Student Learning and Dynamic Transfer While Interacting with Constructing Physics Understanding Curriculum (CPU): A Case Study

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1

Sound and Wave Unit

Research Focus

Cycle I: Introduction to Wave Properties

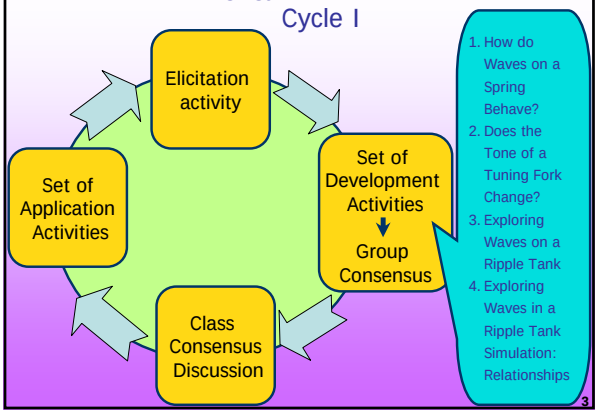
Cycle II: Sources of Sound, Harmonics and Quality of Sound

Cycle III: Factors that Affect the Speed of a Wave

Cycle IV: Interference and Diffraction

2

CPU Pedagogy & Waves and Sound-Cycle I



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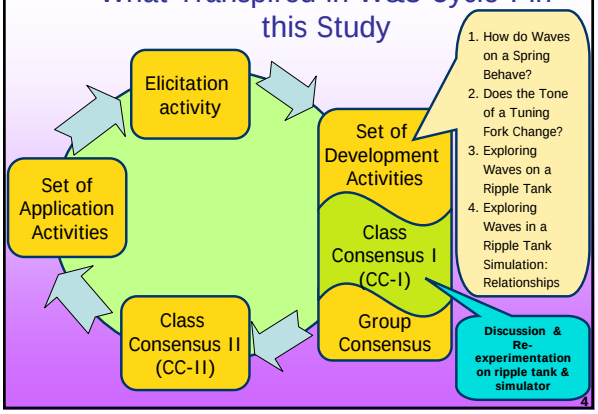
What Transpired in W&S Cycle I in this Study



4

Research Setting

- University of San Carlos, Cebu City, Philippines
- 6 incoming Senior Students
  - majoring in
    - Physics-Chemistry teacher education
    - Physics-Mathematics teacher education
  - availability
  - 1 man and 5 women

Data Sources

- Worksheets
- Idea Journals
- Transcripts

Analytical Framework

- Dynamic Transfer Model

5

Research Questions

Phase I: To what extent is the Constructing Physics Understanding curriculum (CPU) effective in the University of San Carlos (USC) environment?

Phase II: How do students develop intellectually as they interact with Constructing Physics Understanding (CPU) unit?

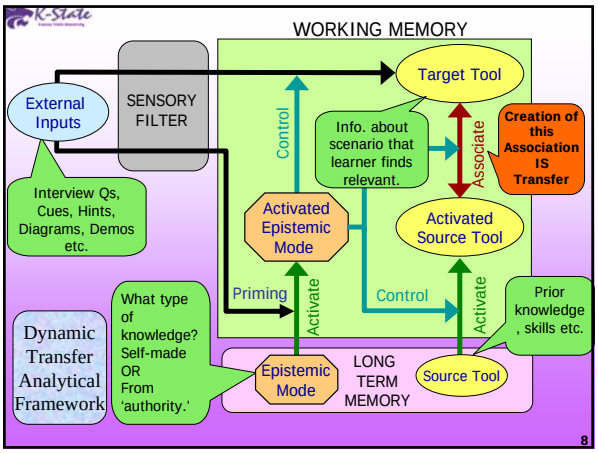
6

Research Methodology

- Phenomenographic Approach[1]
  - variations of thinking
- Constructivism Philosophy
  - Zone of Proximal Development[2]
  - Conceptual Change[3]

[1] Creswell (1999) [2] Tharp and Gallimore (1998) [3] Duit (1999)

7



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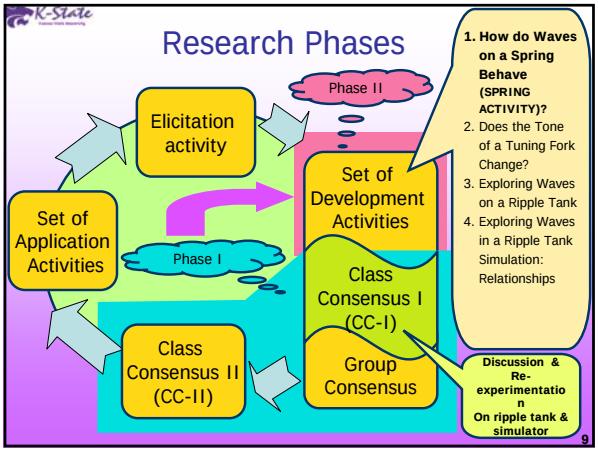


9

Phase I: Agreements and Disparities in CC-I

Activity Disparity and Group Disparity

	Relationships	Proponent	Evidence Cite
a)	Wave speeds directly proportional to wavelength	Both groups	Simulator
b)	Wave speeds inversely proportional to wavelength	Both groups	Ripple tank
c)	Frequency affects wave speed (The error might be due to the irregularity of the tap on the ripple tank)	c1) Both groups	Ripple tank
		c2) Group 1	Spring
d)	Frequency does not affect the wave speed	d1) Both groups	Simulator
		d2) Group 2	Spring
e)	Velocity = frequency x wavelength y = mx + b where m is constant	Variety of students	Simulator Previous lessons Physics book, other students
f)	Stretching of the spring/string is directly proportional to wave speed	Both groups	Spring and String activity
g)	Amplitude does not affect wave speed	Group 2	Spring
h)	Amplitude is directly proportional to wave speed	Group 1	Spring

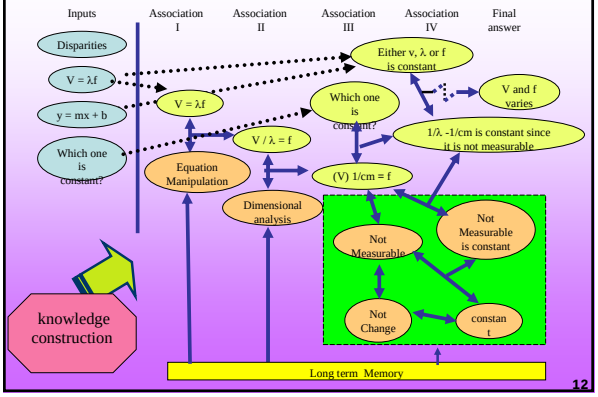
10

Phase I: Resolution of Disparities in CC-I

- Discussion on Velocity-Wavelength-Frequency Equation and Linear Equation
- Discussion of Errors
- Role of Simulators and Analogies

11

Phase I: An Example in Resolving Disparities in CC-I



12

Phase II: Emerging Themes From Transcript on Spring Activity

Students extend other's ideas that fit to their knowledge structures

Students' predictions being controlled by prior knowledge or activities

Filtration of inputs into target concepts

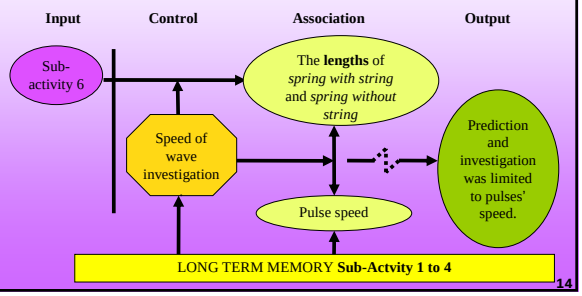
Target ideas from external inputs activate previous associations to create new associations

13

Phase II: Themes from Spring Activity Transcript

Students' predictions being controlled by prior knowledge or activities

Filtration of inputs into target concepts



14

Conclusion

Phase I: Extent of CPU's Effectiveness

- In some respect CPU applied at USC was an effective tool in meeting target ideas
- CPU created disparities between groups and activities
- Resolution of disparities need expert intervention "a time to tell"

Phase II: Students' Intellectual Development

- Students extend other's ideas that would fit their knowledge structures;
- Students' predictions could be controlled by prior knowledge or activities - filtration (Rebello, 2005)
- Target ideas from external inputs activate previous associations to create new associations (Rebello, 2005)
- Dynamic Transfer Model framework of analysis did help in mapping out students' knowledge elements and as well as evaluate the CPU curriculum

15

Implications for Instruction

- Be wary of "stand alone" materials. Students may interpret them differently than intended and may not scaffold as desired.
- Working equipment certainly will lessen disparities.
- The role of the instructor as a guide and mentor is indispensable. The "time to tell" is essential to students' intellectual development.

Further Research

- look into other Cycle I activities in order to further gauge students' intellectual development
- ownership of knowledge issue

16