Finding FOCIS:
A Framework for Examining Lessons and Learning Activities

2013 15th Annual Chicago Symposium Series on Excellence in Teaching Mathematics and Science: Research and Practice
An analysis of longitudinal data for 3300+ students spanning 12 years from ages 14 – 26 suggests that 8th graders with an interest in science are 2-3 more likely to earn degrees in STEM-related disciplines than those who do not report a similar early interest.

When do scientists and graduate students say they first became interested “science”? 

70% of scientists and 69% of graduate students reported developing their interest in science in Grades K-8.

24% of both scientists and graduate students in Grades 9 - 12.

6% of scientists and 7% of graduate students in College.

*Data from Project Crossover (NSF REC 0440002), PI R. H. Tai, University of Virginia*
When do scientists and graduate students say they first became interested in their career discipline?

29% of scientists and 23% of graduate students reported developing their interest in chemistry/physics in Grades K-8.

52% of scientists and 56% of graduate students in Grades 9-12.

18% of scientists and 21% of graduate students in College.

*Data from Project Crossover (NSF REC 0440002), PI R. H. Tai, University of Virginia*
Interest appears to play an important role in student engagement in a subject area.

How might we conceptualize the development of interest?

### The Four-phase Model of Interest Development (Hidi & Renninger)

<table>
<thead>
<tr>
<th>Phases</th>
<th>Description and Characteristics</th>
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<tbody>
<tr>
<td>Triggered Situational Interest</td>
<td>Sparked by environmental or text features such as incongruous, surprising information</td>
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<tr>
<td>Maintained Situational Interest</td>
<td>Held and maintained through <strong>meaningfulness of tasks and/or personal involvement</strong></td>
</tr>
<tr>
<td>Emerging Individual Interest</td>
<td>Positive feelings, stored knowledge, and stored value</td>
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<tr>
<td>Well-developed Individual Interest</td>
<td>More positive feelings, stored knowledge, and stored value over other interests Typically self-generated, but benefits from external support</td>
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• “Authentic” learning associated with life outside the classroom has strong positive connection with student engagement


• Connecting learning to students lives has a measureable impact on performance and interest among students
FOCIS
Framework for Observing Children’s Interactions with Science
is a typology of learning activities

(Originally developed for K-12 learning environments, there are some
applications for instruction in higher education)
Creating/Making
• When I see old bottles or boxes, I like to imagine making them into useful things

Teaching
• Helping my classmates learn new things is fun for me

Collaborating
• Working with others is more fun than working alone

Performing
• I feel comfortable when I am in front of a crowd

Competing
• Activities are more fun when I get to compete

Caretaking
• I like taking care of plants and animals

Discovering
• I like figuring things out
Exploratory Study

Method

• Observed 12 FRC teams across Midwest, New England, and Central and Southern Atlantic regions.
• Conducted over 65 interviews with mentors and students.

Themes

• Student and Mentor Perception of 4-H
  • Community Outreach
• Team Operations
  • Start Up
  • Recruitment
  • Fundraising
FRC Build Season
FRC Competition Season
Surveyed students at Camp Invention®

- Camp Invention® is operated by InventNOW®, a non-profit organization in Akron, Ohio.
- Annually, Camp Invention® has 1100 5-Day summer programs enrolling over 77,000 students.
- We developed a survey for FOCUS to assess students’ preferences for learning activities.
- In this pilot study, we surveyed 17 sites enrolling 465 participants in Grades 4 - 6 from 10 states.
Creating/Making
Discovering
Collaborating
Caretaking
Teaching
Performing
Among 465 4th – 6th Grade students who attended Camp Invention® in 2013 at the 17 study sites

- Creating/Making, Discovering, Collaborating, and Caretaking generally reported high or very high preferences among campers

- Preference response patterns for Collaborating, Discovering, and Creating/Making are very similar for both Girls and Boys

- Caretaking was rated very high among Girls compared to only generally positive among Boys

- Teaching were generally positive among Girls, but revealed a shallower slope among Boys

- Competing and Performing both reported “flat” response patterns for both Girls and Boys
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Thank you

Robert H. Tai, Ed.D.
rht6h@virginia.edu
SUPPLEMENTARY SLIDES