

Capturing a Group's Unquantifiable Understanding of a Concept

Capturing what a group knows about the topic at the beginning and end of the learning period

1. Combine Individual's Understanding

2. Measure Group Throughout Learning

1a. Average

1b. Sum

1c. Most / Least

2a.

Develop unique method for group's understanding

2b.

Use methods for individuals as a group

- % of students who understood topic for each learning objective. Transforms data into a more quantifiable set, easy to perform analysis on.
- "Understanding" a topic when a threshold of learners understand it. Realistic target goal

- If anyone understands a topic, the group does. Like 2b, but learners don't get to work together

- Using the learner that understood the least as what the group learned. Good for situations where *everyone* needs to understand a concept.
- Same but the learner who understood the most. Might be useful to find the upper limit of a lesson's effectiveness

Developing a unique method for capturing the group's knowledge that does not rely on individual assessment.

Wouldn't fall under our research expertise, would require educational research experts.

Treating the group as parts of one individual, more useful in situations where a group is working together throughout a project

Determining Learning Objectives and Measuring Effectiveness

Effectiveness is derived from the delta of knowledge between the start and end of the learning experience

Pros

- Effectiveness is adapted to the skillset of the group
- Better for a more free-flowing learning experience, rather than needing learners to understand specific concepts

Cons

- If the lesson is oriented towards a specific skill level, higher skill levels might not be shown as improving as much
- Does not account for the relevance or truth of knowledge

Learning objectives are predetermined and effectiveness is derived from the delta of knowledge between the group and the objectives

Pros

- Keeps within relevant learning outcomes and measures against a specific goal
- Better for more structured learning with goals that need to be hit

Cons

- Lacks the ability to capture learning outside the lesson goals
- Lessons that adapt to the learners' interests and skillsets will appear to do worse

Capturing a Group's Understanding of a Concept in a Deliverable Format

1. Quantitative

- Graded Assessments (ie. tests, exams)
- Measurable applications (ie. homework)

2. Visual, Conceptual

- Concept Maps
- Rubrics (fall in gray space between 1 and 2)

3. Written, Verbal

- Reports
- Parent-Teacher Conferences

Visualizing a Group's Understanding of a Concept

Reading

- Successive Concept Mapping: Assessing Understanding in College Science Classes
 - Examples of concept maps being effective in college science classes
- The Role of Visual Representation in the Assessment of Learning
 - Students creating art to represent what they've learned, targets affective learning rather than cognitive learning
- Assessing Children's Understanding of the Work of Computer Scientists: The Draw-a-Computer-Scientist Test
 - Students drawing computer scientists at the beginning and end of a course to see how they view the people that work in the field
 - Based on the Draw-A-Scientist Test
- Concise Graphical Representations of Student Effort on Weekly Many Small Programs
 - Graphing students' progress of weekly programming assignments

Alternate Solutions

grouped by specificity level

Assessing Understanding

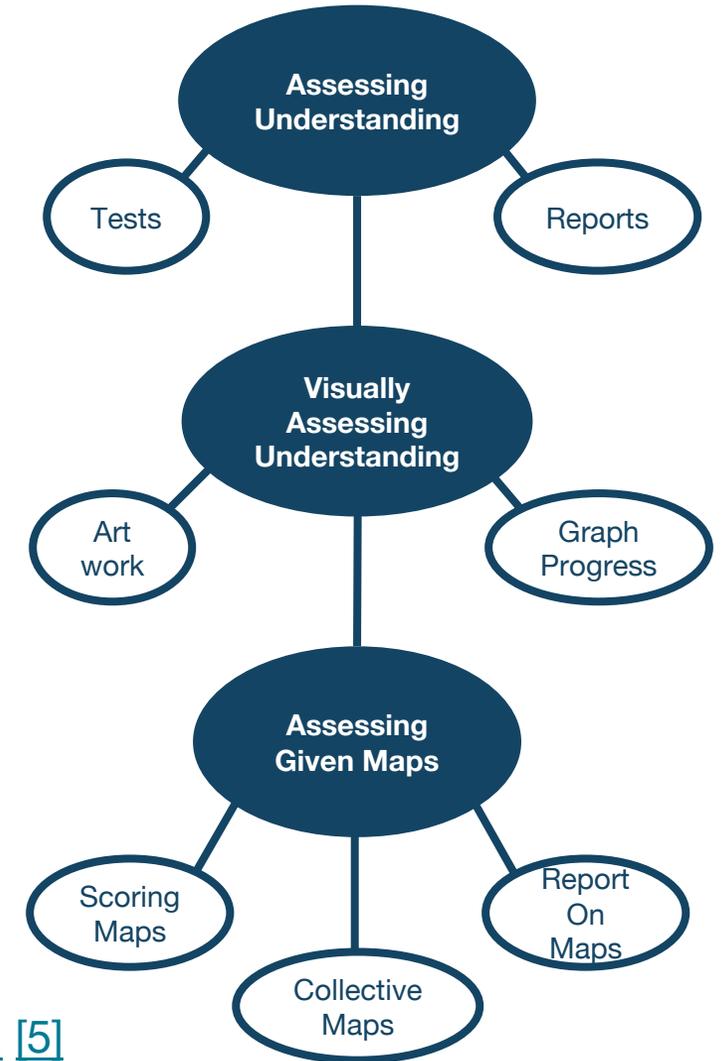
- Tests, Homework, Other Graded Work
 - Basic, quantitative assessments. Not really our field
- Reports, Meetings
 - Reports on a student or classes understanding, standard way of expressing students' understanding in a nuanced manner

Visually Assessing Understanding

- Representing understanding through artwork [\[1\]](#) [\[2\]](#)
 - More related to affective learning, research has been done on visualizing a student's attitude toward a topic
- Graphing progress of modules or goals [\[3\]](#)
 - Work has been done to graph students progress through assignments over a week

Assessing a group's understanding given individual concept maps

- Scoring concept maps and comparing scores through data visualization [\[4\]](#) [\[5\]](#)
 - Lots of research has been done on scoring concept maps, with various methods
- Generating a report of understanding based on concept maps [\[6\]](#)
 - Could work in tandem with a collective concept map, probably in the realm of future work. Not much research done, but some research on extracting prerequisites which could be adapted to fit this solution

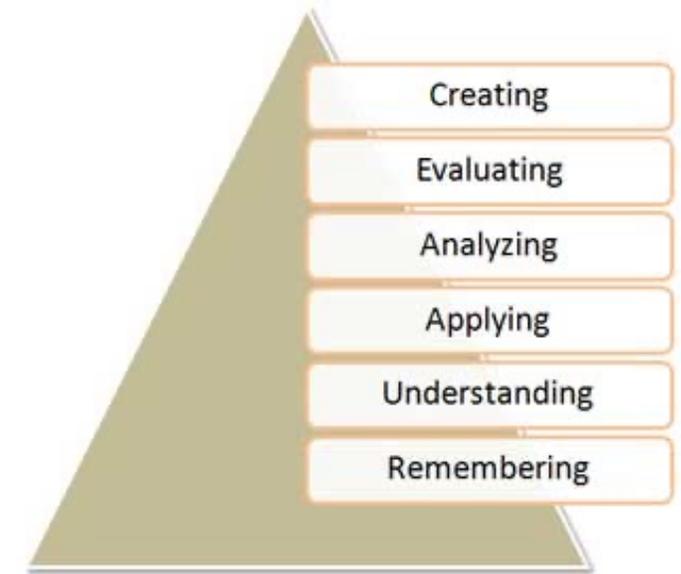


Questions To Be Answered

- For what purpose are we capturing the group's understanding?
- What domain of learning is this meant for?
 - Cognitive Learning, focusing on the understanding level
- Why are we looking at the group as a whole?
- Why do we need it to be visualized?
- Why are we dismissing scoring methods?

Glossary

- Learner: Pupil, student, one who is being taught
- Understanding: “Comprehending the meaning, translation, interpolation, and interpretation of instructions and problems.” – Don Clark
- Cognitive Learning: Standard classroom domain of learning, mental skills and knowledge



The Three Domains of Learning

The committee identified three *domains* of educational activities or [learning](#) (Bloom, et al. 1956):

- **Cognitive:** mental skills (*knowledge*)
- **Affective:** growth in feelings or emotional areas (*attitude or self*)
- **Psychomotor:** manual or physical skills (*skills*)