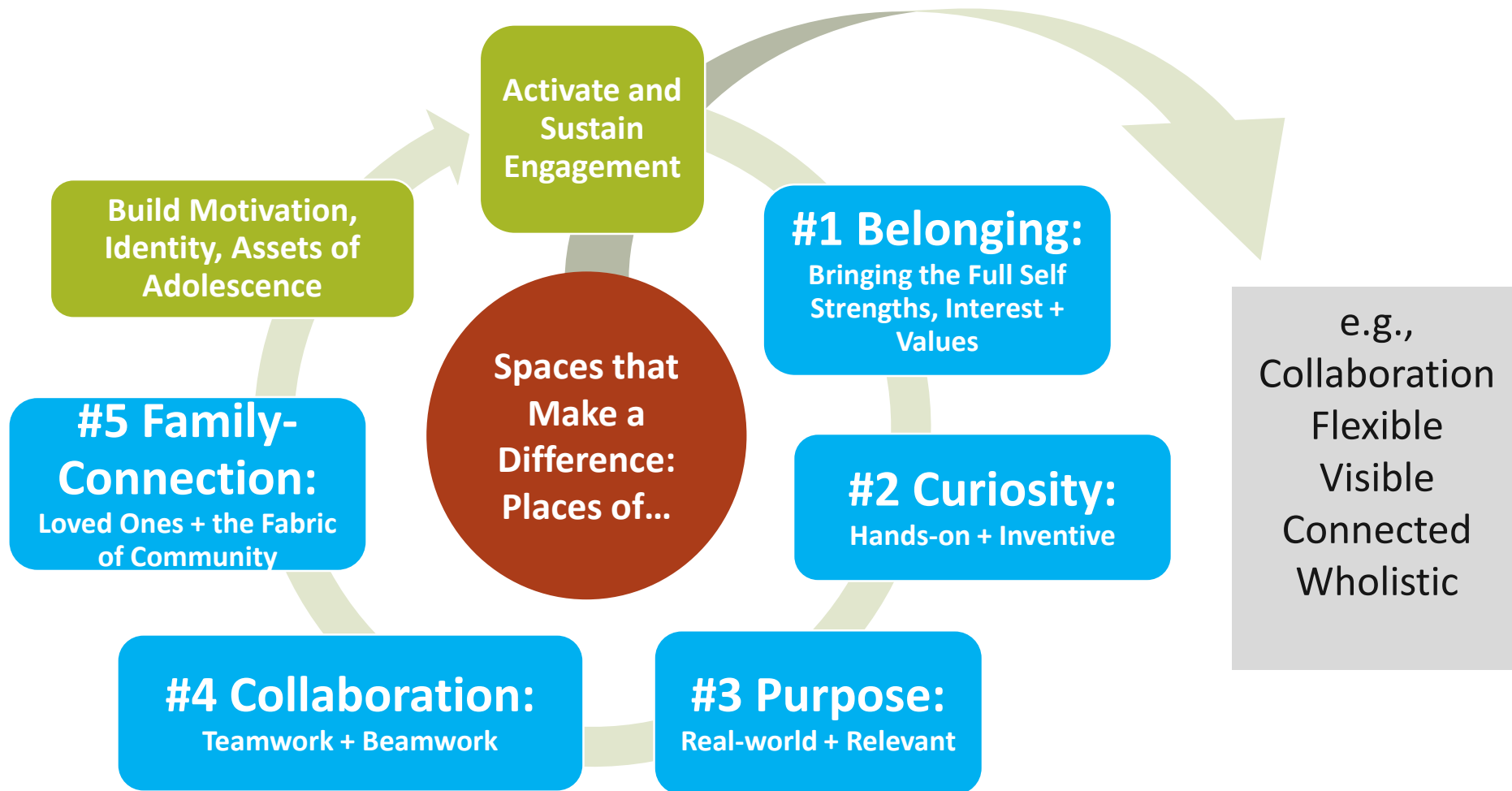


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# Let research inform space design elements



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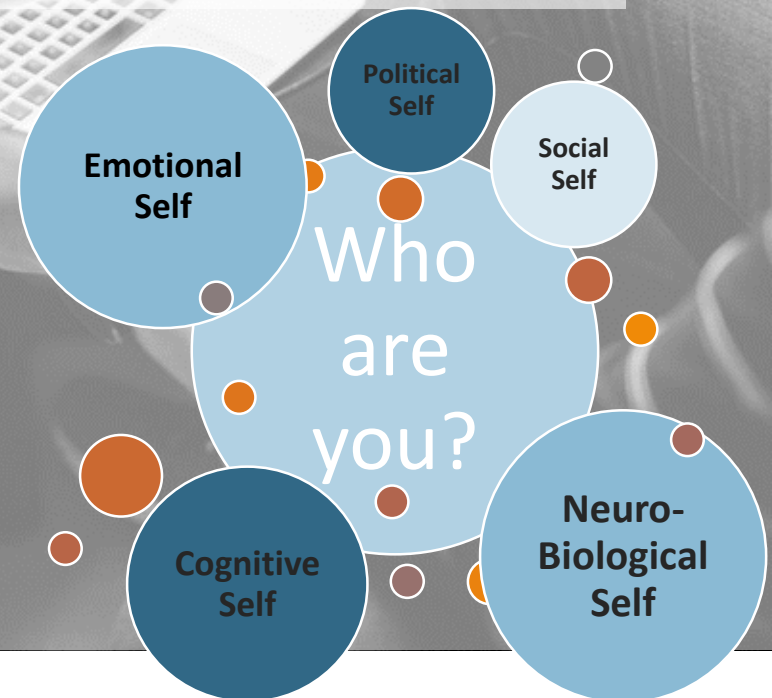
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**planning + design**  
**STEM & STEAM Learning**



# Spaces of Belonging

- Bring my human self-in- development
- Explore my strengths, interests and values
- Build my identity as a successful STEAM learner
- Experience multiple paths to and expressions for participation





# PLANNING + PROGRAMMING PHASE SCHEDULE

## kickoff meeting 7.07

goal: introduce the team, the process + project goals  
participants: district members, ERHS admin. staff, CNUSD teachers, local college professors, community professionals, board members, city council, parents, professional learning experts, design team

## discover meeting 7.20

goal: gain stakeholder insight  
participants: district members, ERHS admin. staff, ERHS teachers, professional learning experts, design team

## collaborate meeting 7.20

goal: establish the relationship between ERHS + eSTEM  
participants: district members, ERHS admin. staff, ERHS teachers, professional learning experts, design team

## research meeting 1 8.03

goal: tour other exemplary STEM spaces  
participants: district members, ERHS admin. staff, CNUSD teachers, local college professors, community professionals, professional learning experts, design team

## research meeting 2 8.05

goal: tour other exemplary STEM spaces  
participants: district members, ERHS admin. staff, CNUSD teachers, local college professors, community professionals, professional learning experts, design team

## research meeting 3 8.13

goal: tour other exemplary STEM spaces  
participants: district members, ERHS admin. staff, professional learning experts, design team

## explore meeting 1 7.20

goal: define the eSTEM learner profile  
participants: district members, ERHS admin. staff, CNUSD teachers, local college professors, community professionals, parents, professional learning experts, design team

## explore meeting 2 8.01

goal: define place in terms of purpose + pedagogy  
participants: district members, ERHS admin. staff, CNUSD teachers, local college professors, community professionals, professional learning experts, design team

## explore meeting 1 8.17

goal: confirm program + spatial adjacencies  
participants: district members, ERHS admin. staff, CNUSD teachers, local college professors, community professionals, parents, professional learning experts, design team

## recap meeting 9.02

goal: share committee findings + introduce schematic design process  
participants: district members, ERHS admin. staff, CNUSD teachers, local college professors, community professionals, board members, city council, parents, students, professional learning experts, design team

### 2.2 eSTEM DISCOVER WORKSHOP

**MEETING OBJECTIVE**  
The subcommittee will identify the needs of the community and the needs of the students to inform the design of the program. The meeting will also provide an opportunity for the community to provide input into the design of the program.

**PROCESSES**

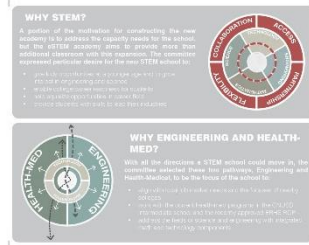
- The subcommittee will identify the needs of the community and the needs of the students to inform the design of the program.
- The subcommittee will provide an opportunity for the community to provide input into the design of the program.

**KEY PRINCIPLES**

- Collaboration
- Science
- Partnership
- Flexibility

**VALUES AND GUIDELINES**

- The subcommittee will identify the needs of the community and the needs of the students to inform the design of the program.
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### 2.2 eSTEM COLLABORATE WORKSHOP

**OBJECTIVE**  
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**PROCESSES**

- The subcommittee will identify the needs of the community and the needs of the students to inform the design of the program.
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**KEY PRINCIPLES**

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**VALUES AND GUIDELINES**

- The subcommittee will identify the needs of the community and the needs of the students to inform the design of the program.
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### 2.2 eSTEM RESEARCH WORKSHOPS

**OBJECTIVE**  
The subcommittee will identify the needs of the community and the needs of the students to inform the design of the program. The meeting will also provide an opportunity for the community to provide input into the design of the program.

**PROCESSES**

- The subcommittee will identify the needs of the community and the needs of the students to inform the design of the program.
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**KEY PRINCIPLES**

- Collaboration
- Science
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**VALUES AND GUIDELINES**

- The subcommittee will identify the needs of the community and the needs of the students to inform the design of the program.
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### 2.2 eSTEM EXPLORE WORKSHOP 1

**OBJECTIVE**  
The subcommittee will identify the needs of the community and the needs of the students to inform the design of the program. The meeting will also provide an opportunity for the community to provide input into the design of the program.

**PROCESSES**

- The subcommittee will identify the needs of the community and the needs of the students to inform the design of the program.
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**KEY PRINCIPLES**

- Collaboration
- Science
- Partnership
- Flexibility

**VALUES AND GUIDELINES**

- The subcommittee will identify the needs of the community and the needs of the students to inform the design of the program.
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### 2.2 eSTEM EXPLORE WORKSHOP 2

**OBJECTIVE**  
The subcommittee will identify the needs of the community and the needs of the students to inform the design of the program. The meeting will also provide an opportunity for the community to provide input into the design of the program.

**PROCESSES**

- The subcommittee will identify the needs of the community and the needs of the students to inform the design of the program.
- The subcommittee will provide an opportunity for the community to provide input into the design of the program.

**KEY PRINCIPLES**

- Collaboration
- Science
- Partnership
- Flexibility

**VALUES AND GUIDELINES**

- The subcommittee will identify the needs of the community and the needs of the students to inform the design of the program.
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### 2.2 eSTEM EXPLORE WORKSHOP 3

**OBJECTIVE**  
The subcommittee will identify the needs of the community and the needs of the students to inform the design of the program. The meeting will also provide an opportunity for the community to provide input into the design of the program.

**PROCESSES**

- The subcommittee will identify the needs of the community and the needs of the students to inform the design of the program.
- The subcommittee will provide an opportunity for the community to provide input into the design of the program.

**KEY PRINCIPLES**

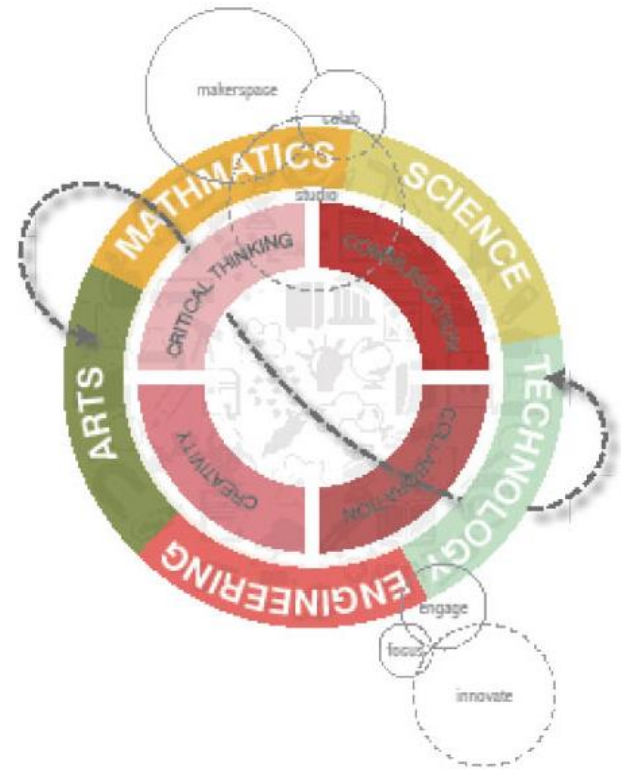
- Collaboration
- Science
- Partnership
- Flexibility

**VALUES AND GUIDELINES**

- The subcommittee will identify the needs of the community and the needs of the students to inform the design of the program.
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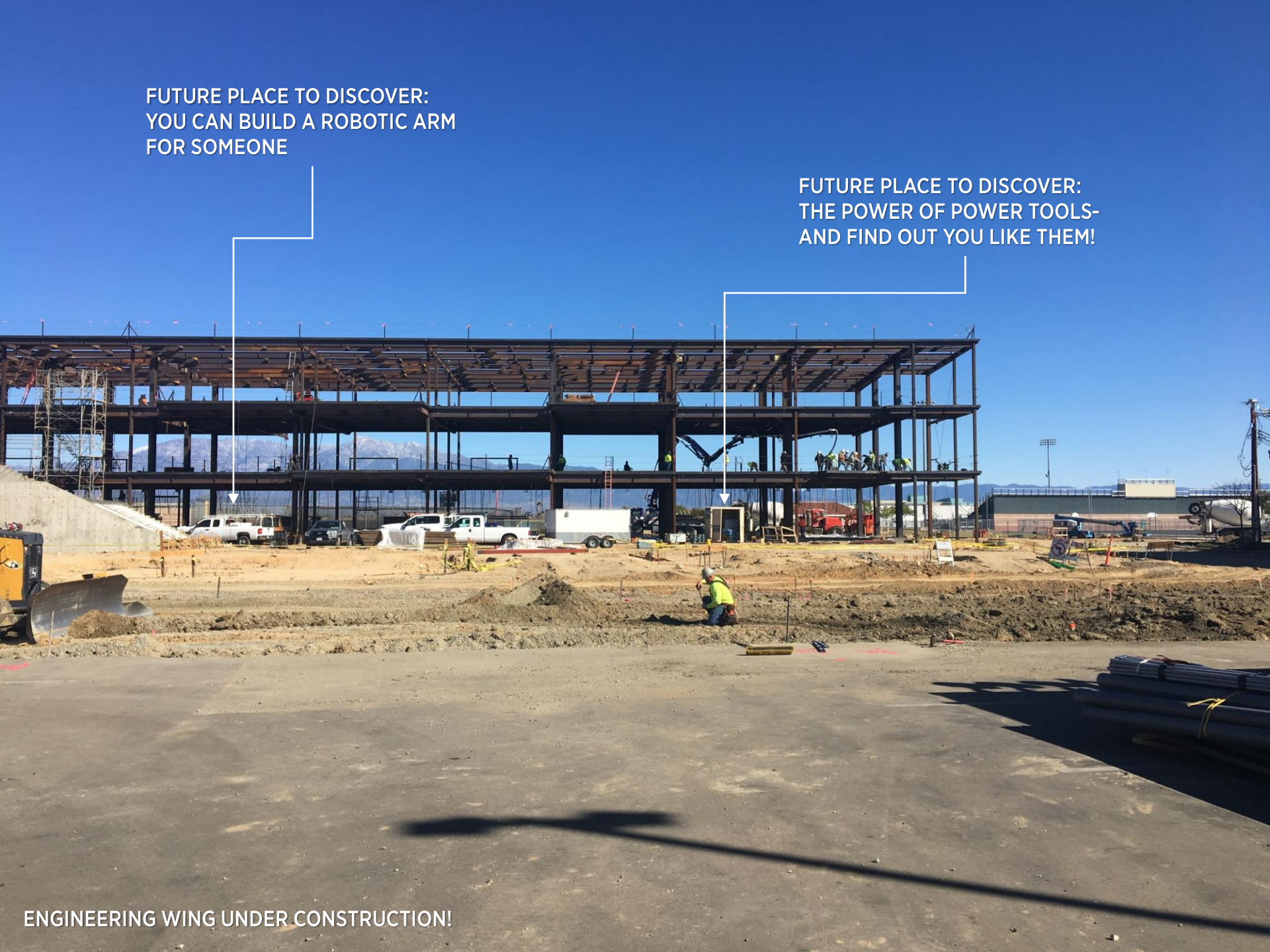






FUTURE PLACE TO DISCOVER:  
YOU CAN BUILD A ROBOTIC ARM  
FOR SOMEONE

FUTURE PLACE TO DISCOVER:  
THE POWER OF POWER TOOLS-  
AND FIND OUT YOU LIKE THEM!



ENGINEERING WING UNDER CONSTRUCTION!





## A PLACE TO BE

23,000 children effected by homelessness in the San Diego County, Monarch School serves up to 350 of these students each day.

“We know education is the key to success for homeless students. In order to meet our student’s unique needs, Monarch has developed an innovative approach to learning where students gain the skills they need to improve their lives, develop awareness of their emotions and healthy coping skills, explore their passions and plan for a life of self-sufficient living. Monarch provides students with a safe, stable environment for learning with wraparound services to meet their basic needs.”



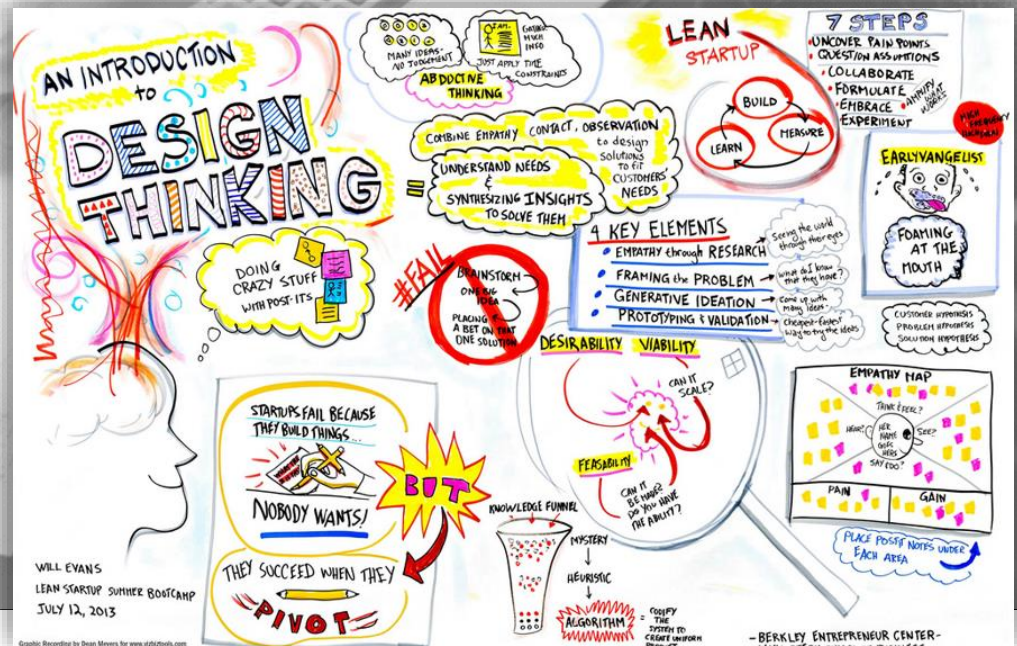
COMMUNITY ENGAGEMENT

The **value of support** is evident in this project, as well as everyday at Monarch School. Gifts from major donors made the renovation possible, and a ribbon cutting ceremony well attended by the city and local community showed the support and love for Monarch’s mission. With an active internship program already in place at the school, the new space gives the program a home where representatives from different career or college opportunities can come in to talk and work with students. The space is easily divisible with a range of acoustic options that allow multiple groups to meet at the same time.



# Spaces of Curiosity

- Construct my own novel adventures
- Discover risk and reward through experimentation
- Experience the process of mastery
- Change the physical world through hands-on activities







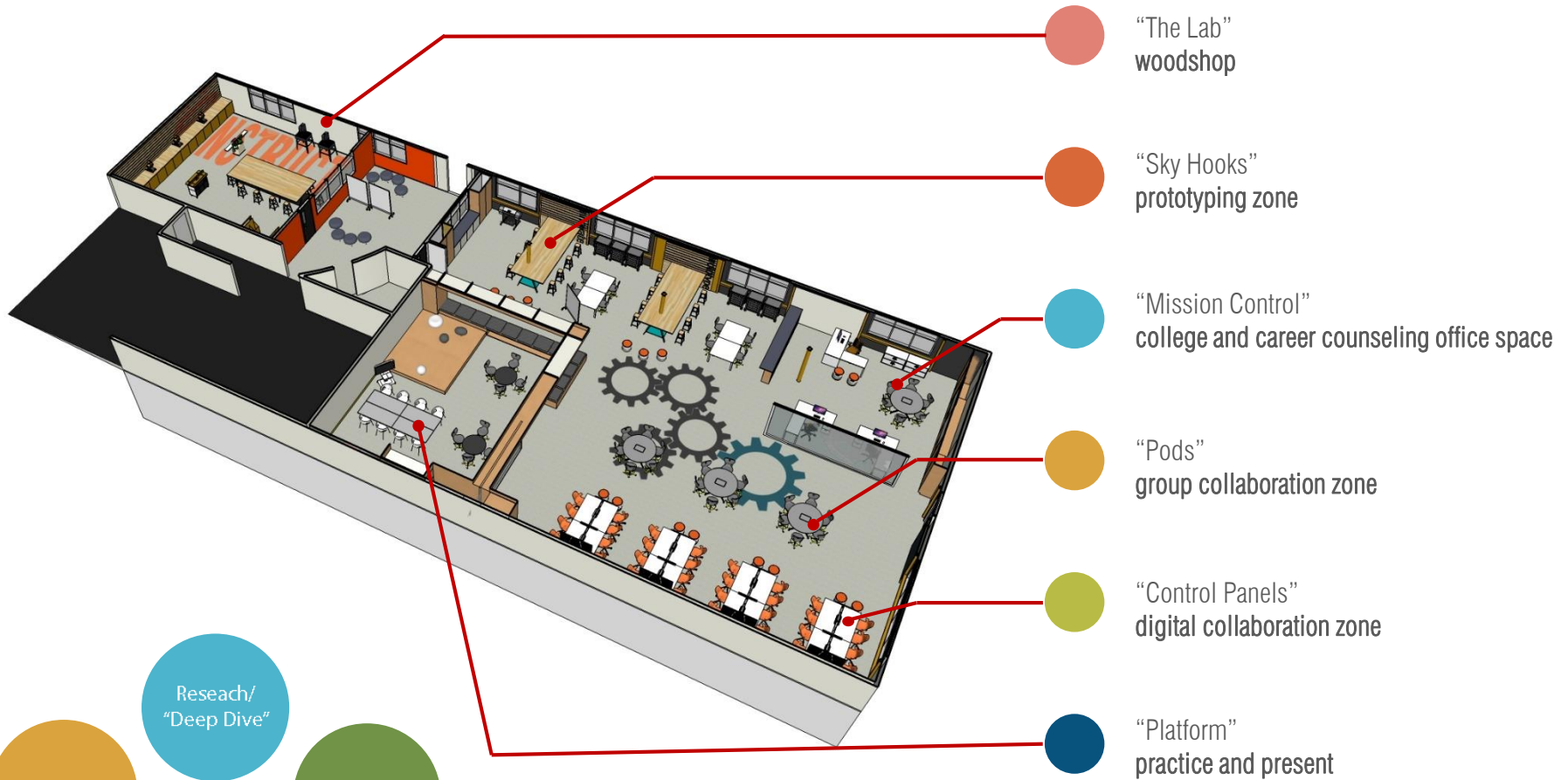












The Launch Point, designed as a “stage for learning”, is zoned to support design thinking in any number of hands-on, tinkering or digital pathways. Students move between zones as they work through the creative process. From digital and tactile exploration, to decompressing/regrouping, to building physical models and giving presentations; the creative process is supported in the educational environment. Students gain confidence as they have the opportunity to learn and explore their individual learning preferences.

The overall build out included zoning space based on activities and student centered engagement. The full Shop completes the interactive learning environment by providing a space for students to explore project development to a deeper level of learning by engaging in hands on activities and prototyping ideas. **The shop supports collaboration, safety and a mission of making resources available to expose students to additional career & college opportunities.**

## hands on learning





# Spaces of Purpose

- Relevant to my real world
- Use my voice and engage and authentic audience
- Provide opportunities to contribute to beautiful and worthy projects
- Help to find my place of impact in the world of work

See how one district connects to the World of Work...

**Twitter** #cvWOW #meetaPro

**YouTube** <http://bit.ly/cvWOWvid>

**Learn more:** <http://bit.ly/cvWOWhidalgo>

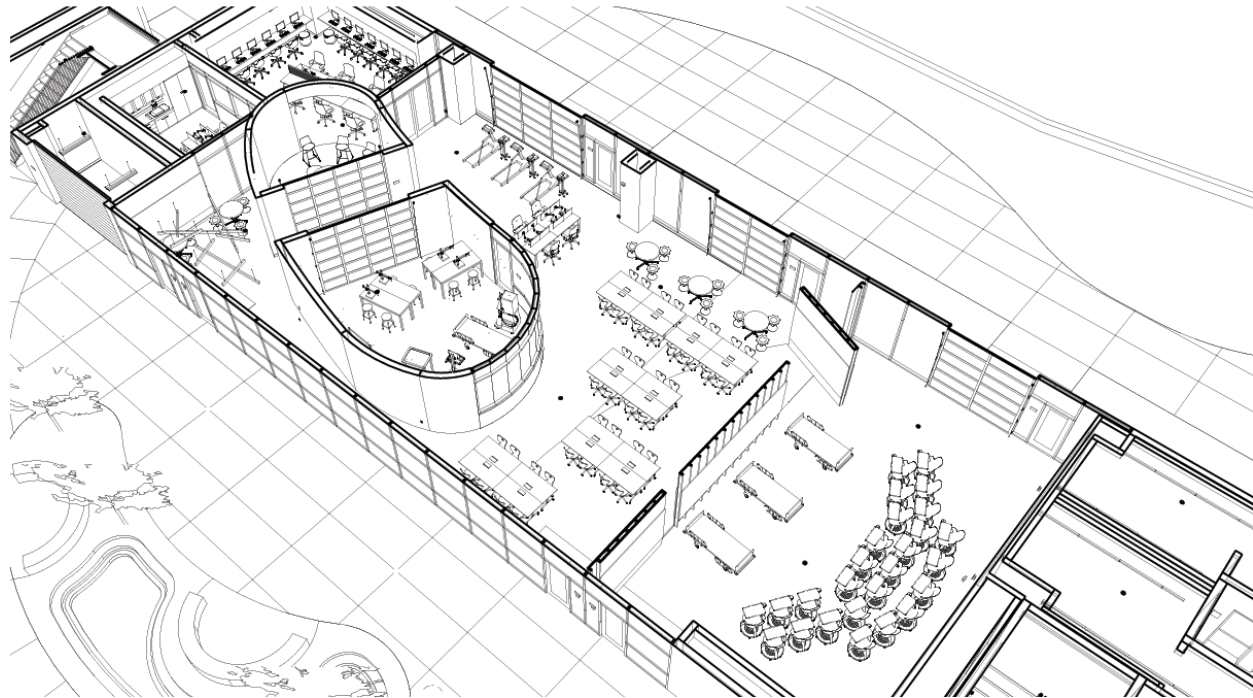
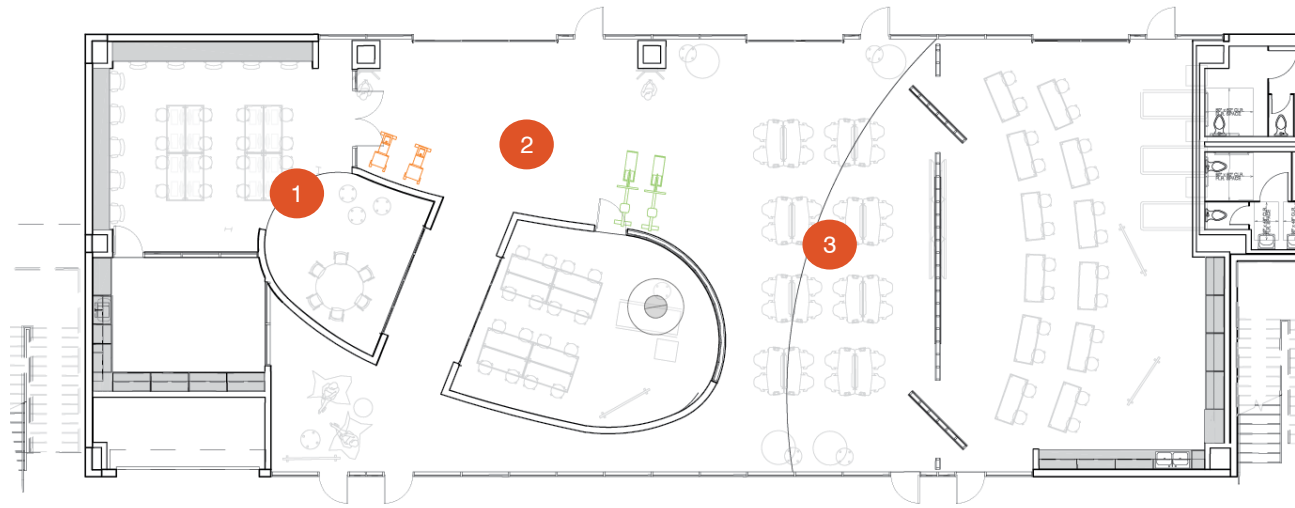


# eSTEM PATHWAY: HEALTH MEDICAL

**Patient care** – cte courses in nursing, paramedical studies

**Anatomy + physical analysis** – the study of the body and movement  
(pe of the stem world)

**Digital analysis** – bioinformatics  
(computer tech to aid the management of biological information)







eSTEM | Health Medical Lab Connectivity Rendering





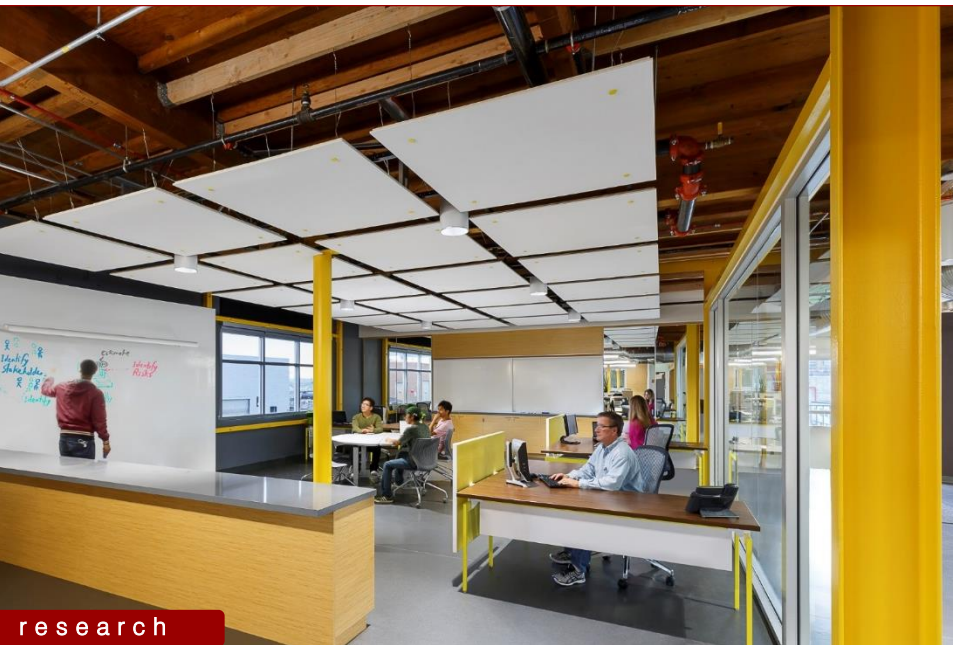
focus



Informed decisions

Passionately stated by Monarch School, “[...] In order to meet our student’s unique needs, Monarch has developed an innovative approach to learning where students gain the skills they need to improve their lives, develop awareness of their emotions and healthy coping skills, explore their passions and plan for a life of self-sufficient living [...].” The physical environment is the built response to resourcefulness, creativity and opportunities.

## 360° OF GROWTH



research



generate ideas



# Spaces of Family Connection

- Explore, affirm, and engage my cultural heritage and the heritage of others
- Attends to challenges that come with me from my home environment
- Welcomes my family and supports their guidance of me

## **The Story of Now**

The educational approach

What we want students to Know, Do, and Value

## **The Story of Us:**

People and place in the cultural context

## **The Story Across Time:**

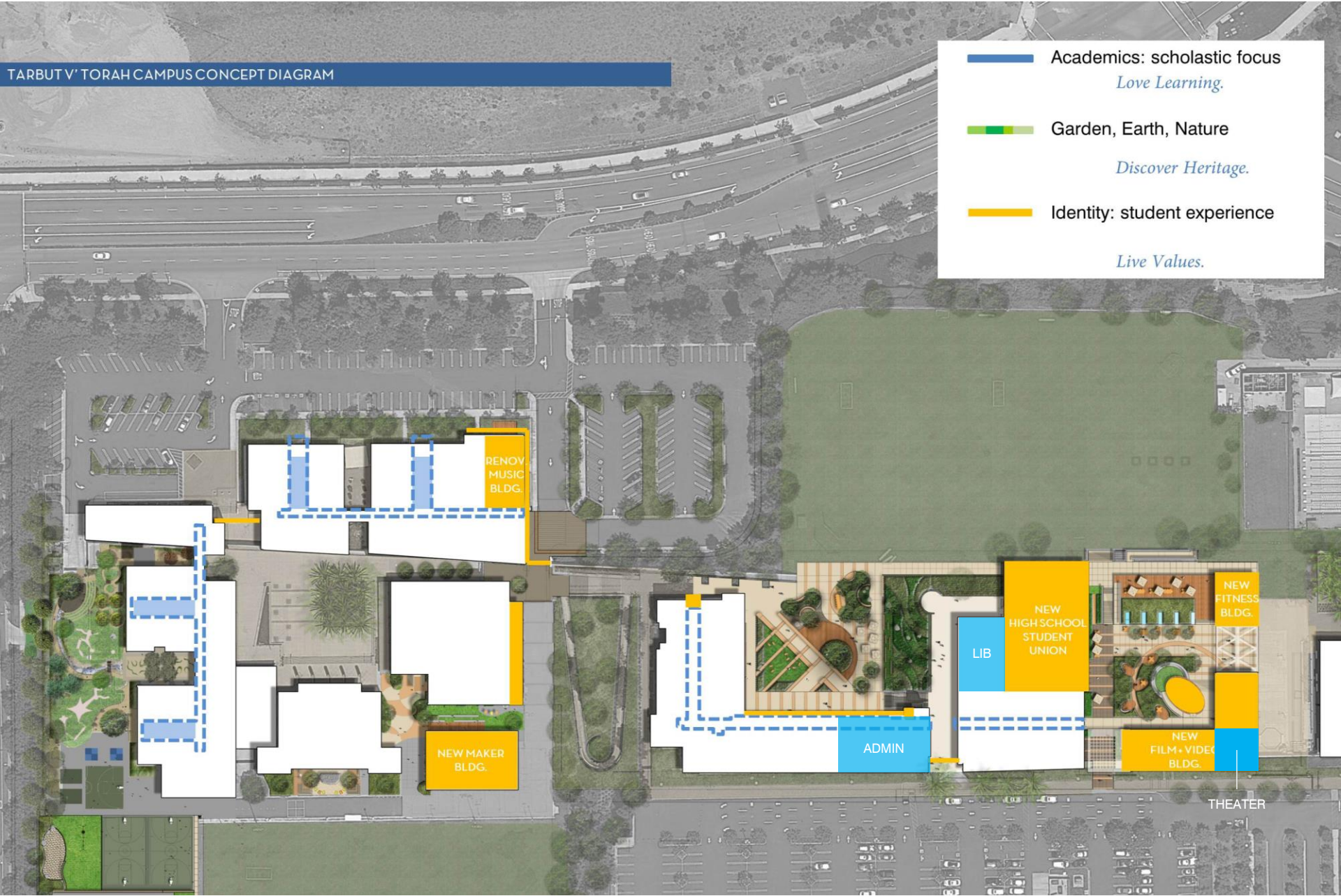
Child and adolescent development

## **The Story of Me:**

I am a successful learner in the academic environment

TARBUT V' TORAH CAMPUS CONCEPT DIAGRAM

- Academics: scholastic focus  
*Love Learning.*
- Garden, Earth, Nature  
*Discover Heritage.*
- Identity: student experience  
*Live Values.*







# the monarch

story

“The mission of the Monarch School is to educate students impacted by homelessness and to help them develop hope for a future with the necessary skills and experiences for personal success.” –monarch school



academic growth

emotional growth

social growth

life skills



# Spaces of Collaboration

- Work with others towards a common goal
- Work across fields of study
- Use focused time to prepare for collaboration
- Witness models of collaboration among adults

**Teamwork + “Beamwork”**



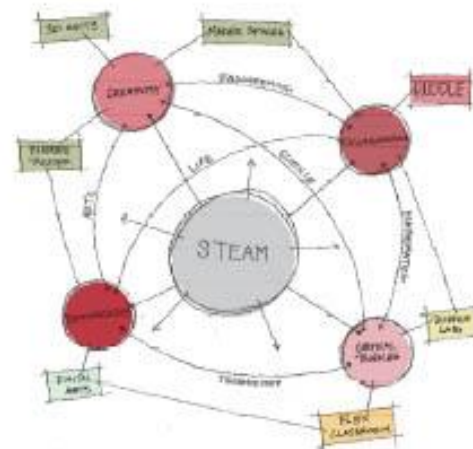
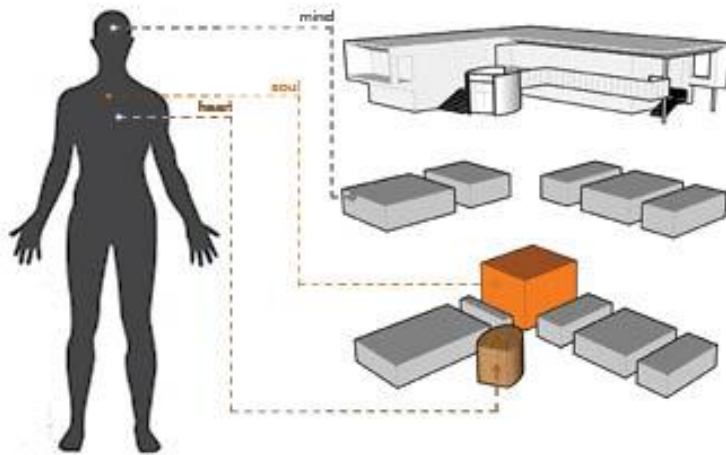
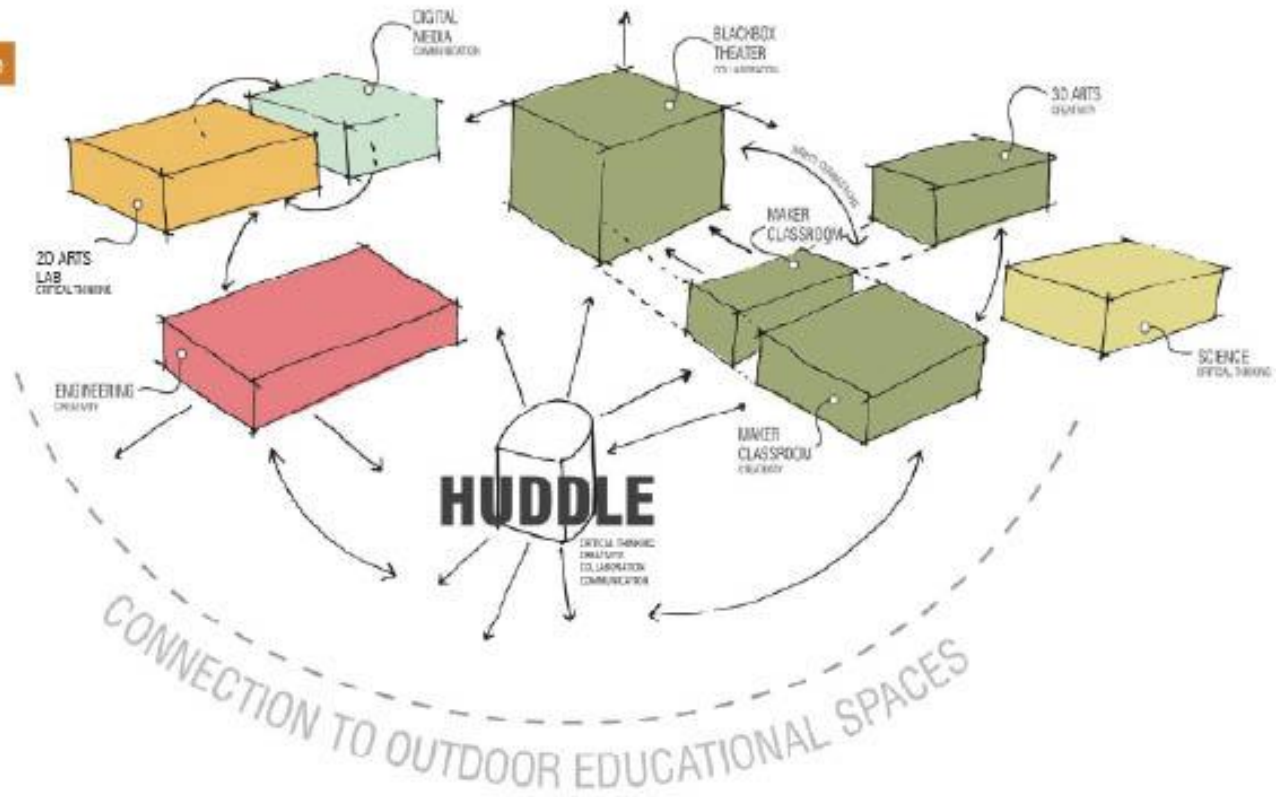


## PROGRAM / integration

The building program adjacencies influenced the form of the building, with the hands-on large lab, shop, and studio spaces surrounding a central, shared space designed for small group discussion and presentation.

The integration of arts to the hands-on engineering and maker spaces is a direct response of research that shows the arts increase deeper understanding and promote innovative thinking.

In true 'form follows function' approach, the exterior skin brings further definition to the unique program: durable stainless steel wraps all spaces addressing the mind; a playful color metal panel defines the sound stage, addressing the soul, and the huddle, the heart of the high school, is clad in warm wood.









# 4.2 eSTEM ACTIVE LEARNING STUDIO

effective communicators and collaborators

## GOAL

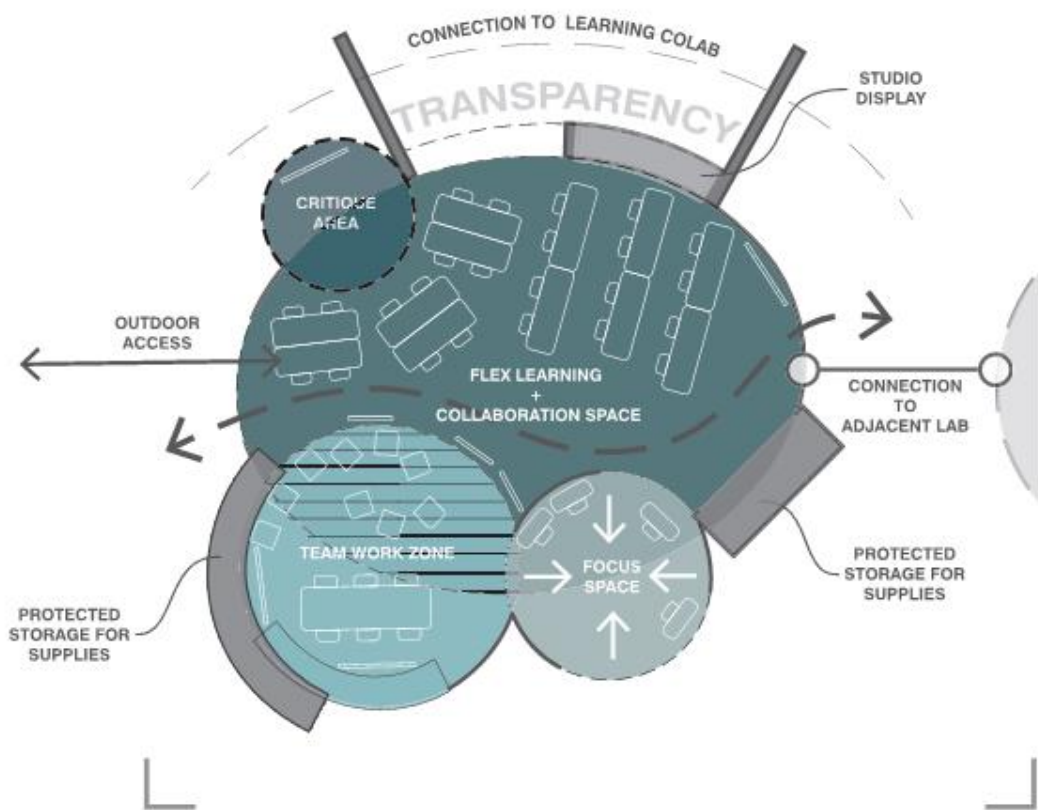
21st Century Classroom that supports Next Gen Learners  
Spaces for direct instruction, presentation of findings, and collaboration—space must cater to multiple learning modalities and support student-teacher interaction.

## ACTIVITIES

- Instructional lessons for group and individual work with active and passive spaces supporting various student learning styles
- Project Based Learning for students to explore independent learning, group and team learning, including outdoor activities.
- Studios can vary in design when it comes to shared workspace or shared focus space - synergy between classes is created when these spaces connect to each other

## DESIGN OBJECTIVES & CHARACTERISTICS

- Access to flexible break out spaces for small group work
- Focus area with-in Studio for individual or quite group work, either enclosed with glass or open to the Studio
- Display of ongoing student work, exposed to outside spaces, particularly circulation areas
- Connection to adjacent learning spaces through operable partitions, sliding glass or barn-like doors
- Visual or physical connection to outdoor lab space, maximize the opportunity for outdoor connections
- Storage for supplies should be plentiful and accessible to the students and the faculty. Consider long-term shared storage for multiple studios
- Multiple Presentation walls - learning should happen on multiple walls throughout the studios
- Additional electrical for student devices, plugs are power.



1200 SF









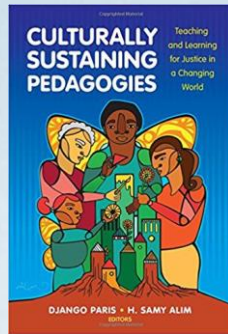
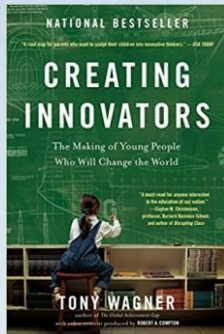
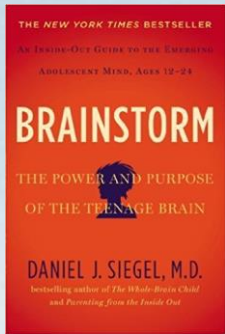
# Q&A

**Thank You!**



# Seven “Stretch” Reads to Continue the Conversation

@jazcramer



## **Brainstorm**

*The power and purpose of the teenage brain*

## **Creating Innovators**

*The making of young people who will change the world*

## **Culturally Sustaining Pedagogies**

*Teaching and learning for justice in a changing world*

## **Drive**

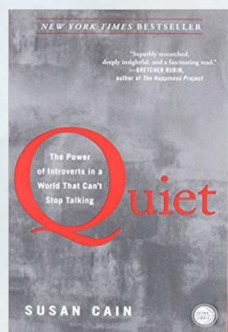
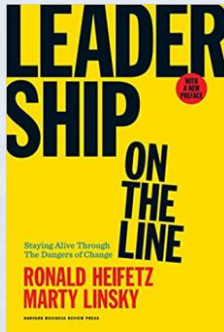
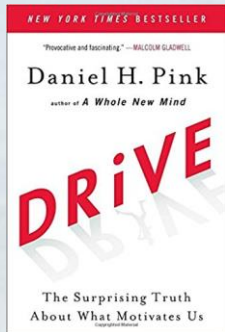
*The surprising truth about what motivates us*

## **Leadership on the Line**

*Staying alive through the dangers of change*

## **Quiet**

*The power of introverts in a world that can't stop talking*



# RECOMMENDED READS