SIGLES021116

ICLS2002

"Keeping Learning Complex"
2002 10 22 26
Seattle, WA. U.S.A.

- The International Society of the Learning Sciences
- ICLS CSCL
  - CSCL2003 6
  –

---

8 31

'
– Inquiry
– Science skills learning
– Sustainable community

(blank slide)

Sustainable community
8 31

-
  – xxxx
  – inquiry
  (Super curriculum)

-

-
  – micro-genesis
  – interplay…)
  – affective…

---

interplay…)

- Keynote "Keeping learning alive" -Jay Lemke
- Special session "The interplay of culture, cognition, and identity in classrooms"
- Closing remarks by Carol Lee, Yasmin Kafai

---

affective…

- Jay Lemke: "Keeping learning alive"
  – Long-term planning
  – Lifelong assessments
  – Involving target people (15-17 year olds) into planning for creation of visions for the future

---

ICLS2002
Seattle, Washington
2002/10/25

Special Session 8.4

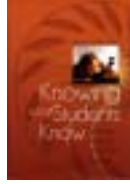### Assessment of complex learning

Organized by
Naomi Myake, Chukyo University
James Pellegrino, U. of Illinois Chicago

Assessment of complex learning:

Towards a better integration of
cognitive models,
empirical observations,
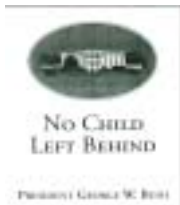and substantive interpretation

---

Dr. James W. Pellegrino

National Academic Press,
2001

To Test or Not to Test, That Is Not The Question!

Jim Pellegrino
University of Illinois at Chicago

No Child Left Behind

PRESIDENT GEORGE W. BUSH

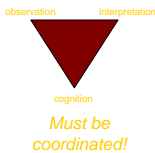## ESEA/NCLB Key Requirements

- Annual assessments of all students in Math and Reading for Grades 3-8, and once in grades 9-12, beginning no later than 2005/2006 academic year
  - Math and Reading annual assessments must be aligned with state academic content and achievement standards
- Annual assessment of students in science no less than once in each of grades 3-5, 6-9 and 10-12, beginning no later than 2007/2008 academic year
- Adequate Yearly Progress
  - 100% of students must meet or exceed a "proficient" level of academic achievement by the 2013-2014 academic year
  - Establish intermediate goals for uniform improvement over the 12 year period

---

Concerns Often Expressed About Educational Assessment

- Misalignment of high-stakes accountability tests and local curricular and instructional practices
- Narrowing of instruction by teaching to tests with restricted performance outcomes.
- Assessments frequently fail to provide instructionally useful and/or policy relevant information, and the information they do provide is not timely.
- Classroom assessments, which have the potential to enhance instruction and learning, are not being used to their fullest capability.

Assessment as a Process of Reasoning from Evidence
The Assessment Triangle

- cognition
  - model of how students represent knowledge & develop competence in the domain
- observations
  - tasks or situations that allow one to observe students' performance
- interpretation
  - method for making sense of the data

observation   interpretation

cognition

Must be coordinated!

Dr. Robert A. Bjork

THE 1999-2000 MARCHESE COLLEGE JUNE AT UCLA

Dr. Marcia C. Linn

COMPUTERS, TEACHERS, PEERS

Lawrence Erlbaum Associates, 2000

WISE
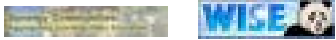
Assessment for Knowledge Integration

Marcia C. Linn
ICLS, October 25, 2002
Seattle, WA

Knowing What Students Know

- "A model of learning and cognition should serve as the cornerstone of assessment design."

Knowledge Integration Assessment and Instructional Design

- How do we make informed decisions about curriculum design?
- Knowledge integration perspective amalgamates current socio-cognitive research

Slide 1: Knowledge Integration Perspective

- **Interpretive**
  Learners make sense of new information based on past experiences and courses

  Cultural
  Learners infer norm, standards, & epistemologies from media, peers, role models, activity structures, and grading rubrics

  Deliberate
  Learners personally guide their learning, select courses and careers, and choose to revisit ideas
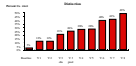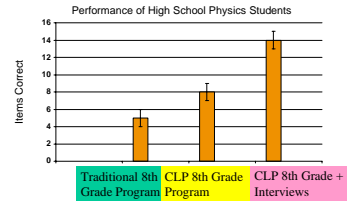

Slide 2: Assessing Knowledge Integration

Eight Versions of the Computer as Learning Partner Curriculum

(Linn, M. C. & Songer, N. B. (1991). Teaching thermodynamics to middle school students: What are appropriate cognitive demands? *Journal of Research in Science Teaching*, 28(10), 885-918.)

- **Interpretive**
  What is the difference between heat and temperature?
- Seven iterations of CLP led to a 400% improvement in student outcomes.

Slide 3: Longitudinal Impact of CLP Curriculum

Performance of High School Physics Students

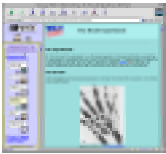| Traditional 8th Grade Program | CLP 8th Grade Program | CLP 8th Grade + Interviews |

P< .0001 All comparisons significant

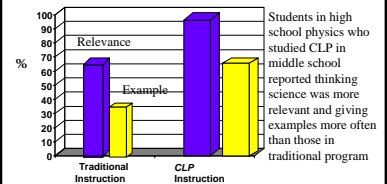## Slide 4: Assessing Knowledge Integration

Cultural
- **Relevance of Material Learned in Science—** CLP curriculum emphasizes practical problems
- **Nature of science—** Controversy projects improve understanding of role of debate in science

## Slide 5: Relevance of Science Class before and after CLP

Pre CLP: 4.8, 5.3
Post CLP: 5.1, 6.2
Long. 1: 6.1, 6
Long. 2: 6, 6.5

Male / Female
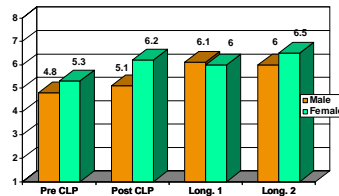
Slide 6: Longitudinal Comparison— Relevance of Science

Relevance
Example

Traditional Instruction / CLP Instruction

Students in high school physics who studied CLP in middle school reported thinking science was more relevant and giving examples more often than those in traditional program

Slide 7: Student views— Scientists motivated by debate

Before Instruction / After Instruction
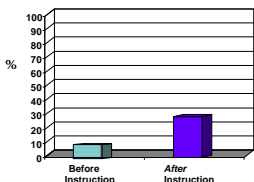
Debate can "encourage scientists to produce the evidence they need to support their theory" & "help them explain their evidence more thoroughly."

Bell, P. & Linn, M. C.(2000) Beliefs about science: How does science instruction contribute? In *Personal epistemology: The psychology of beliefs about knowledge and knowing.* Editors: Barbara K. Hofer and Paul R. Pintrich. Lawrence Erlbaum, Inc., New Jersey.

Slide 8: Assessing Knowledge Integration
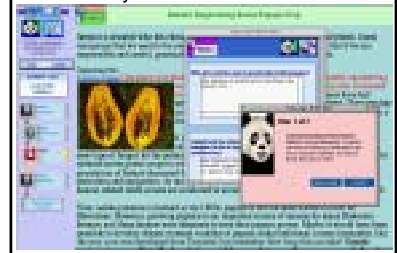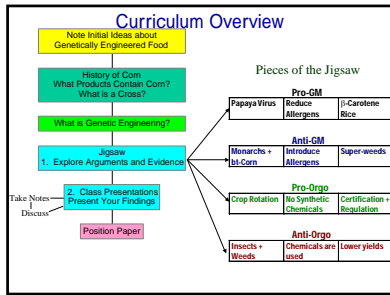

Deliberate—Essay
What agricultural method you think should be used here in California, and why you think we should use this method?
- Scoring — Explain and provide evidence for tradeoffs.

Genetically Modified Foods In Perspective

Slide 9: Genetically Modified Food—Tradeoffs

Slide 1: Curriculum Overview

Curriculum Overview

Note Initial Ideas about Genetically Engineered Food

History of Corn
What Products Contain Corn?
What is a Cross?

What is Genetic Engineering?

Jigsaw
1. Explore Arguments and Evidence

Take Notes / Discuss

2. Class Presentations
Present Your Findings

Position Paper

Pieces of the Jigsaw

Pro-GM		
Papaya Virus	Reduce Allergens	β-Carotene Rice

Anti-GM		
Monarchs + bt-Corn	Introduce Allergens	Super-weeds

Pro-Orgo		
Crop Rotation	No Synthetic Chemicals	Certification + Regulation

Anti-Orgo		
Insects + Weeds	Chemicals are used	Lower yields

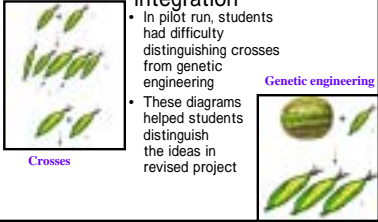## Slide 2: Changes to improve knowledge integration

Changes to improve knowledge integration

- In pilot run students thought people could easily avoid genetically modified corn.
- Revisions included evidence and a note about people with corn allergies.
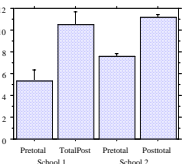- Most students using the revised project explained that avoiding corn is difficult.

Slide 3: Changes to improve knowledge integration

Changes to improve knowledge integration

Crosses

Genetic engineering

- In pilot run, students had difficulty distinguishing crosses from genetic engineering
- These diagrams helped students distinguish the ideas in revised project

Slide 4: Interpretative questions—both schools

Interpretative questions—both schools

Total Scores

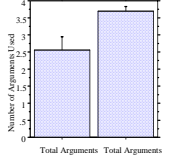Pretotal School 1 / TotalPost / Pretotal School 2 / Posttotal

Example Question—Why might a farmer planting genetically engineered seeds chose to grow genetically modified food?

Pretest: To make more money.

Posttest: He can produce 2 times the amount of food on the same amount of land. He can pick characteristics that will be easier to grow and make him more money. He can reuse his land by fertilizing it. He can control pests.

Seethaler, 2002 "Genetically Modified Food in Perspective: An Inquiry-Based Curriculum to Help Middle School Students Make Sense of Tradeoffs. Paper presented at AERA, New Orleans.

Slide 5: Deliberate question — both schools

Deliberate question — both schools

Write a one-page essay to explain the agricultural method you think should be used here in California, and why you think we should use this method…"
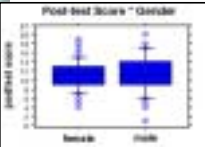
Arguments used in essays

Tara: "A great conflict with genetically modified fruits and vegetables are allergies. If a gene is taken from one plant and transferred to another, the person that shall be eating the plant will not have the knowledge that the plant they are eating has a specific gene from another plant that they could possibly be allergic to. Although genetically engineering a plant could mean that they take out the allergenic gene, not genetically modifying plants could at least give people the assurance that they are eating something they are not allergic to…"

Total Arguments Pilot Run students / Total Arguments Second Run Students

Seethaler, 2002 "Genetically Modified Food in Perspective: An Inquiry-Based Curriculum to Help Middle School Students Make Sense of Tradeoffs. Presented at AERA, New Orleans.
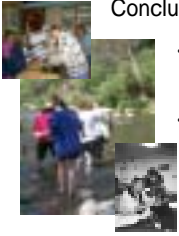
Slide 6: How do males and females respond to knowledge integration assessment?

How do males and females respond to knowledge integration assessment?

Genetically Modified Foods Study

Post-test Score ~ Gender

female / male

Assessment research by
**Sherry Seethaler,
University of California, Berkeley**

Slide 7: Conclusions

Conclusions

- Knowledge integration perspective guides design and refinement of curriculum.
- Compelling comparisons — between versions designed to investigate aspects of knowledge integration—inform refinement of instruction

Slide 8: Why do we need better assessments?

Why do we need better assessments?

"Schools caught in rash of cheating on tests
Teachers say they're pressured to ensure good results on exams
Lack of training, materials cited"
Detroit News

"State Fears Cheating By Teachers - 51 schools left off cash award list"
San Francisco Chronicle

"Oakland school superintendent deplores possible cheating on state aptitude tests
OAKLAND -- The head of the Oakland Unified School District says it is too soon to tell whether state aptitude tests were altered in three district classrooms, but if so he would not spare the rod."
Bay Insider

"Cheating teacher skews schools' test scores"
Eagle-Tribune

Slide 9: Dr. Carl Bereiter

Dr. Carl Bereiter

Surpassing Ourselves

Open Court, 1993

Levels of Explanatory Inquiry
(from Chin & Lee, 2001)

Level 1. Questions asking about the definitions of terms.

Level 2. Factual, topical, and general questions. Statements turned into questions by adding 'why' or 'how.'

Level 3. Questions with conjectures.

Level 4. Explanations-based questions. Questions centred on problems that arise from an effort to produce explanations.

Naomi Myake & Hajime Shirouzu

Dr. Allan Collins

Jim Greeno @ closing remarks

•
  – Pasteur   microbes
  –   constrained hypothesis

•   healthy
discourse practice
  –   public health
   Pasteur

•   social movement

Carl Bereiter @ closing remarks

•
                                          vision, deep
solution, dazzling results
  –
  –

• Social movement
  –