



# Design and Implementation of Inter- & Cross-Disciplinary Experiential Peer Learning Programs

Elahe Javadi, Kristi Sutter, and Robyn Seglem

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**Our quest:**

*Design, implement, and assess impact of recurring research-based peer learning practices*



*Source: unce.org*

# Our Experience: Computational Thinking Playground

- IT students and pre-service teachers teamed up to work on:
  - Coding
  - Image processing: training & use
  - Neural network design
- Sandbox within Computational Thinking Playground
  - Designed by Instructors
  - Pre-service teachers moved freely from one experience to another
  - Peer tutoring facilitated by IT students

Fun for students

Makes topics approachable

Reinforces learning of the topics



# Peer Learning

Cognitive-  
developmental  
theories

Examples of  
cognitive  
approaches to  
peer-learning

Implications  
for teaching &  
educators

Piaget

Vygotsky

Collaborative  
concept-  
mapping,  
Reciprocal  
questioning,...

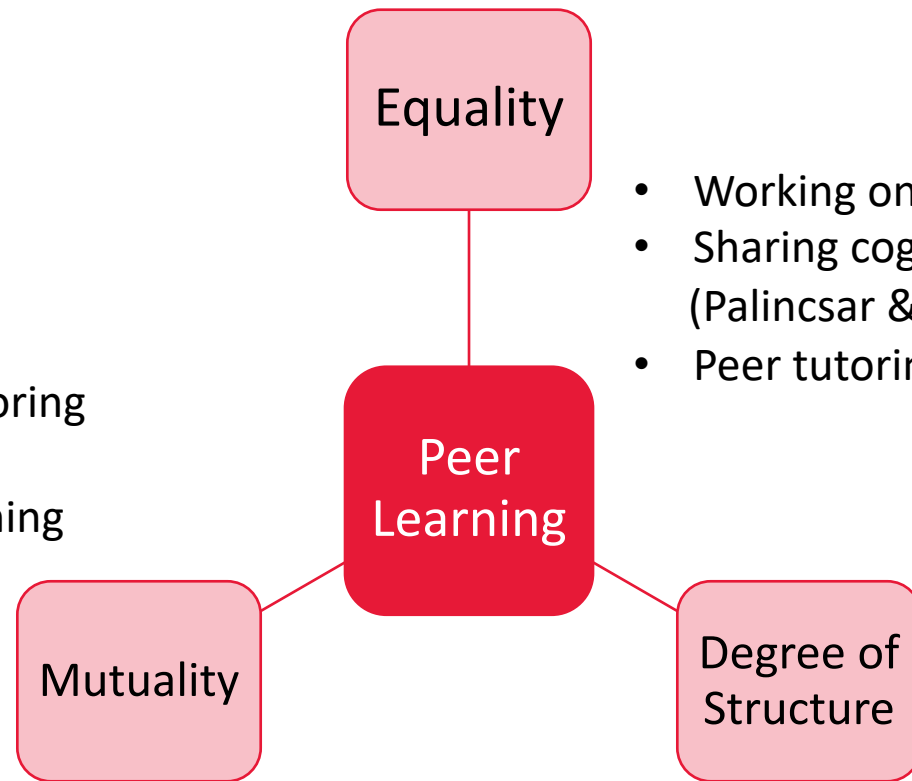
Teacher's  
belief & role

Structures &  
guidance

*King (1996)*



- Directional flow: as in peer tutoring
  - Bidirectional flow: as in cooperative/collaborative learning
- Topping *et al.* (2017)



- Working on the same aspect of the problem
- Sharing cognitive responsibility (Palincsar & Herrenkohl 2002)
- Peer tutoring vs. cooperative/collaborative learning

- Instruction provided prior to peer learning task
- Monitoring practices
- Establishing beliefs about & guiding attitudes toward shared cognition

(Meloth 1996)

Source: Topping *et al.* (2017)

	Equality	Mutuality	Degree of Structure
Peer tutoring	L	L/M	
Cooperative learning	H	M/H	H
Collaborative learning	H	Depends	Depends



# Guided Peer Learning

How would you use...to...?

What is a new example of...?

Explain why....

What do you think would happen if...?

What is the difference between...and...?

How are...and...similar?

What is a possible solution to the problem of...?

What conclusions can you draw about...?

How does...affect...?

In your opinion, which is best,...or...? Why?

What are the strengths and weaknesses of...?

Do you agree or disagree with this statement:...? Support your answer.

How is...related to...that we studied earlier?

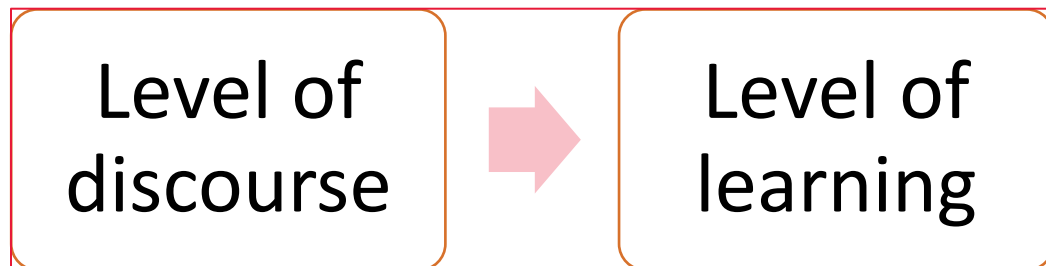
*Source: King (1990)*

peer-tutoring

problem-solving

complex knowledge construction

*Peer learning discourse patterns for three different kinds of learning (King 1996)*

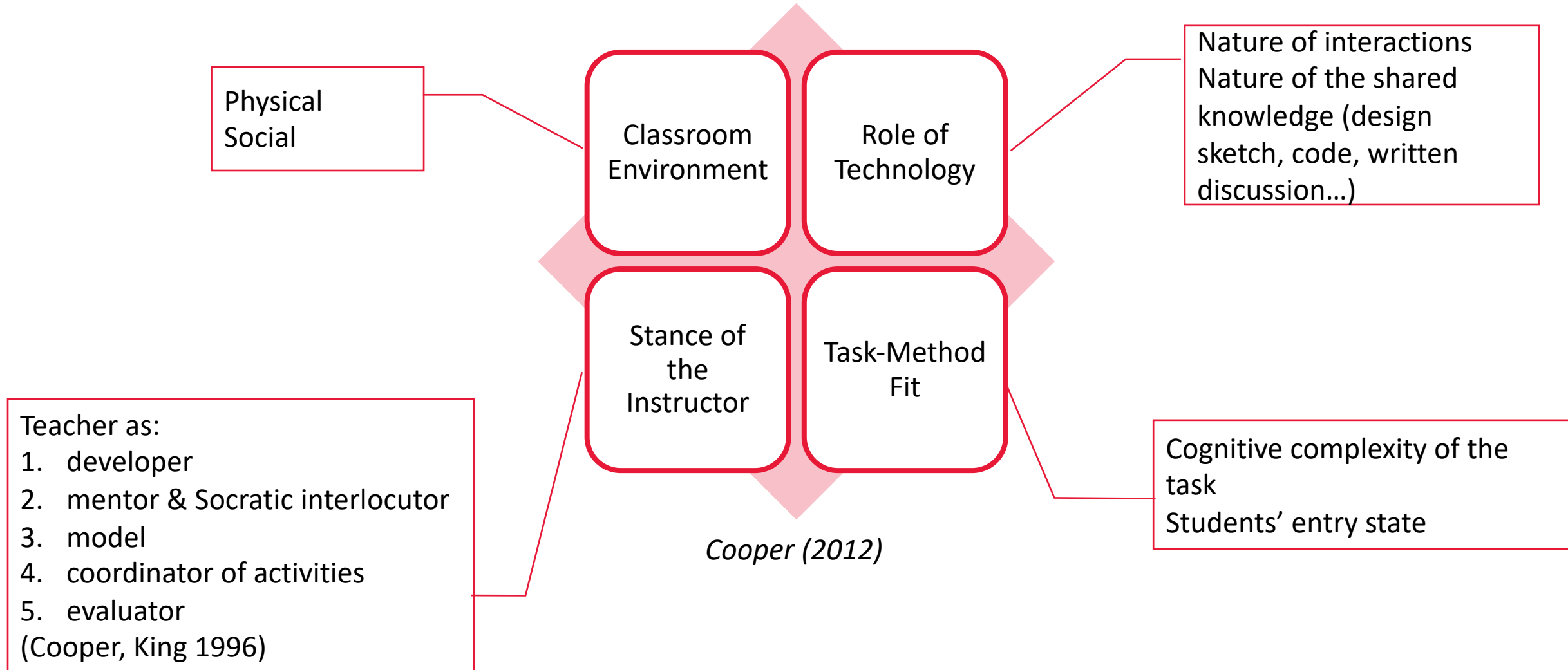


# DIY Peer Learning

Technique	Supporting research	Merit
Reciprocal Questioning	King (1990)	Questioning guides by instructors can cover different levels of cognitive processing
Collaborative Concept Mapping	van Boxtel <i>et al.</i> (2002)	Helps students develop an integrated conceptual framework for the material Are shown to positively impact learning outcomes
Learning Dojo	Heinonen <i>et al.</i> 2013	Like hackathons, intensive immersive cognitive work sessions, starting with problem, and ending with a proved practical sessions
Task-Method Fit	King (2002)	Recall tasks vs. analysis/evaluation tasks demand different forms/structures for peer learning



# Dimensions of Design



# Future Plans

Group size

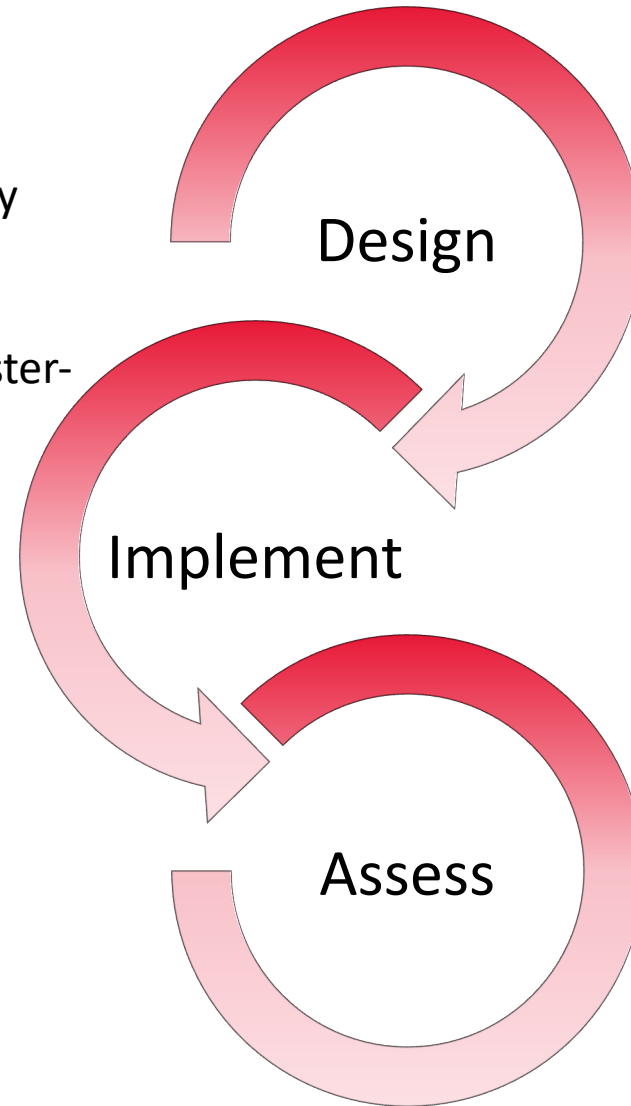
Group composition: equality

Cross-disciplinary vs. IT peer learning: mutuality

Academic task scope

Time commitment: one time in-class or semester-long or in between

Environment: classroom or special spaces



Material  
Coordination

Guiding & mentoring interactions

Evaluation apprehension

Process vs. outcomes

Group vs. individual (Boud *et al.* 1999)

*Boud et al (1999)*





# References

- King, A. (2002). Structuring Peer Interaction to Promote High-Level Cognitive Processing. *Theory Into Practice*, 41(1), 33–39. <http://www.jstor.org/stable/1477535>
- Keith J. Topping (2005) Trends in Peer Learning, *Educational Psychology*, 25:6, 631-645, DOI: 10.1080/01443410500345172
- Boud, David & Cohen, Ruth & Sampson, Jane. (1999). Peer Learning and Assessment. *Assessment & Evaluation in Higher Education*. 24. 413-426. 10.1080/0260293990240405.
- Boud, D. (2001). Peer Learning in Higher Education: Learning from & with each other. Edited By Boud, D., Cohen, R., & Sampson, J.
- Boud, David. (2001). Making the Move to Peer Learning. *Peer Learning in Higher Education: Learning from and with Each Other*. 1-17.
- Heinonen, K., Hirvikoski, K., Luukkainen, M., Vihavainen, A. (2013). Learning Agile Software Engineering Practices Using Coding Dojo. In: *Proceedings of the 14th Annual ACM SIGITE Conference on Information Technology Education. SIGITE '13*. Association for Computing Machinery, New York, NY, USA, pp. 97–102. 9781450322393. <https://doi.org/10.1145/2512276.2512306>.  
<https://doi.org/10.1145/2512276.2512306>
- King, A. (1990). Enhancing Peer Interaction and Learning in the Classroom Through Reciprocal Questioning. *American Educational Research Journal*, 27(4), 664–687. <https://doi.org/10.3102/00028312027004664>
- O'Donnell, A. M., & King, A. (Eds.). (2014). *Cognitive perspectives on peer learning*. Routledge.
- Topping, K., Buchs, C., Duran, D., & Van Keer, H. (2017). *Effective peer learning: From principles to practical implementation*. Routledge.
- van Boxtel, C., van der Linden, J., Roelofs, E., & Erkens, G. (2002). Collaborative Concept Mapping: Provoking and Supporting Meaningful Discourse. *Theory Into Practice*, 41(1), 40–46. <http://www.jstor.org/stable/1477536>
- Palincsar, A. S., & Herrenkohl, L. R. (2002). Designing Collaborative Learning Contexts. *Theory Into Practice*, 41(1), 26–32. <http://www.jstor.org/stable/1477534>
- S. Marie A. Cooper. (2002). Classroom Choices for Enabling Peer Learning. *Theory Into Practice*, 41(1), 53–57. <http://www.jstor.org/stable/1477538>

