ACTIVE LEARNING

Assoc. Prof. Ir. Dr. Hayati Abdullah

PEng CEng CMarEng ASEAN Eng M. AFEO FIMarEST FIEM MIEEE REEM

Director

Centre for Teaching & Learning, UTMLead

Universiti Teknologi Malaysia

Learning Outcomes

At the end of the workshop, participants are expected to be able to

- Explain the key learning principles that underpin the use of active and experiential learning methods
- Evaluate the use of a range of active and experiential learning methods
- Produce a range of active and experiential learning activities to promote disciplinary learning outcomes

“Learning is not a spectator sport. Students do not learn much just by sitting in class listening to teachers, memorizing pre-packaged assignments...

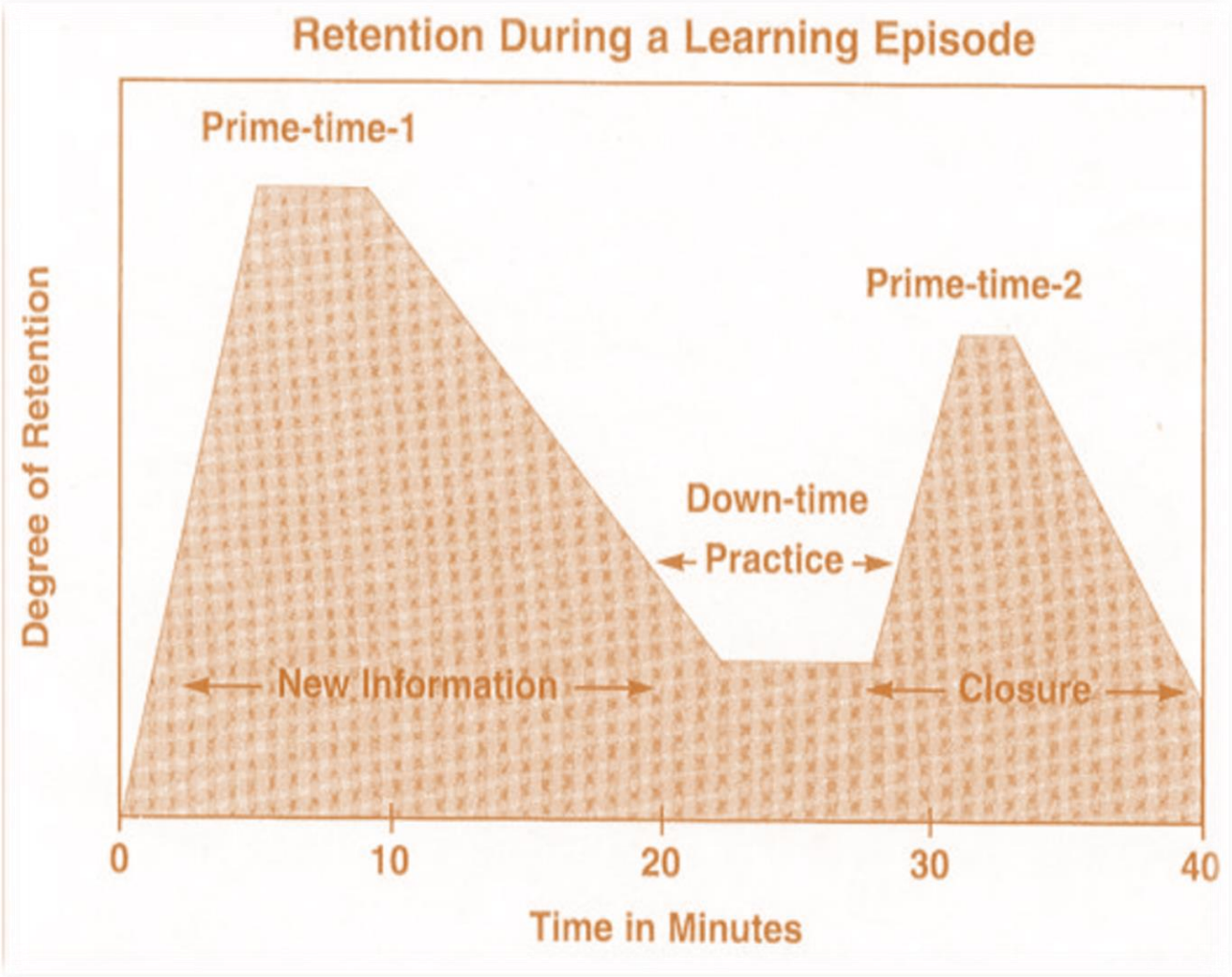
They must talk about what they are learning, write about it, relate it to past experiences, apply it to their daily lives. They must make what they learn part of themselves”

(Chickering & Gamson, 1987, Seven principles for good practice in undergraduate education, p.3)
-Adapted from CDIO Workshop Component 2, Dennis Sale (Singapore Polytechnic), 2012

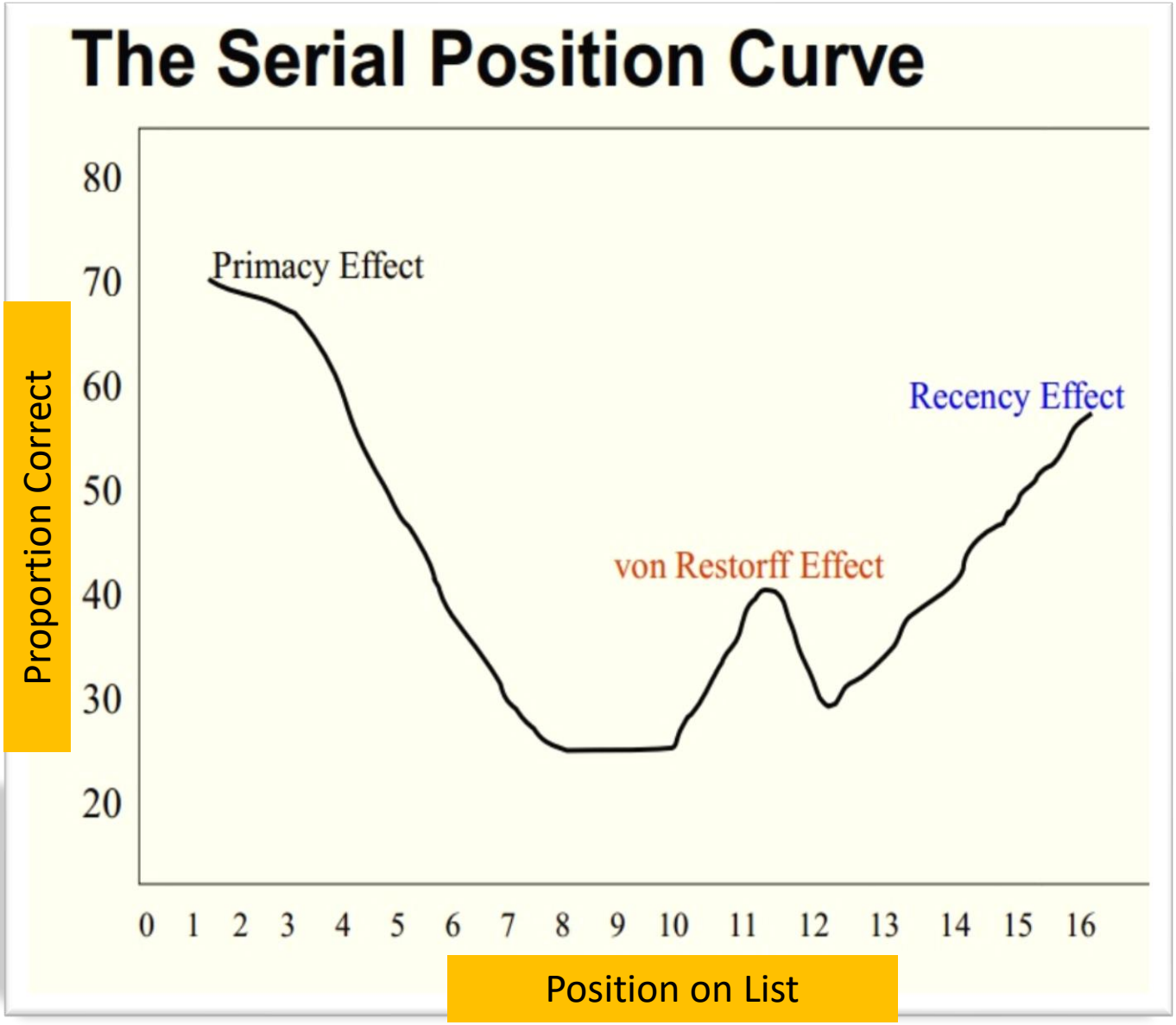
Psychological Effects

- It’s not possible to be attentive for long periods of time
- We can’t take in too much information at once
- The brain needs time to process the information
- Discussing new learning and applying it in practice helps builds effective long term memory

Adapted from CDIO Workshop Component 2, Dennis Sale (Singapore Polytechnic), 2012



Adapted from CDIO Workshop Component 2, Dennis Sale (Singapore Polytechnic), 2012



Adapted from CDIO Workshop Component 2, Dennis Sale (Singapore Polytechnic), 2012

Psychological Effects

- Primacy Effect (the tendency for the first items presented in a series to be remembered better or more easily)

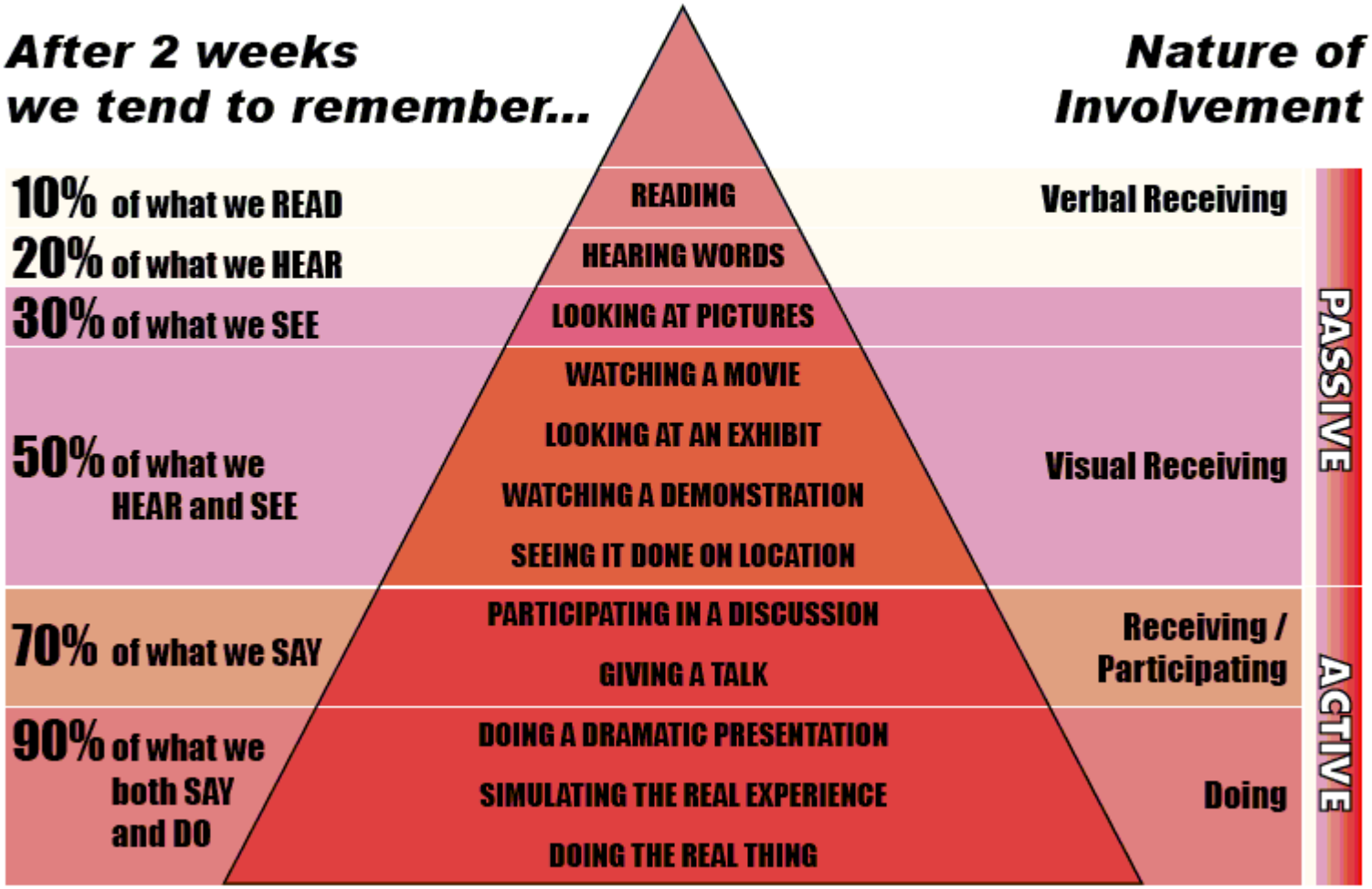
- Recency Effect (the tendency for the most recently presented items or experiences to be remembered best)

- Von Restorff Effect (the tendency to remember distinct or novel items and experiences)

Adapted from CDIO Workshop Component 2, Dennis Sale (Singapore Polytechnic), 2012

ACTIVE LEARNING

Cone of Learning (Edgar Dale)



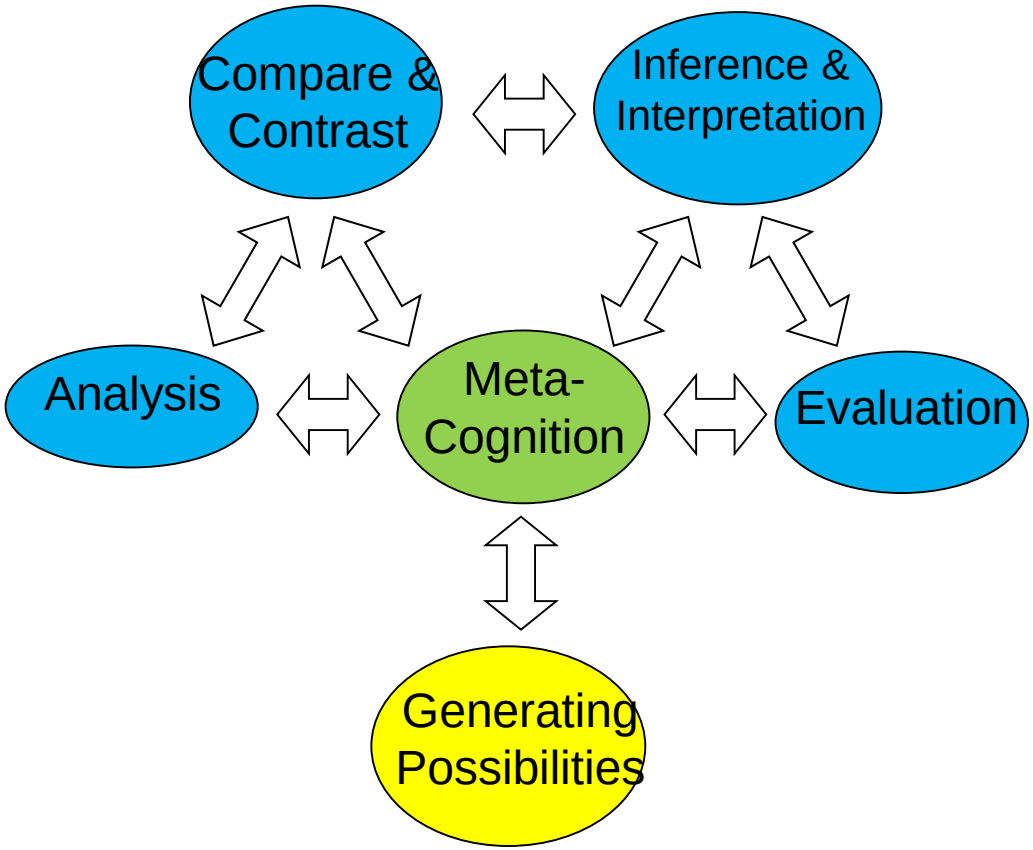
Edgar Dale, *Audio-Visual Methods in Technology*, Holt, Rinehart and Winston.

What is Active Learning ?

- *Active learning is "anything that involves students in doing things and **thinking** about the things they are doing" (Bonwell & Eison, 1991, p. 2)*

What is **good thinking**?

A Model of Thinking



Dennis Sale, 7-9 June 2012, Temasek Foundation-Singapore Polytechnic, CDIO Workshop

What is Active Learning ?

*Michael Prince explains, "Active learning is generally defined as any instructional method that engages students in the learning process. In short, active learning requires students to do **meaningful** learning activities and **think** about what they are doing" (Prince, 2004)*

Basic Activities

Reading

- Active learning exercises such as summary, note checks and mind map can help students process what they've read and help them develop the ability to focus on important information

Basic Activities

Listening

- When they listen, we want to ensure that it's meaningful listening, relating what they hear to what they already know

- And they need **reasons** to listen, reasons perhaps more immediate than a good grade at the end of the semester

- Did the lecturer ask a question before the lecture segment that was thought-provoking enough to cause the students to search for the answer in the words that followed?

Basic Activities

Talking

- When students talk about a topic, whether answering a teacher's question or explaining a point to another student, they organize and reinforce what they've learned

Basic Activities

Writing

- writing provides a means for students to process new information in their own words

- It is particularly effective in large classrooms where breaking students into pairs or groups may be restrictive

Basic Activities

Doing

“Give the pupils something to do, not something to learn; and the doing is of such a nature as to demand thinking; learning naturally results.”
*……**John Dewey***

*"For the things we have to learn before we can do them, we learn by doing them“……..**Aristotle***

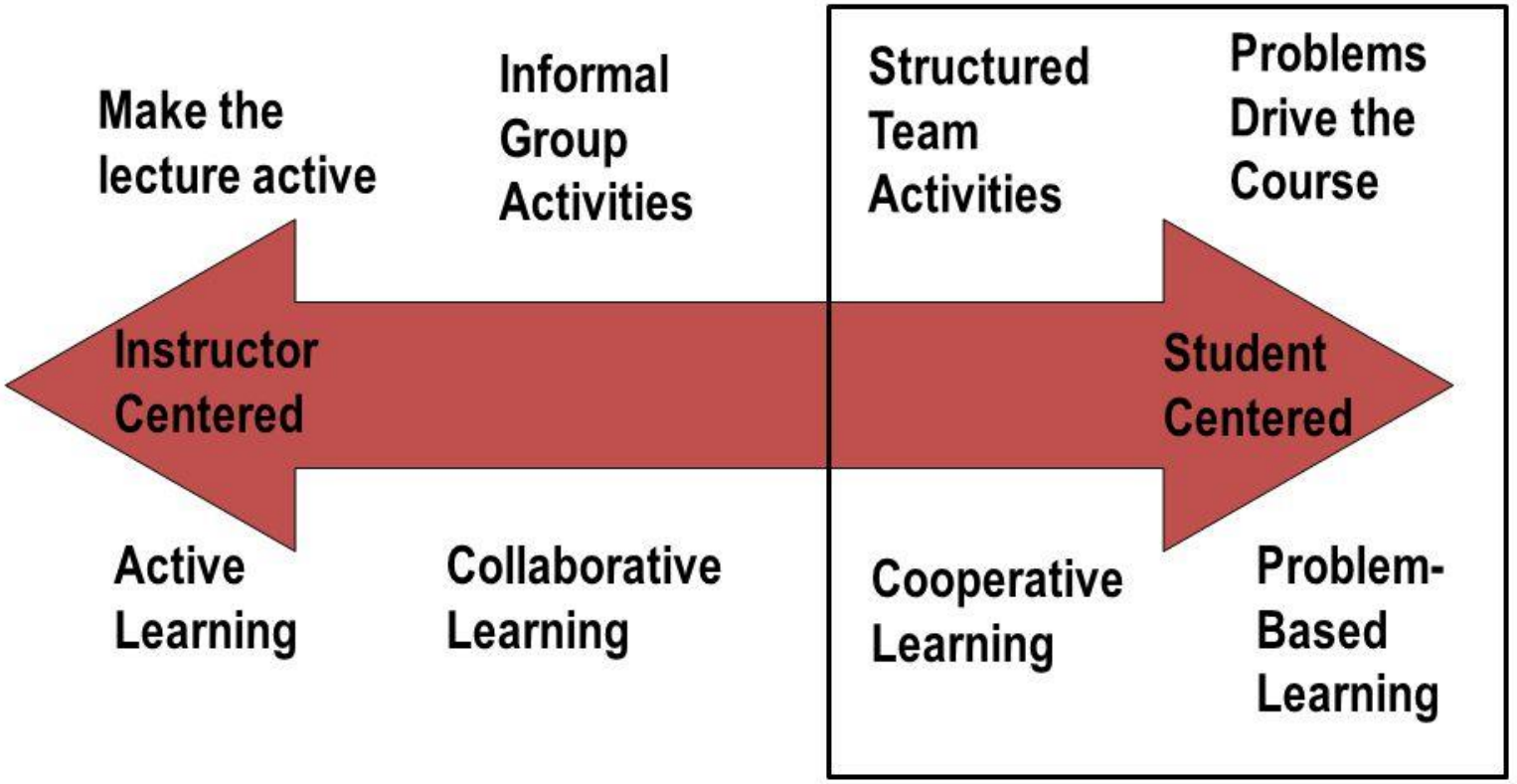
Basic Activities

Reflecting

- In a typical lecture, the lecturer stops talking at the end of the class. Students gather up their notes and run for their next class.
- They've had no time to reflect, to connect what they've just learned with what they already know, or to use the knowledge they've gained in any way
- Allowing students to pause for thought, to use their new knowledge to teach each other, or to answer questions on the day's topics is one of the simplest ways to increase retention

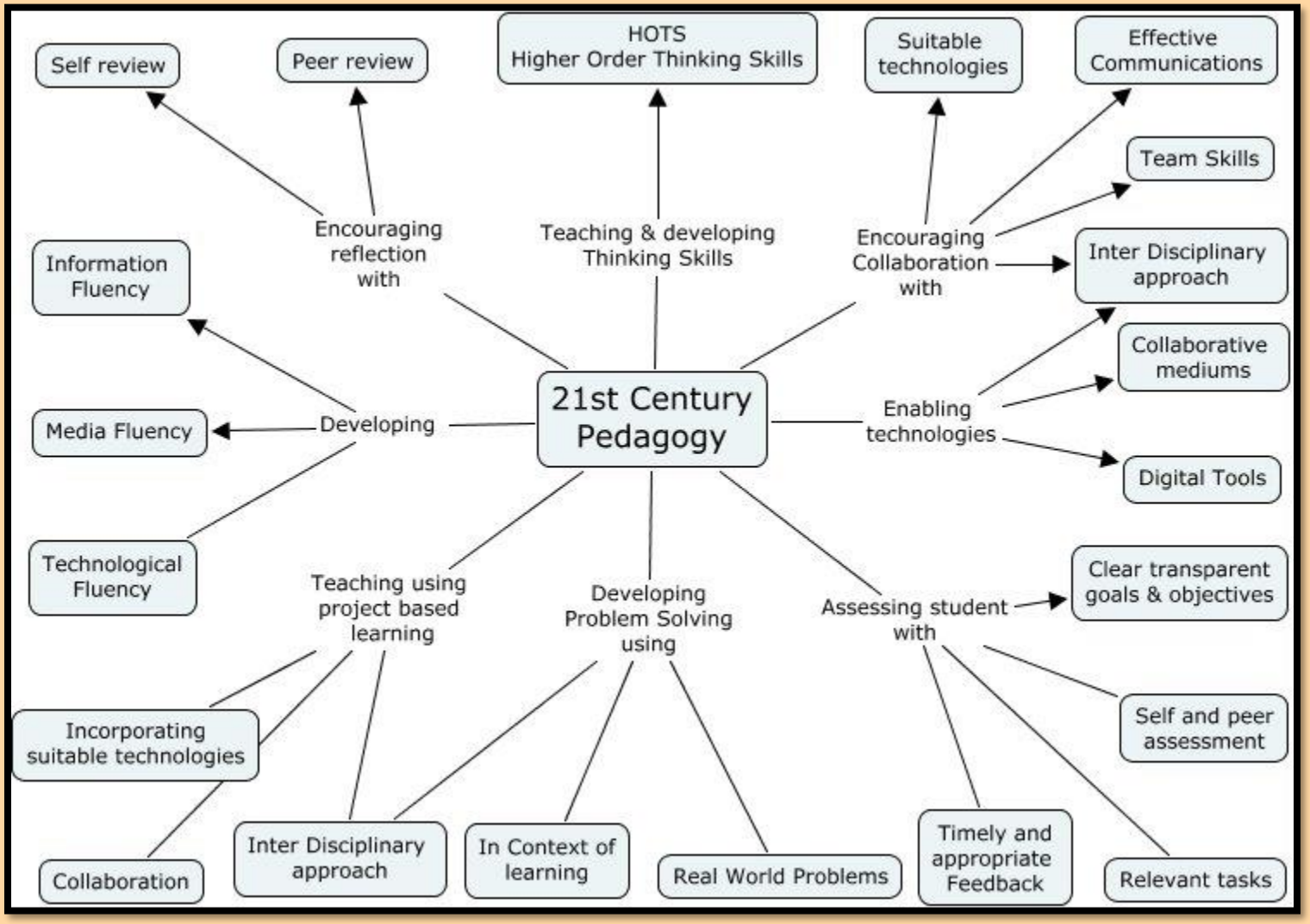
IMPLEMENTING ACTIVE LEARNING

The Active Learning Continuum

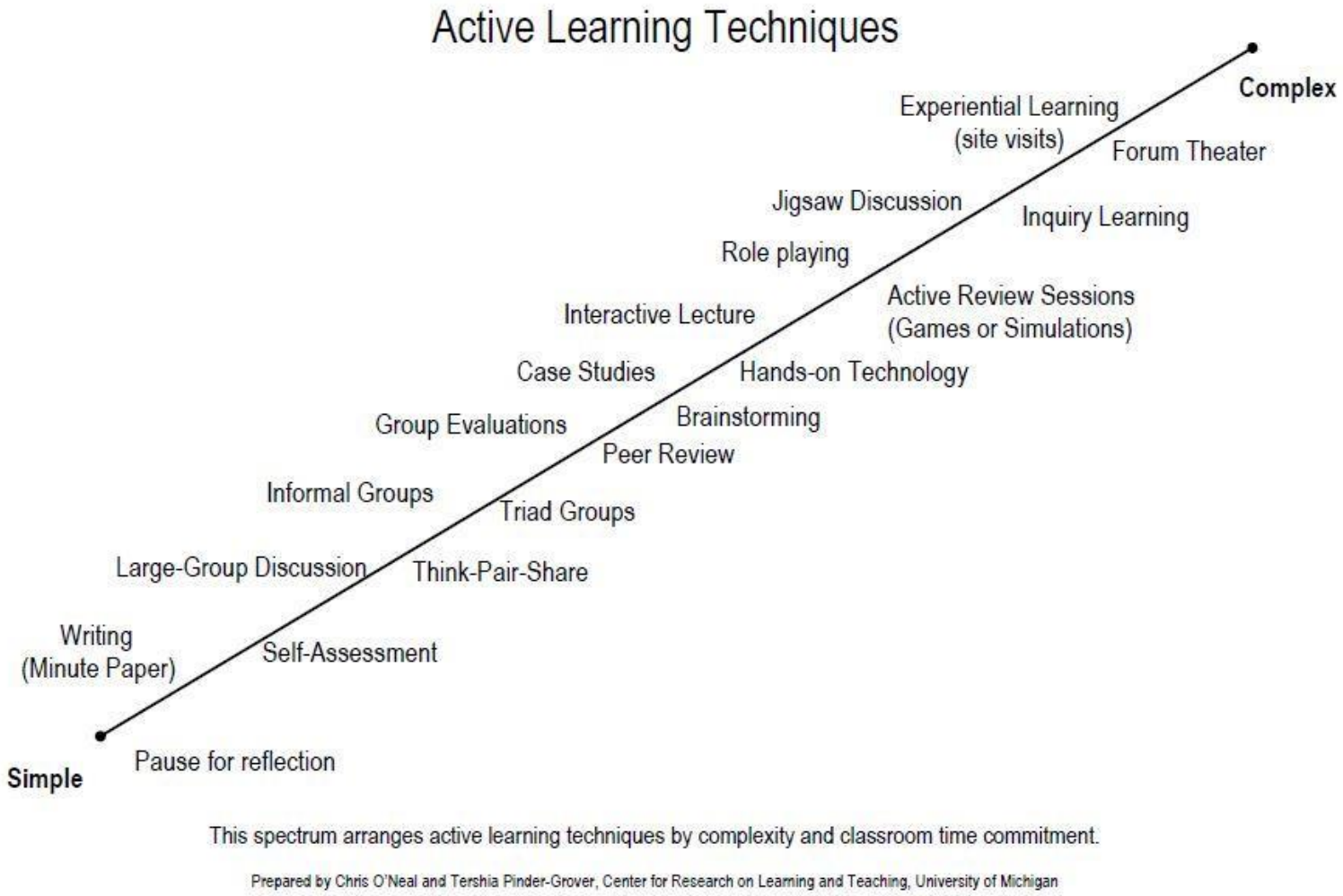


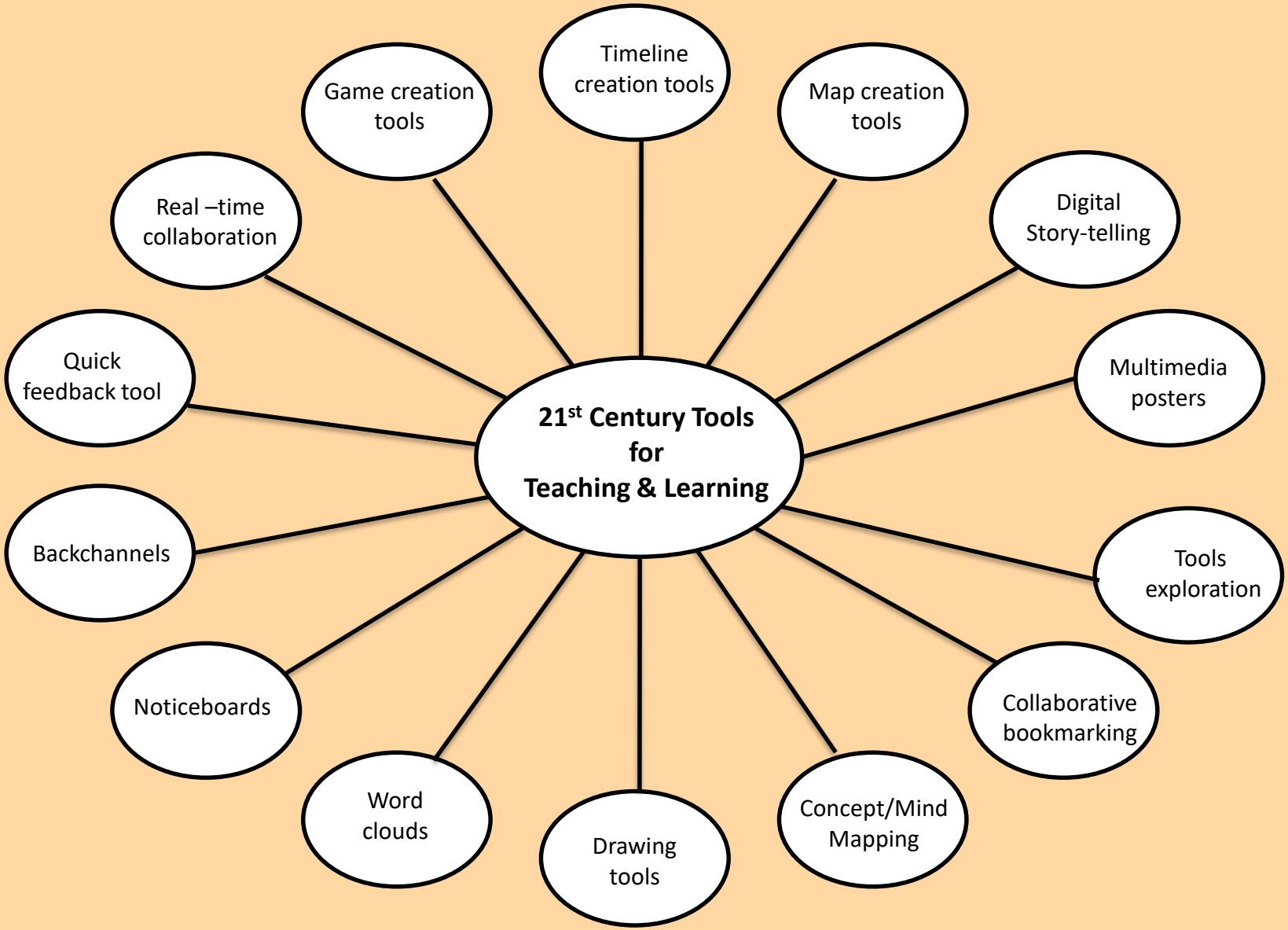
Strong Evidence Base – Cooperative Learning & Challenge-Based Learning

Prince, M. (2010). NAE FOEE



Source: http://edorigami.edublogs.org/2008/08/16/21st-century-pedagogy/


Active Learning Techniques
Complex
Experiential Learning
(site visits)
Forum Theater
Jigsaw Discussion
Inquiry Learning
Role playing
Active Review Sessions
(Games or Simulations)
Interactive Lecture
Case Studies
Hands-on Technology
Group Evaluations
Brainstorming
Peer Review
Informal Groups
Triad Groups
Large-Group Discussion
Think-Pair-Share
Writing
(Minute Paper)
Self-Assessment
Simple
Pause for reflection
This spectrum arranges active learning techniques by complexity and classroom time commitment.
Prepared by Chris O'Neal and Tershia Pinder-Grover, Center for Research on Learning and Teaching, University of Michigan



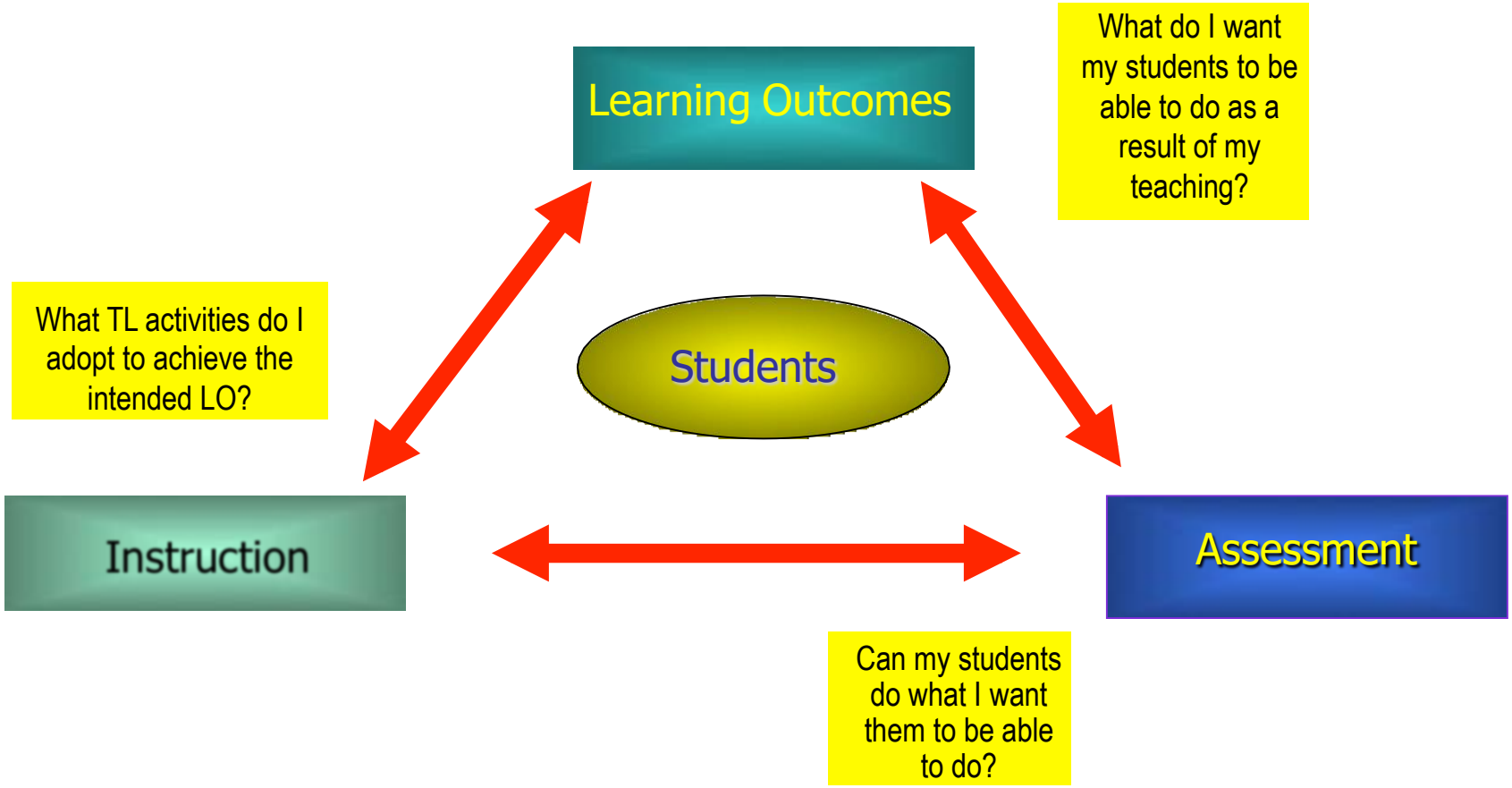
Source: http://21ctoolsoutline.weebly.com , London Centre for Leadership in Learning, Institute of Education, UK

Active Learning Planning

When planning and presenting active learning strategies to your students, make sure to consider four elements:

- the goal of the activity
- the outcomes you expect of students
- the procedure they should follow
- and the time limit for the activity

Constructive Alignment

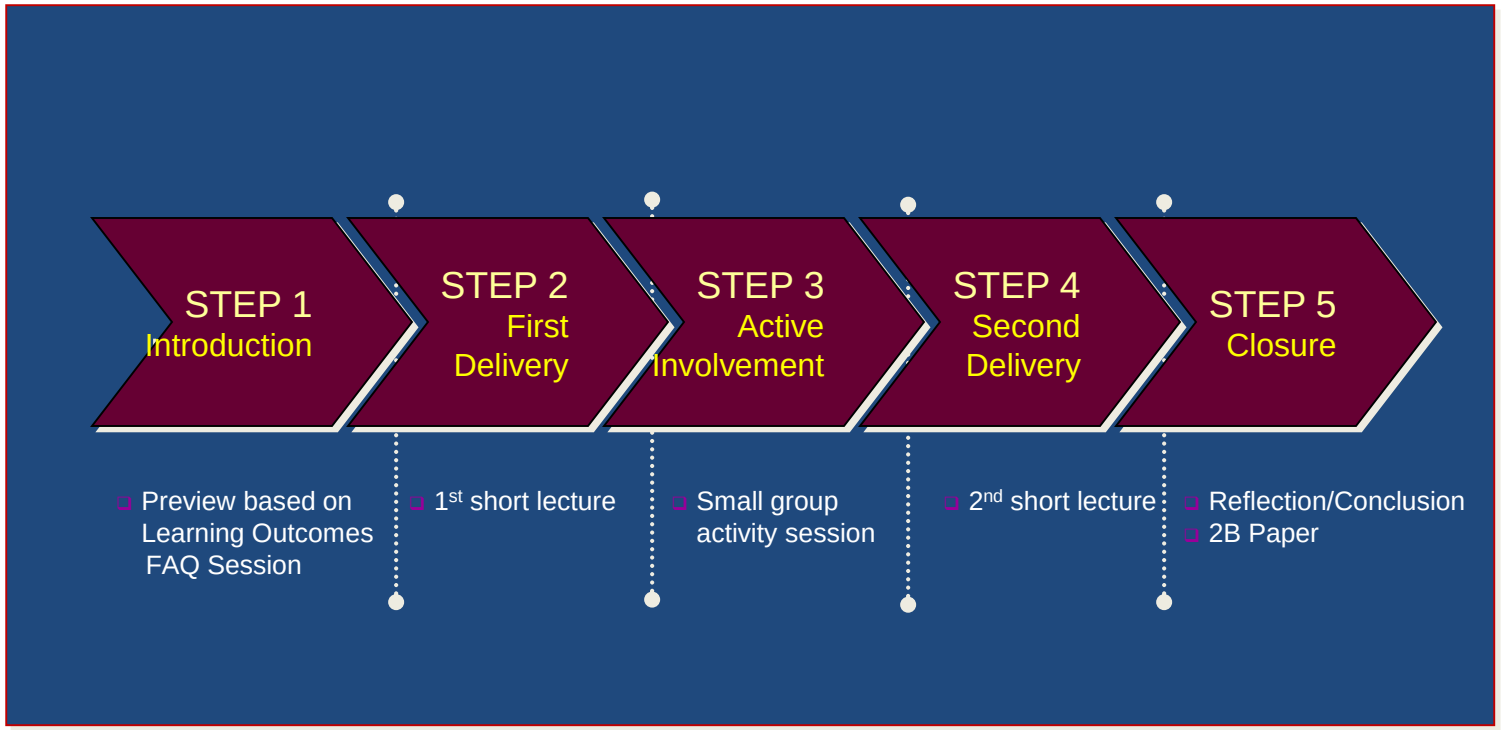


Felder & Brent, JEE, Jan., 2003

5-Step Model for Active Learning

To develop a culture of involvement by engaging students in thinking & learning

(Listen, Read, Write, Discuss and Solve problems)



A Plan for 5-Step Model for Active Learning

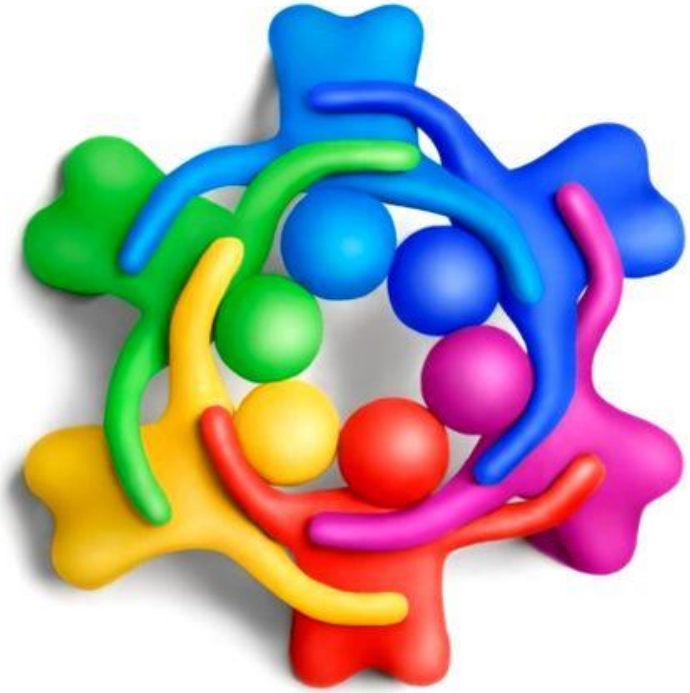
Time	Topic	Lecturer's Activities	Student's Activities	Learning Outcome Addressed	Assessment

Week 4	Topic 2	• Give Short Lectures
		• Prepare Active Learning Problem
			• Think-pair-share
			  ◦ Pair with a partner
			  ◦ Discuss ideas on strategies to solve problem
			  ◦ Use problem solving technique to give response on the solution
				• Ability to identify the state of pure substances on property diagrams and analyze phase change process	• Empty Outlines
					• Assignment 2

Active Learning Tips

- Be creative! Invent new strategies and adapt existing ones to your needs.
- Start small and be brief.
- Develop a plan for an active learning activity, try it out, collect feedback, then modify and try it again.
- Start from the first day of class and stick with it. Students will come to expect active learning and perform better.
- Be explicit with students about why you are doing this and what you know about the learning process.

COOPERATIVE LEARNING



Cooperative Learning

To develop

- teamwork skills
- a culture of lifelong learning
- oral & written communication skills
- and inculcate creative & critical thinking skills

Cooperative Learning (CL)

Informal CL

- incorporates group learning with small groups throughout the lesson or by discussion at the end of a lesson, and typically involves groups of two (e.g. think-pair-share, concept questions and Three-Step Interview). These groups are often temporary and can change from lesson to lesson

Formal CL

- is structured, facilitated, and monitored over time and is used to achieve group goals in task work. T&L strategies include jigsaw techniques, case studies and assignments involving group problem solving and decision making.

Informal CL

Think

Pair

Share

Think-Pair-Share

- A strategy designed to encourage a high degree of pupil response and can help keep students on task
- Easy to use in large classes
- Helps students develop conceptual understanding of a topic, develop the ability to filter information and draw conclusions, and develop the ability to consider other points of view

Informal CL

Using Think-Pair-Share

- With students seated in teams of 4, have them number them from 1 to 4
- Announce a discussion topic or problem to solve
- Give students a few minutes of 'think time' to THINK & WRITE their own answer
- Using student numbers, announce discussion partners. (Example: For this discussion, Student #1 and #2 will be partners – Be sure to switch the discussion partners frequently)
- Ask students to PAIR with their partner to discuss the topic or solution
- Randomly call on a few students to SHARE their ideas with the class.

Informal CL

Concept Questions

- A strategy designed to increase student understanding of fundamental concepts
- Easy to use in large classes

Informal CL

Using Concept Questions

- After an important concept has been explained in a lecture, a multiple-choice concept question is displayed, and each student indicates which answer he or she believes is correct (high-tech method: use clickers, or low-tech method: show of hands)
- If most students choose the correct answer, the lecturer may give a brief explanation and move on. However, if a substantial proportion of students have chosen a wrong answer, then the students discuss the question with their immediate neighbors in the lecture room, explaining the concept(s) and their reasoning to each other and trying to agree on the correct answer
- At the end of these brief student discussions, the lecturer again asks the students to choose the answer for the concept question

Informal CL

Three-Step Interview

- To engage students in conversation for the purpose of analyzing and synthesizing new information
- Helps students personalize their learning and listen to and appreciate the ideas and thinking of others
- Active listening and paraphrasing by the interviewer develops understanding and empathy for the thinking of the interviewee

Informal CL

Using the Three-Step Interview

- Students work in pairs. One is the interviewer, the other is the interviewee
- The interviewer listens actively to the comments and thoughts of the interviewee, paraphrasing key points and significant details
- Student pairs reverse roles, repeating the interview process
- Each pair then joins another pair to form groups of four. Students introduce their pair partner and discuss the different components of the given topic or problem

Informal CL

Numbered Heads Together

- Promotes discussion and accountability (individual and group)
- Beneficial for reviewing & integrating subject matter
- Students are placed in groups of 4 and each person is given a number (one to four)
- The lecturer poses a question and students "put their heads together" to figure out the answer
- The lecturer calls a random number and the students with that number raise their hands, and when called on, the student give the respond for his/her team

Formal CL

Assignments involving group problem solving and decision making/Project Work

Team formation

- Structure the learning environment by grouping students into teams (eg. 3-5 students) based on specified criteria
- Announce project topics and use a lottery system to let students pick the topics

Formal CL

Assignments involving group problem solving and decision making/Project Work

- Assist students develop skills in teamwork
  - Groups are formed early in the semester and *kept intact* for the whole semester
  - Teams establish goals and expectations and set ground rules:
    - » Project Planning/Scheduling
    - » Meetings
    - » Communication between members
    - » Feedback and criticisms
    - » Accountability

Formal CL

Assignments involving group problem solving and decision making/Project Work

- Assist students develop skills in teamwork
  - Promote positive interdependence
    - » Assign roles to team members
    - » Team members select their leader/coordinator, secretary/ recorder, report editor, presentation coordinator etc.
    - » Use 'Jigsaw method' to provide specialised expertise for each team. This approach is especially useful for final year students of an option/elective course

Formal CL

Assignments involving group problem solving and decision making/Project Work

- Build in individual accountability
  - Call randomly on individuals to present and explain team progress and results in class
- Peer Rating
  - Get each team member to rate everyone's performance to reflect each individual's level of participation and effort and sense of responsibility
  - The final individual project grade takes into account the weighing factor obtained from peer rating by the team members through the use of the auto rating system

Formal CL

Jigsaw Technique

- Each student of a "Base" group is to specialize in one aspect of a learning unit
- Students meet with members from other groups who are assigned the same aspect, and after mastering the material, return to the "Base" group and teach the material to their group members
- Each student's part is essential for the completion and full understanding of the final product/result

Formal CL

Using Jigsaw Technique

- Each student receives a portion/part of the materials to be learned
- Students leave their “Base" groups and meet in “Specialist" groups
- Specialists groups discuss the material and brainstorm ways in which to present their understandings to the other members of their “Base” group
- The specialists return to their “Base” groups to teach their portion/part of the materials and to learn from the other members of their “Base” group
- The “Base” group uses their knowledge to solve the assigned problem/issues

Experiential Learning

- "Learning is the process whereby knowledge is created through the transformation of experience" *(Kolb, 1984, p. 38)*
- Kolb's experiential learning theory is represented by a four-stage continuous learning cycle:

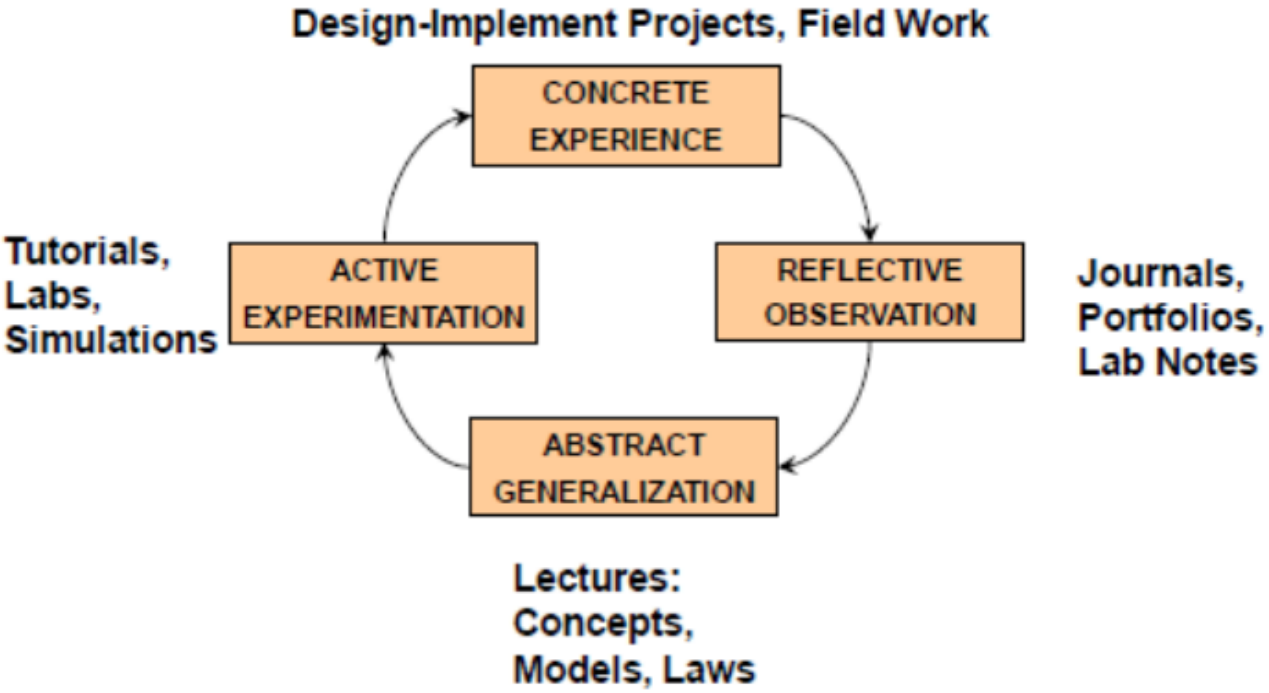
  1. Concrete Experience (a new experience or situation is encountered, or a reinterpretation of existing experience).

  2. Reflective Observation of the new experience (of particular importance are any inconsistencies between experience and understanding).

  3. Abstract Conceptualization (reflection gives rise to a new idea, or a modification of an existing abstract concept).

  4. Active Experimentation (the learner applies them to the world around them to see what results).

Experiential Learning Cycle: Connecting Methods



Experiential Learning Cycle – From Kolb, 1984

Experiential Learning

- Experiential learning is a method of educating through ‘real world’ learning tasks such as:
  - Simulations
  - Problem solving through case studies
  - Project/Problem-based learning (PoPBL/PBL) activities
  - Any activity that essentially models what would be done in the real work scenario
- Skills, knowledge, and experience can be acquired outside of the classroom setting, and may include internships, field work, field trips, field research, community and service-learning projects.

Core Principles of Learning

1. Learning goals, objectives and expectations are clearly communicated
2. Learners' prior knowledge is activated and connected to new learning
3. Motivational and Attentional strategies are incorporated into learning designs
4. Content is organized around key concepts and principles that are fundamental to understanding the key structure of a subject
5. Self-directed learning is encouraged through facilitating the development of good thinking

Dennis Sale, The Challenge of Reframing Engineering Education, Springer 2014, p. 33-42

Core Principles of Learning

6. Instructional methods and presentation mediums engage the range of human of senses (e.g. visual, auditory, kinaesthetic)

7. Learning design takes into account the working of memory systems

8. Learner competence is promoted through active and experiential learning

9. A psychological climate is created which is positive, success orientated and promotes self-esteem

10. Assessment practices are integrated into the learning design to promote desired learning outcomes and provide quality feedback

Dennis Sale, The Challenge of Reframing Engineering Education, Springer 2014, p. 33-42

Tell me and I may forget
Show me and I may remember
Involve me and I will understand

- *Chinese Proverb*

I Learned Something Today!

....Thank You