



VSoE Engaged Learning Initiative

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VSoE Engaged Learning Initiative Goals



- Improve pedagogical practices for face-to-face & distance learning– technology mediation, experimentation with engaged pedagogies with technology mediation in undergrad courses and in large DEN courses.
- Fully engage undergrads, DEN grad students and face-to- face grad students.
- Improve and transform technology and tech mediated learning- Reviewed LMS and other ed. tech. companies for flexibility, VSoE development opportunities and other novel opportunities that facilitate maximal engagement and personalization with low to moderate faculty burden.

★★Facilitates personalized learning★★



Student STEM Outcomes Recognized by NAE, NAS, IEEE, and NRC (2007, 2011, 2012, 2013)



Students must:

- Formulate societally relevant questions and define associated problems
- Develop and use scientific and engineering problem solving models
- Plan, carry out and lead investigations
- Rigorously analyze and interpret data
- Use advanced mathematics and computational thinking in real life problem solving
- Construct explanations and design solutions
- Engage in scientific argument from evidence
- Obtain, evaluate, and communicate scientific information for diverse audiences
- Be prepared to think, live and practice in globally situated engineering workforces

National Research Council and National Academy of Engineering Recognized Strategies for Engaged and Impactful Learning



- **Prepare impactful learning outcomes for students-** focus on A & K higher ordered learning with proving behavior
- **Infuse demos into conceptually & principle oriented courses-** interactive “mini-lectures” (<20 min. intervals), principles provide “glue” for concepts
- **Organize students into small learning communities within courses-** STEM Circles, group projects, ACT model, TPS
- **Engage in authentic, scenario-based (case-based) content instruction-** garnish contemporary scenarios from the field via dept. advisory groups etc.; promotes self-directed learning (metacognition)
- **Design diverse in-class “learn by doing” activities** to actively engage students (cooperative problem solving, student demos)
- **Use a “studio approach” instructional model-** (round tables, instructor in the middle, “see one (demo), try one.”- “tangibles,” (hands-on observations & measurements) or “ponderables,” (complex real world questions & simulations w/discussions).
- Infuse **undergraduate research** in faculty research labs-e.g. ERC, COE model, degree projects).
- Develop comprehensive ways to provide students with **feedback through systematic formative assessment tied to course “products.”**
- **Engage in innovative, globally focused problem solving-**study abroad, in course problem solving with global foci, cross cultural experiences, iPodia, innovation garage.



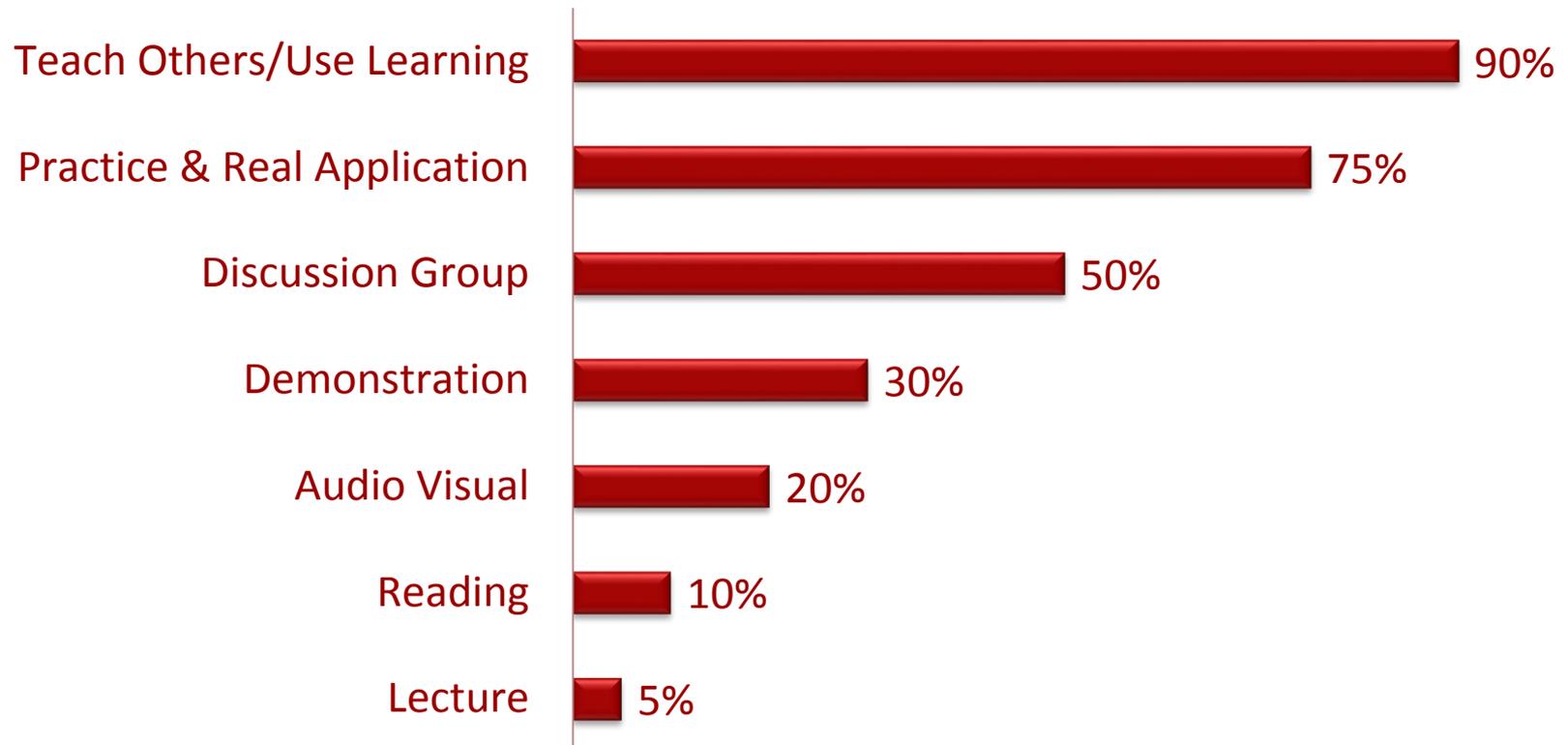
Emphasize Essential Skills/Knowledge/Strategies (= *importance*)

- Teaching is only as good as the learning that takes place
- Education is meaningless when it is reduced to an unending list of content topics for which the student quickly learns the facts, takes the test, and then forgets it all



Pedagogical Approaches Aligned with Knowledge Retention/Transfer

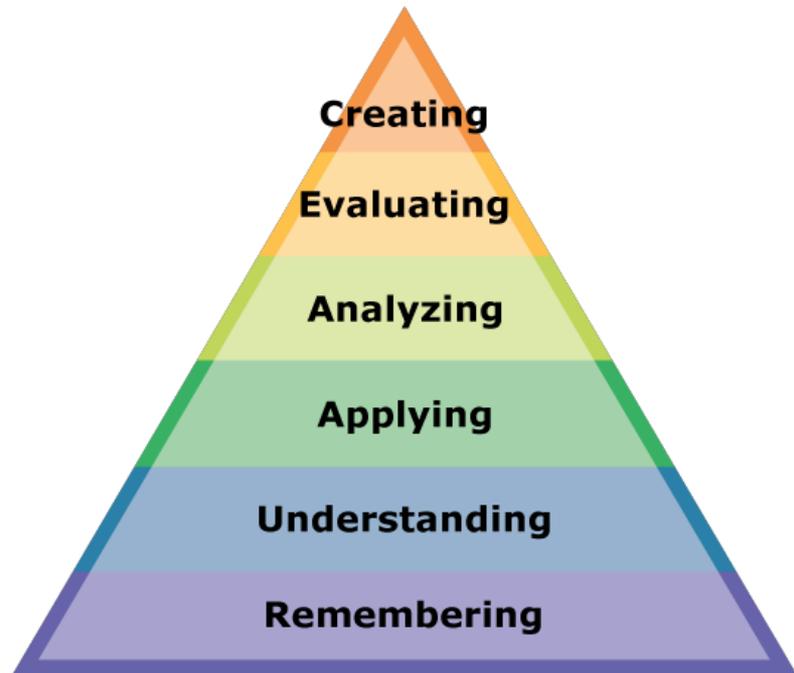
Percentage of Transfer



Linking Outcomes Focused Taxonomies to Learning Objectives



- Learning objectives are based on course outcomes
 - Specific statements about which outcomes related to learning are expected of the student
- Application of the Anderson & Krathwohl's taxonomy
 - Enables faculty to relate cognitive processes to instructional tasks and expected student outcomes
 - Facilitates documentation of student progress and analysis of patterns and components of student learning
 - Enables faculty to determine how instruction impacts different levels of learning

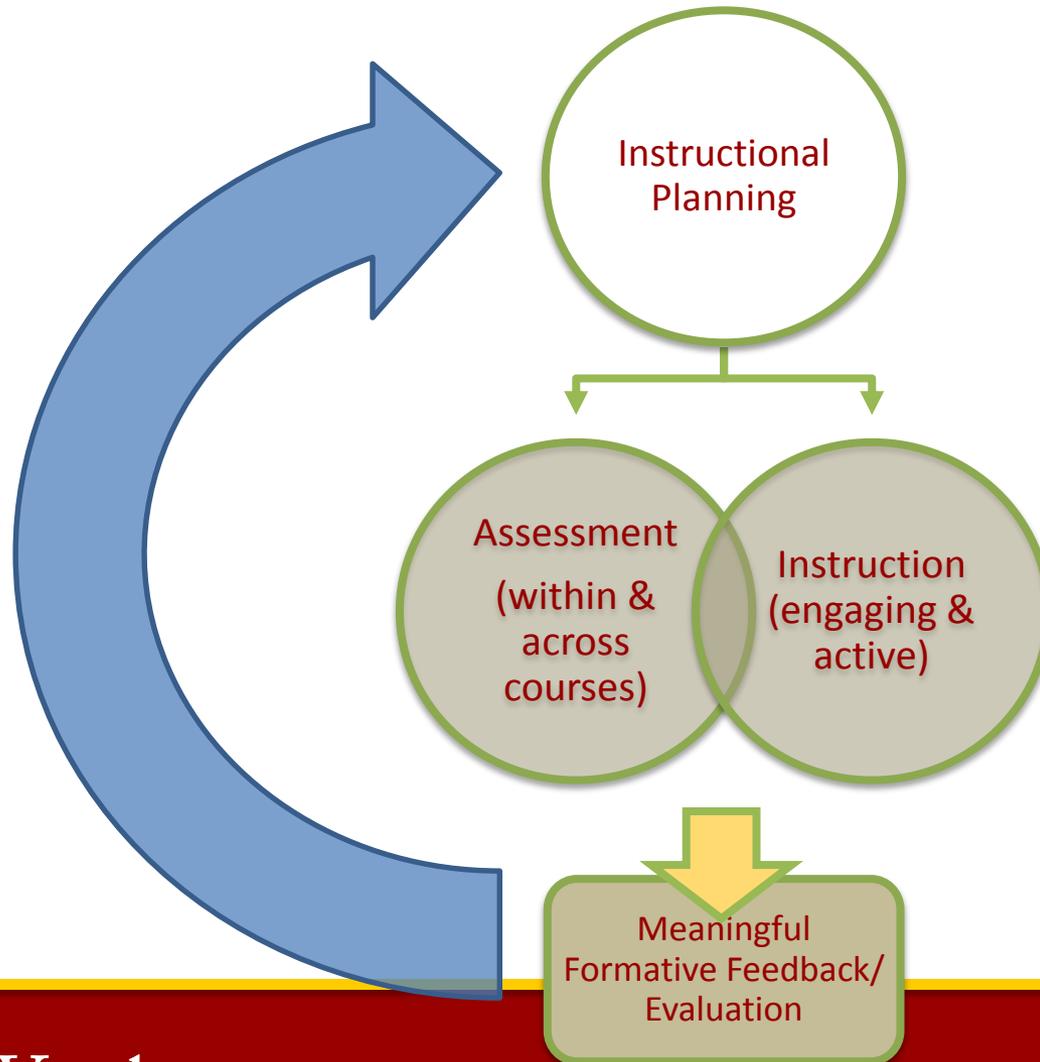




Categorized Types of Engagement Strategies

- **Rehearsal**
 - Review
 - Recitation
 - Teaching (ACT, TPS)
 - Think aloud
 - Demos & “Tangibles”
- **Elaboration**
 - Summarization
 - Quick Writes
 - Re-statements
 - Answering questions
 - Generalizations
- **Organization/Application**
 - Selection of main idea/Key concept
 - Identification of supporting details
 - Outlines
 - Worked Examples
 - Planning/articulating solution
 - Solving a problem (Scenarios, cases, & problems) using forward thinking
 - Debates on ill defined problems
- **Representation**
 - Mapping of ideas & key concepts
 - Semantic Maps
 - Mapping of Procedures (Flow Maps)
 - “Ponderables” & Simulations
 - ★ **Important:** Course type and content should guide strategy.

Instructional Planning for Performance



Specific VSoE Engaged Learning Activities



- Initiated in October 2013
- “Taxonomized” 234 courses using engaged learning strategies
- Approximately 110 “early adopter” faculty members using engaged pedagogy reforms 2013-2016
- Addresses needs of both graduate & undergraduate courses
- Aligns with ABET criterion 3
- All early adopters are full time faculty (*mix of T/ TT w/ teaching faculty*)
- 2014-16- filmed engaged pedagogy in action as exemplars (and evidence) to provide professional development for faculty
- Transforming in-class and technology mediated environments to maximize student engagement



- Creating a repository of VSoE engaged pedagogy exemplars on secure web site for faculty to review and adopt- *Could be shared with other Schools of Engineering-national impact*
- Three funded NSF projects to study these efforts (two more are under review)
- ★★ Many opportunities for new faculty to join our efforts!★★

Formative Initiative Results



- Video-taped proof of increased in class engagement
- Improved student-student, student-faculty & team interaction
- Expansive & comprehensive team projects



- Just in time formative tutoring leads to improved exam results-personalize learning.
- Improved class attendance
- Improved student achievement (exams and projects)



Questions???



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