

## Transfer of Learning: From Physical Models to Understanding Complex Phenomena\*

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## Overview

- Teaching activities for Positron Emission Tomography (PET)
- Students' approach of problem solving individually and in group
- Associations made by students between models and the complex problem individually and during group interaction

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## Research Context

- Individual teaching interview\*
  - Spring 2006
  - Kansas State University
  - Algebra-based physics
  - n=16
- Group teaching interview
  - Fall 2006
  - Kansas state university
  - Algebra-based physics
  - n=21 (divided into 9 groups)

\* Engelhardt et.al.(2004)

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## Physical Model 1



Cart activity

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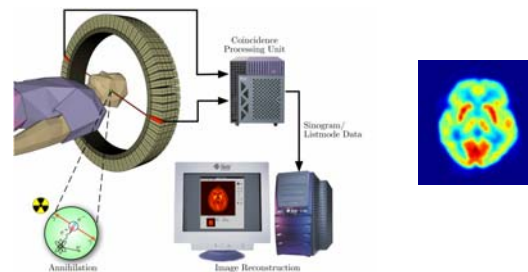
## Physical Model 2



Light activity

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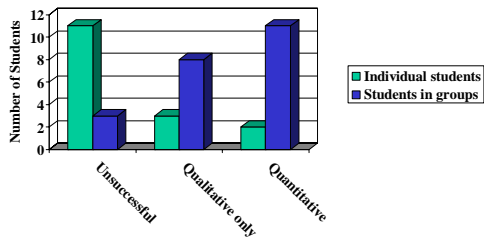
## PET Problem



[http://en.wikipedia.org/wiki/Positron\\_emission\\_tomography](http://en.wikipedia.org/wiki/Positron_emission_tomography)

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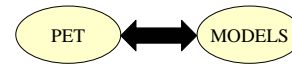
## Student Performance in Locating Hidden Events



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## Individual Spontaneous Transfer of Learning

4 students

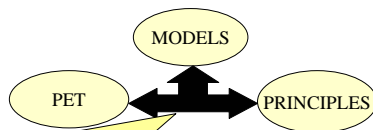


...it (coincidence detection) looks lot like the two carts that you had and push them together (points at the annihilation location) and let them go and...and goes like that (points the direction of gamma ray travel)...

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## Individual Semi-spontaneous Transfer of Learning

6 students



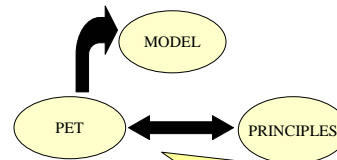
...they move in opposite direction...so if one hits this one before another hits that one...then you know that it is closer to over this side...because they were traveling with the same speed after the collision  
(So...what prompted you to answer in that way)

From what we did last time.... exactly same thing we did last time

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## Individual Non-spontaneous Transfer of Learning

3 students



(How are the activities of last session and today's session connected)

The goal of both of them is to figure out the ...from the set of data where an event is originating ....

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## Group Spontaneous Transfer of Learning

7 group (16 students)

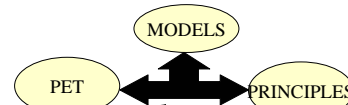


A3...it is pretty much like the...we did last time  
A2...carts...  
A1...yes...the circle thing  
A2...circle?! was thinking about the carts here it says describe the process to determine exact location of annihilation...just one annihilation  
A1...huh...just one annihilation...  
A2...that's what I was thinking like...it senses where the gamma rays hit...draw the straight line between them  
A3...it senses which one hits first

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## Group Semi-spontaneous Transfer of Learning

1 group (2 students)



A2...both of these gamma rays going to create a line...and if it is not in the center of the line then you can measure the amount of time difference in between the one hitting the machine and the other one hitting the machine...and by their velocity find where the common source was...assuming that both were moving with the same speed...  
A1...yeah...I think both of them move with speed of light since they don't have the mass...since we know the speed and we know time we can find where they started from and the stuff...

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## Conclusion

- Qualitative reasoning is enhanced in peer interaction leading to quantitative process
- Physical models are useful in transfer of physics ideas to complex phenomena
- Students transfer ideas more easily through group interaction

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# Thank You!!!

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