STEM in the Middle Grades

Meeting the Developmental Needs of Students
STEM Ready – Our Goal

Rancho-Starbuck Intermediate School, Lowell-Joint School District, G-CAD Prep
Students Owning Their STEM Goal
Meeting the Goal: Profile Overview

Orange Unified
- P21 Framework for integrated Learning K-12
- Engineering Design Process - K-12
- Councilor on Special Assignment (COSA) coordinates Middle to HS transitions
- Career Assessment and Planning System
  - Naviance 4-6 year plan
  - Career assessments and Planning for Middle Graders
- Experiences for Students
- Options for High School Transitions
  - Academies and Pathways

Placentia Yorba Linda
- Integrated Learning for K-12
- District wide focus on Career Readiness
- Career Assessment and Planning
  - Kuder 4-8 year plan
  - Career assessments and exploration for Middle Graders
- Experiences for Students
  - Stem Action Lab – 2 semester experience
- Options for High School Transitions
  - Academies and Pathways
Orange Unified School District
A Pre-K – 12 Model of Integrated Learning

Kathy Boyd, STEM/CTE Coordinator, OUSD
Adolescent Development

Orange County C-STEM Day 2015, Middle School
Foundations for Young Adult Success: A Developmental Framework

Developmental Experiences Can Happen in All Settings

Children are shaped by their interactions with the world, the adults around them, and how they make meaning of their experiences no matter where they are.

Developmental Experiences Require Action and Reflection

Children learn through developmental experiences that combine Action and Reflection, ideally within the context of trusting relationships with adults.

Developmental Experiences Build Components and Key Factors of Success

Over time, through developmental experiences, children build four foundational components, which underlie their "key factors" to success.

Foundational Components

Self-Regulation includes awareness of oneself and one's surroundings, and managing one's attention, emotions, and behaviors in goal-directed ways.

Knowledge is sets of facts, information, or understanding about self, others, and the world. Skills are the learned ability to carry out a task with intended results or goals, and can be either general or domain-specific.

Mindsets are beliefs and attitudes about oneself, the world, and the interaction between the two. They are the lenses we use to process everyday experience.

Values are enduring, often culturally-defined, beliefs about what is good or bad and what is important in life. Values serve as broad guidelines for living and provide an orientation for one's desired future.

Key Factors

Being successful means having the Agency to make active choices about one's life path, possessing the Competencies to adapt to the demands of different contexts, and incorporating different aspects of oneself into an Integrated Identity.

Continued on reverse.

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Download the full report at ccsr.uchicago.edu and wallacefoundation.org
Focus of Development Changes as Children Grow Older

Early Childhood (Preschool, Ages 3-5)

Middle Childhood (Elementary School, Ages 8-10)

Early Adolescence (Middle Grades, Ages 11-14)

Middle Adolescence (High School, Ages 15-18)

Young Adulthood (Postsecondary, Ages 19-22)

Foundations for Young Adult Success: A Developmental Framework

UCCCSR June 2015
# Child Development in Elementary School

<table>
<thead>
<tr>
<th>Child Development Framework for Middle Childhood (Ages 6-10)</th>
<th>Elementary School Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students continue cognitive development, increasing capacity for self-regulation and Interpersonal knowledge and skills.</td>
<td>School experiences can support students in developing content knowledge and beyond – including learning and social skills, and early mindsets about their capabilities to achieve their aspirations.</td>
</tr>
<tr>
<td>Expanding cognitive abilities supports metacognitive awareness (self-awareness, thinking about one’s thought processes).</td>
<td>Adult support in all environments is vital to help build healthy peer relationships and negotiate new tasks.</td>
</tr>
<tr>
<td>Students are developing interpersonal skills. A growing capacity for self-reflection and increasingly complex perspective-taking and coordinating multiple social categories.</td>
<td>If children do not learn how to develop positive relationships during this period they become increasingly at risk for emotional and behavioral issues in adolescents and adulthood.</td>
</tr>
</tbody>
</table>
## Youth Development in Middle School

<table>
<thead>
<tr>
<th>Youth Development for Early Adolescents (11-14)</th>
<th>Challenges of Typical High School Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students are becoming ready to assert increased personal autonomy and assume greater responsibility for their learning as they have a growing sense of who they are as individuals and in relationships</td>
<td>Classrooms become more restrictive, placing greater emphasis on teacher control and diminished opportunities for student choice and independence</td>
</tr>
<tr>
<td>Students become increasingly sensitive to social comparisons</td>
<td>Institutional practice tends to reward performance (demonstration and recall of knowledge) over effort, highlighting interpersonal comparisons and the “fixed mindset”</td>
</tr>
<tr>
<td>Students are developing the ability to engage in more complex, abstract forms of problem-solving – <em>mastery</em> orientation</td>
<td>For many students, the academic demands of class assignments decline, often becoming less, not more, challenging</td>
</tr>
</tbody>
</table>
# Youth Development in High School

## Youth Development for Middle Adolescents (15-18)

- Developing personal beliefs and values for individuated identity formation and group identification
- Beginning to find own voice and begin setting own personal goals
- Students need opportunities to experience increasing sense of ownership and membership in goal-oriented community
- H. S. can provide developmental opportunities to explore “Who am I? What do I have to offer others? What can I do in the world?”
- Students are developing the ability to engage in more complex forms of problem solving, mastery orientation – understanding that investing in learning = investing in self

## Challenges of Typical High School Environment

- Decrease in importance to social conform can increase potential of isolating by self or small sub-groups
- Schools are challenged to differentiate between harmless experimentation and “enduring patterns of dangerous or troublesome behaviors”.
- H.S. experience may fragment into sub-groups, diminishing sense of connection to one community
- Without support for these kinds of self-reflection, exploration, and mastery experiences, adolescents in the high school years are not able to fulfill the developmental tasks before them.
Nurturing A Growth Mindset

Success

what people think it looks like

what it really looks like
Personal Learning

Maslow’s Human Needs
Personal Learning: Voice and Choice

STEM and the Arts Career Showcase connects student talents to future jobs, OCDE Newsroom
Common Career Education Goals for Students K-12

1. Acquiring information (world)
   a. learning about oneself
   b. learning about the world

2. Developing positive attitudes and habits
   a. exploring equity issues
   b. increasing work-related skills/competencies

From “Understanding Typical Career Development Topics for Children” Harkins (2001, p. 29)
Voice and Choice

Rancho-Starbuck Intermediate School, Lowell-Joint School District, 7th Grade Science
Personalized Learning: One Model in Action

Cerro Villa Middle School, OUSD
Meeting the Goal: Placentia Yorba Linda Unified School District

Cary Johnson, Director of Secondary Education, PYLUSD
Looking More Closely at Career Readiness and Youth Development

Where do we begin?
“Destination Data” – Where Careers Begin

“Unless they fail to enter the labor market all students will ultimately enter a career regardless of the timing of their careers begin after post-secondary education or directly upon graduating (or otherwise leaving*)… school.”

Linda Darling-Hammond and Soung Bae, 2014, except *DM
CA Employment Outcomes for Youth and Young Adults (16 – 24 years old)

<table>
<thead>
<tr>
<th></th>
<th>Ave. 2013</th>
<th>June 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unemployed</td>
<td>483,400 (19.1%)</td>
<td>353,000 (13.8%)</td>
</tr>
<tr>
<td>Not in Workforce or Education/Training</td>
<td>374,000 (12.2%)</td>
<td>353,100 (13.8%)</td>
</tr>
<tr>
<td>Total</td>
<td>867,600 (31.3%)</td>
<td>729,000 (27.6%)</td>
</tr>
</tbody>
</table>

http://www.labormarketinfo.edd.ca.gov/CES/Labor_Force_Unemployment_Data_for_Cities_and_Census_Areas.html
Orange County Unemployment

Skills Gap

At the national level, demand for workers in manufacturing, health care, construction and energy-related occupations outstripped supply of adequately skilled workers to fill these positions.

Importance of Closing the Skills Gap

STEAM education is critical in closing the “skills gap”.

More vacant job positions

Than qualified employees to fill

Especially in the manufacturing, health care, construction and energy-related occupations

This is especially troubling among minority students.

OC dropout rate is 6.7%, while

- African Americans 10.3%
- Latinos 10%
- Pacific Islanders 8.7%

For every twenty 9th graders
For every twenty 9th graders, 6 drop out.
For every twenty 9th graders

6 graduates are work-bound

6 drop out
For every twenty 9th graders:

- 6 graduates are work-bound
- 8 become college freshman
- 6 drop out
For every twenty 9th graders:

- 6 graduates are work-bound
- 8 become college freshmen
- 4 are college dropouts
- 6 drop out
For every twenty 9th graders:

6 graduates are work-bound

8 become college freshman

4 graduate from college

6 drop out

4 are college dropouts
For every twenty 9th graders:

- 6 graduates are work-bound
- 8 become college freshmen
- 4 graduate from college
- 2 secure high skills/high wage occupations
- 6 drop out
- 4 are college dropouts
For every twenty 9th graders:

- 6 graduates are work-bound
- 6 drop out
- 8 become college freshman
  - 4 graduate from college
  - 2 secure high skills/high wage occupations
  - 4 are college dropouts
  - 2 are underemployed
For every twenty 9th graders

- What actions must we take to meet the needs of ALL our students?
- How will we educate for mastery of cognitive and non-cognitive skills to prepare for both Career and College?

2 secure high skills/high wage occupations
STEM competent workers make more than $500,000 over their lifetime as compared to non-stem skilled workers
Career Readiness: The Context

Orange County teachers look to merge core academic content with career technical education (video), OCDE Newsroom
More Starting Points

- Widespread acknowledgement of importance of Career Readiness
- Growing perception that current efforts are not enough
- Recent studies as reported by EdSource indicate educators at all levels are uncertain how to address career readiness and students are not prepared
- Yet there is interest in CTE, multiple pathways, Career Pathways Trust Grants, and integrated labor market efforts such as STEM
- By focusing on an expanded view of career readiness and what we have learned from research and practice, we’ll – goal is to reach greater clarity of relevance of STEM/MG and share existing models and efforts
# Career Readiness: Cognitive and Non-Cognitive Skills

<table>
<thead>
<tr>
<th>School Counseling</th>
<th>Career Development</th>
<th>21st Century Learning</th>
<th>Youth Development</th>
<th>Social/Emotional Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manage emotions; Understand the connection between school and work</td>
<td>Personal and social competencies</td>
<td>Interpersonal Domain</td>
<td>Agency; Self-regulation, values, mindsets, integrated identity</td>
<td>Emotional competence, Self-regulation</td>
</tr>
<tr>
<td>Plan and make successful transitions across life span; learn &amp; apply interpersonal skills</td>
<td>Career and life skills</td>
<td>Interpersonal domain; Intrapersonal domain; Cognitive domain</td>
<td>Knowledge and skills; Self-regulation (see above)</td>
<td>Grit; Growth mindset; Master orientation; Creativity &amp; critical thinking</td>
</tr>
<tr>
<td>Support and maximize ability to learn</td>
<td>Educational achievement</td>
<td>Cognitive domain</td>
<td>Knowledge and skills</td>
<td>Academic self-efficacy; Study skills; Creativity &amp; critical thinking</td>
</tr>
</tbody>
</table>

37
Expanded Approach to Career Readiness

Program Elements:

● Skills and knowledge related to core academic content
● Job related and technical skills and knowledge related to anticipated labor market conditions
● Employability skills, behaviors, attitudes, and habits of mind, sometimes referred to as “soft skills”
● Career planning and self-management skills and competencies that can be utilized throughout a working lifetime.
“Building a Common Language for Career Readiness and Success: A Competency-Based Framework for Employers and Educators”

Hope Clark, Ph.D., ACT WP-2015-02

- **Career Readiness** is defined as a level of “foundational skills” an individual needs for success in a career pathway or career cluster, coupled with the level of “career planning skills” needed to advance within a career pathway or transition to other career paths.

- **College Readiness** is currently defined as the level of achievement a student needs to enroll and succeed – without remediation – in credit-bearing first-year secondary courses.

An expanded approach to career readiness places an increased emphasis on non-cognitive factors, social/emotional learning, “deeper learning”, and youth development research and frameworks.
“Dewey firmly believed that the purpose of school was to educate, not to train. The goal was to help students become knowledgeable and thoughtful, equipped to construct and evaluate ideas in a community of others who were equally knowledgeable and thoughtful.”

Career Readiness K-12+

http://linkedlearning.org/
What we want our students to look like when they leave our doors?
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All presentation resources located at:

https://sites.google.com/a/ocde.us/prof-learning-series/learners/career-readiness
**Expose**
students in Elementary

**Explore**
in Middle School

**Experiences**
for students in High School

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S.T.E.A.M. in Orange Unified School District
1. Identify the need or problem
2. Research the need or problem
   - Examine current state of the issue and current solutions.
   - Explore other options via the internet, library, interviews, etc.
3. Develop possible solutions
   - Brainstorm possible solutions
   - Draw on mathematics and science
   - Articulate the possible solutions in two and three dimensions
4. Select the best possible solution(s)
   - Determine which solution(s) best meet(s) the original requirements
5. Construct a prototype
   - Model the selected solution(s) in two and three dimensions
6. Test and evaluate the solution(s)
   - Does it work
   - Does it meet the original design constraints
7. Communicate the solution(s)
   - Make an engineering presentation that includes a discussion of how the solution(s) best meet(s) the needs of the initial problem, opportunity, or need.
   - Discuss societal impact and tradeoffs of the solutions
8. Redesign
   - Overhaul the solution(s) based on information gathered during the tests and presentation