Teacher Pedagogical Content Knowledge for Using Learning Progressions

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Curriculum

Learning Progressions

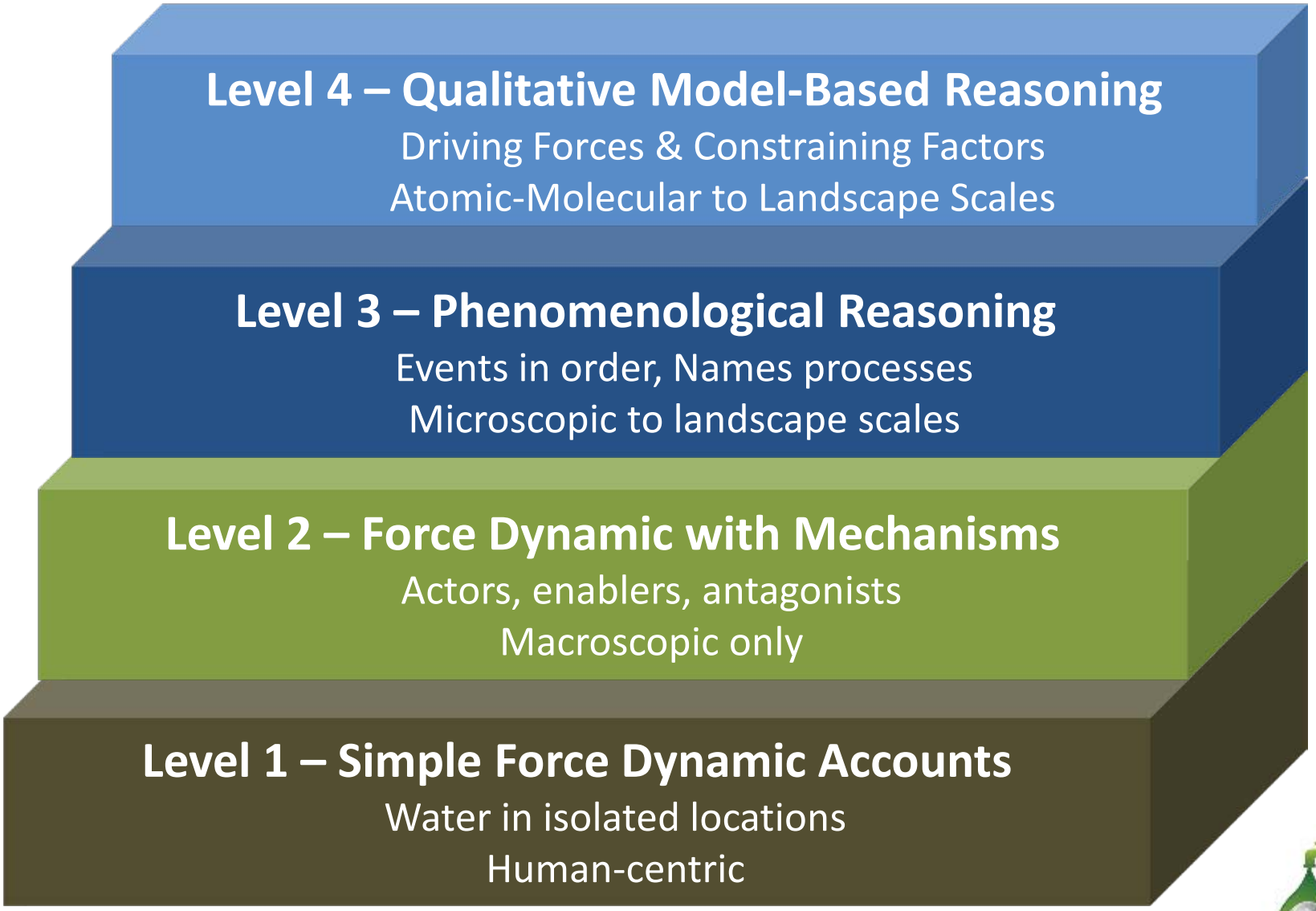
Assessment

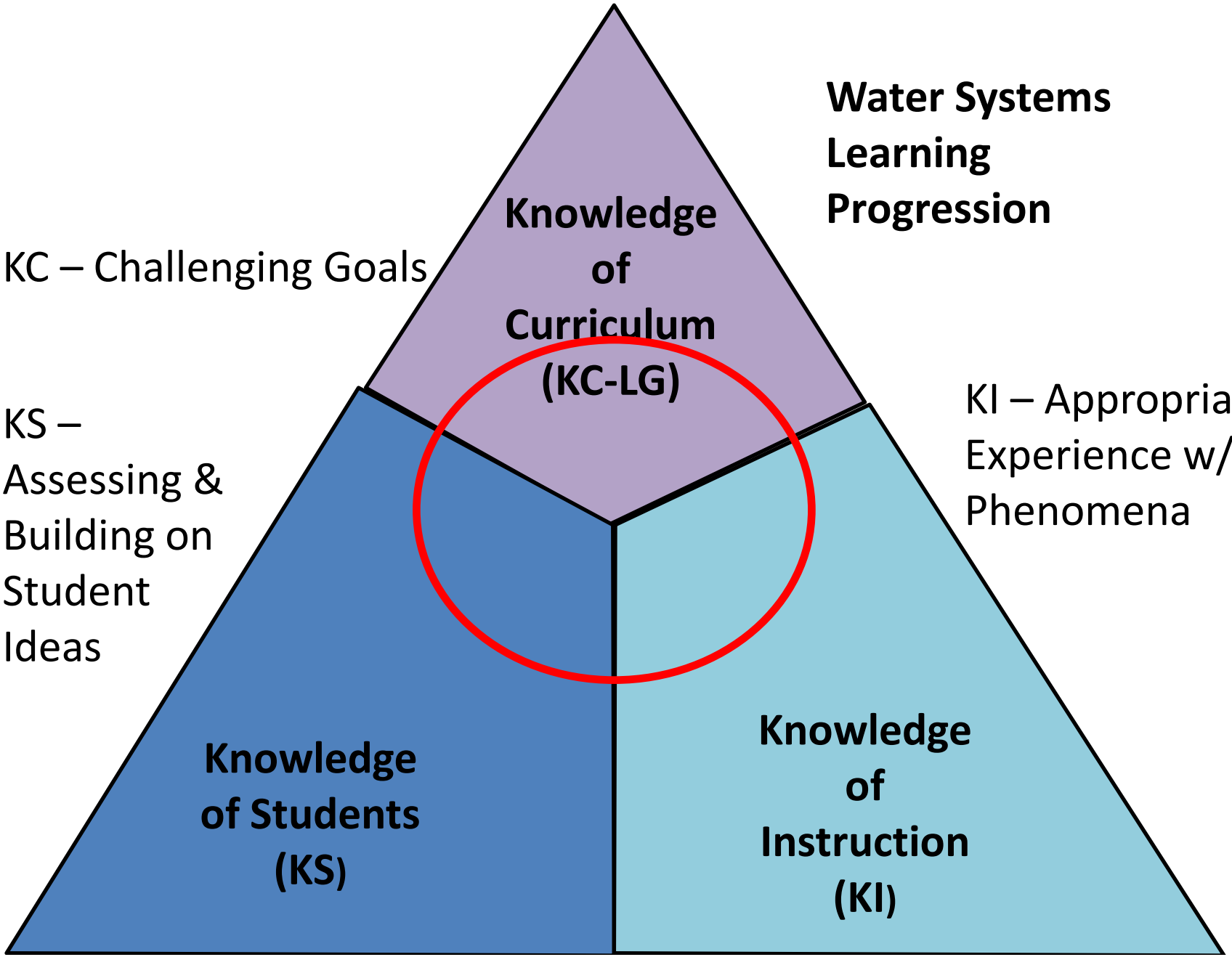
Instruction

Content Knowledge (CK)

Pedagogical Content Knowledge (PCK)

Water Systems Learning Progression





Pedagogical Content Knowledge for Water in Environmental Systems

Research Questions

- What is the status of teachers CK and PCK relevant to teaching about water?
- How does using LP-based curriculum materials support teachers in developing relevant CK and PCK?
- Is there a relationship between teacher CK/PCK and student learning about water?


School Water Pathwa
Instructional Activities
School Map Assessment – Version 5.18.11
Below is a map of a school campus.
Asphalt Parking Lot
Playing Field
School Creek
School Building
Grassy Areas
Concrete Walkways
N
X
Y
1. If you were looking from the side instead of from above, what would the shape (height) of the land be like across the distance from Point X to Point Y? (Circle the answer you think is the best.)
A
B
C
D
E
F There's no way to know.
Explain your reasons for your answer.
2. Circle which direction you think School Creek is flowing: North South You can't tell from the map
Explain how you know.
Formative Assessments
Before
After
River
Tools for Reasoning

Methods

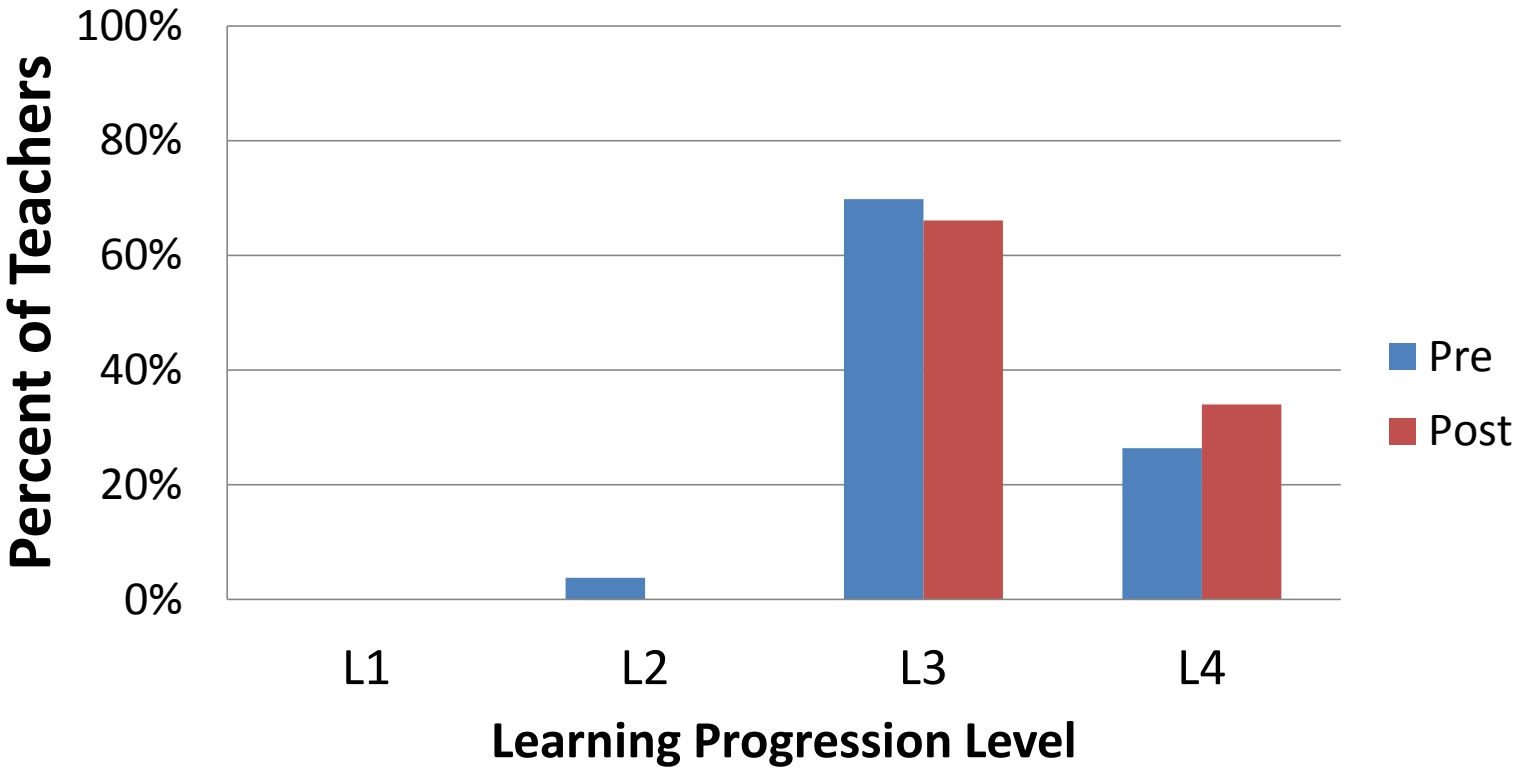
- Middle and high school teachers
- Assessments of CK & PCK prior to PD and following teaching using LP-based curriculum materials
- 54 teachers had matching pre-post assessments; 37 teachers also had student pre-post assessments (CK only).

PCK Assessment Item Types

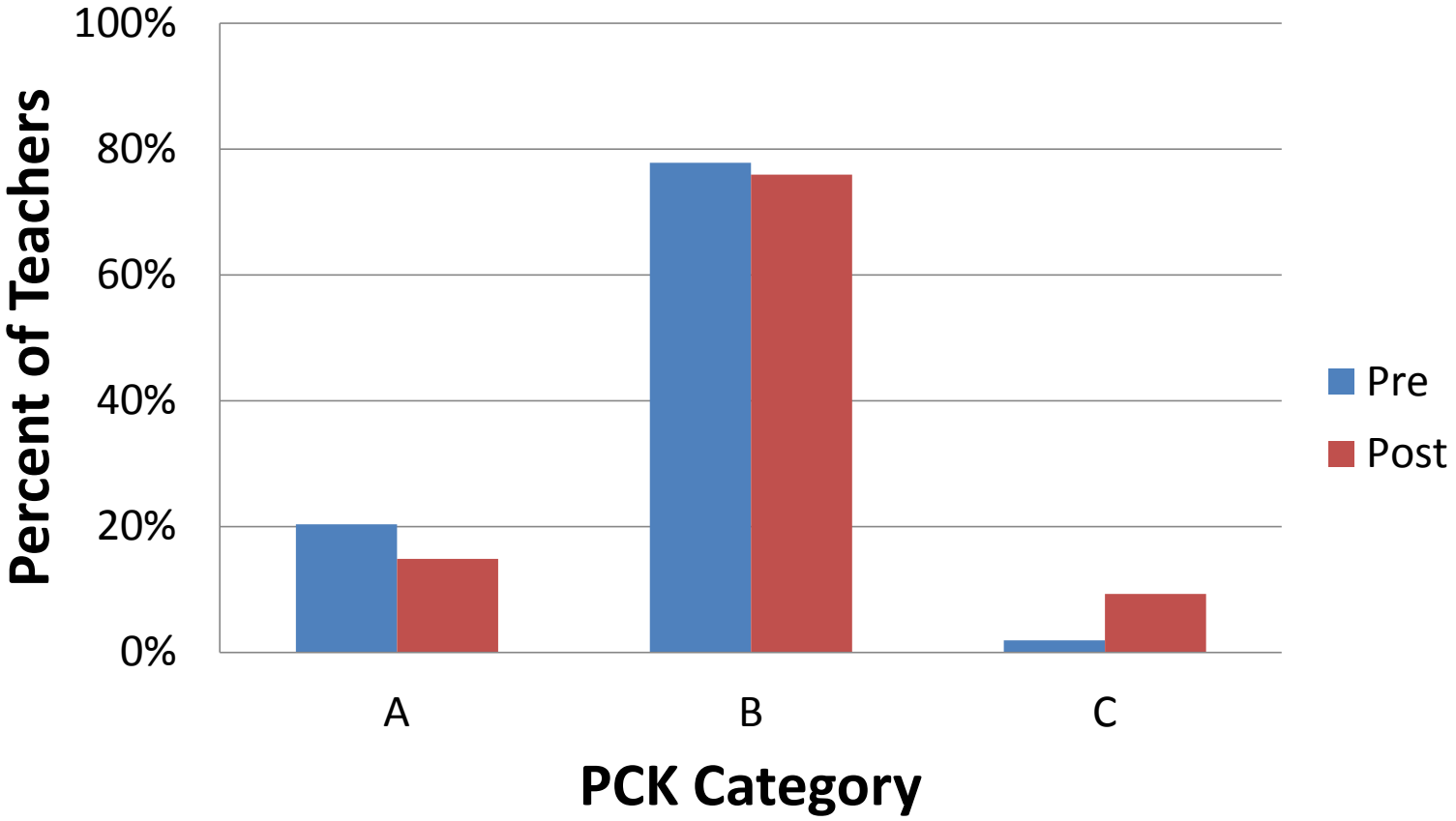
KC-LG	• Write learning goals
KS	• Interpret student response
KI	• Choose next instructional move

A	B	C
• **KC-LG:** Disconnected Facts • **KS:** Content Knowledge Interferes • **KI:** Activities are fun or just hands-on	• **KC-LG:** Naming Processes & vocabulary • **KS:** Ideas right or wrong • **KI**: Transmitting explanations	• **KC-LG:** Challenging goals for MBR • **KS:** Interprets reasoning based on LP • **KI:** Appropriate experiences w/ phenomena based on LP
Knowledge for Level 2	**Knowledge for Level 3**	**Knowledge for Level 4**

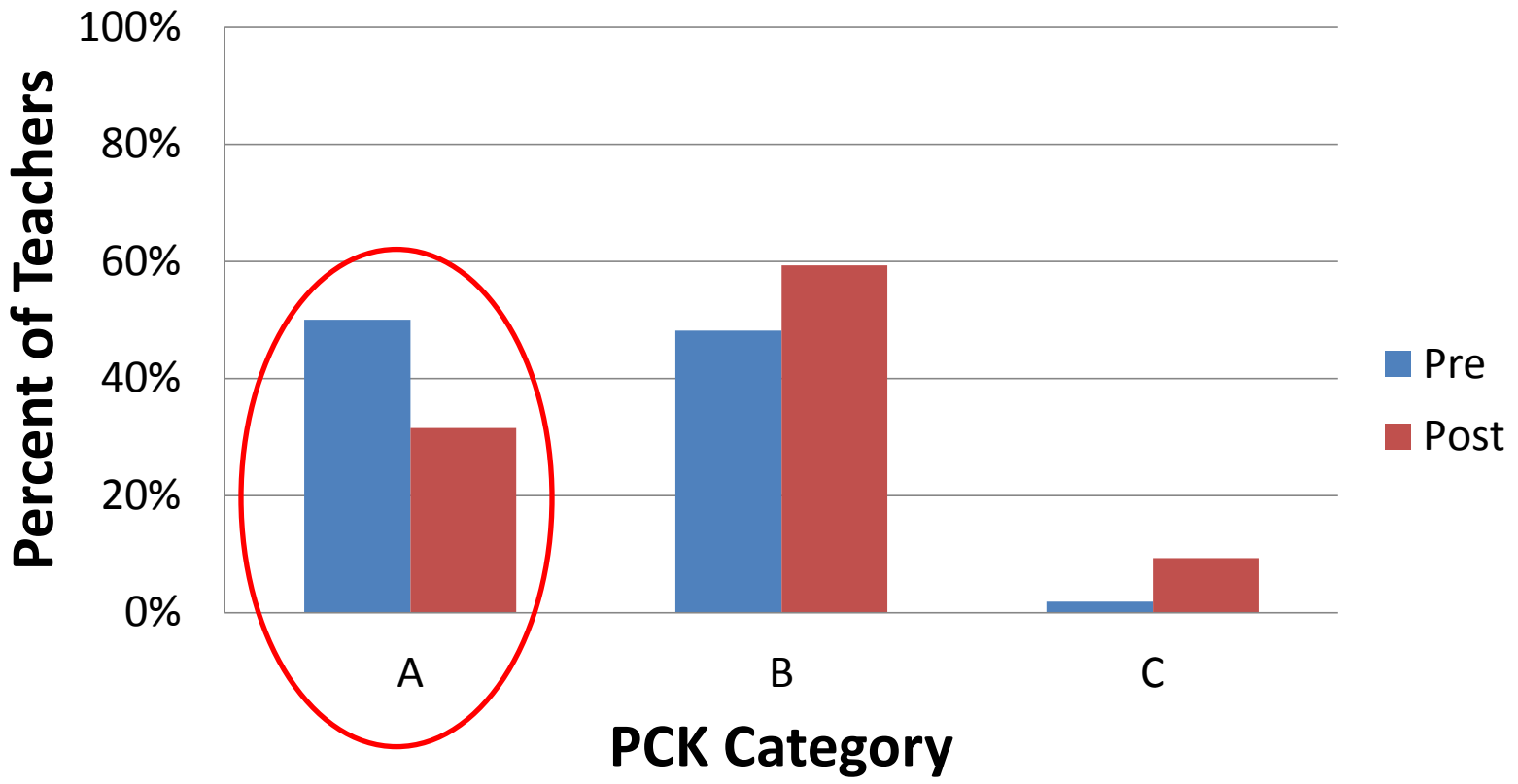
Content Knowledge



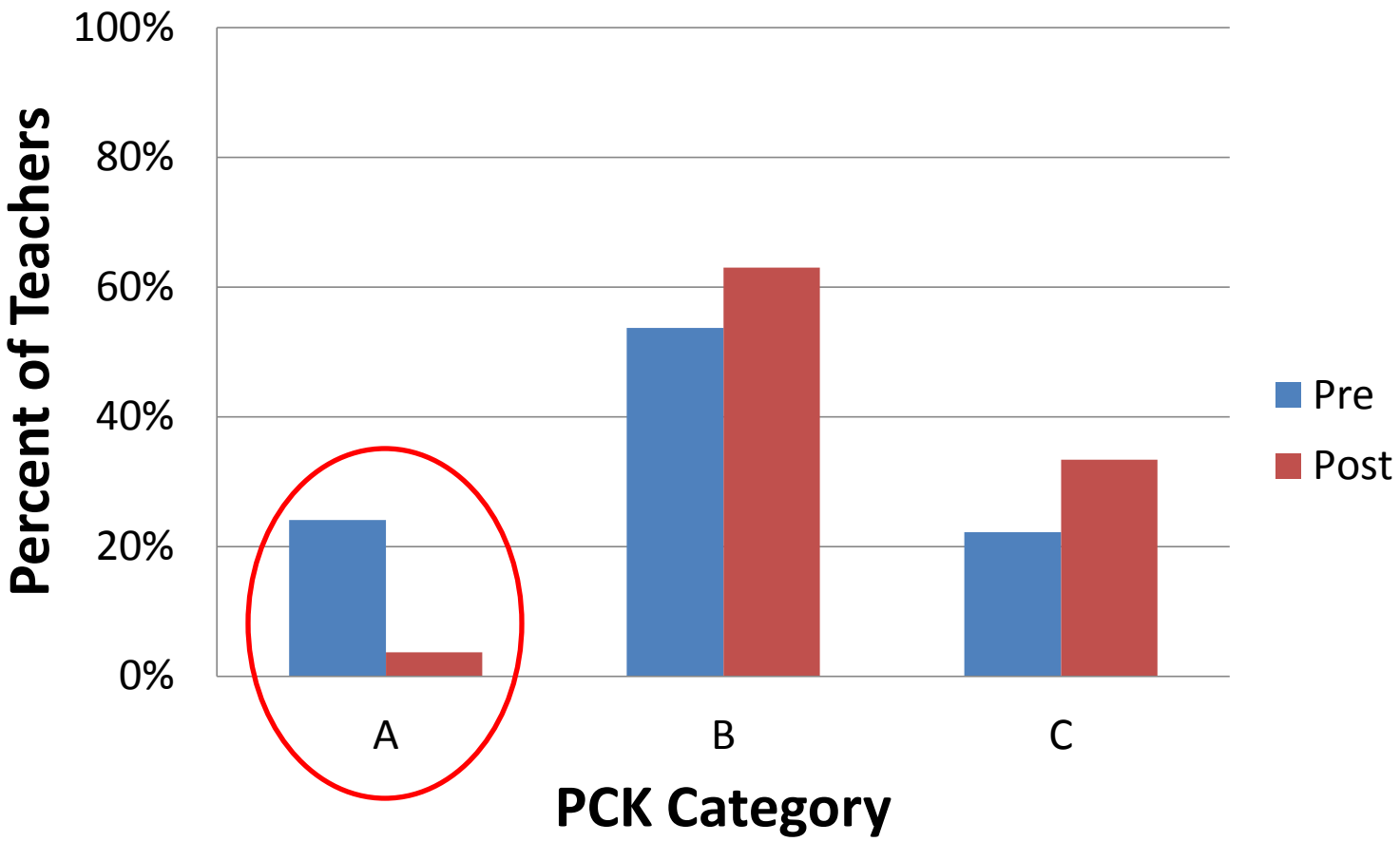
Overall PCK


100%
80%
60%
40%
20%
0%
Percent of Teachers
A
B
C
PCK Category
Pre
Post

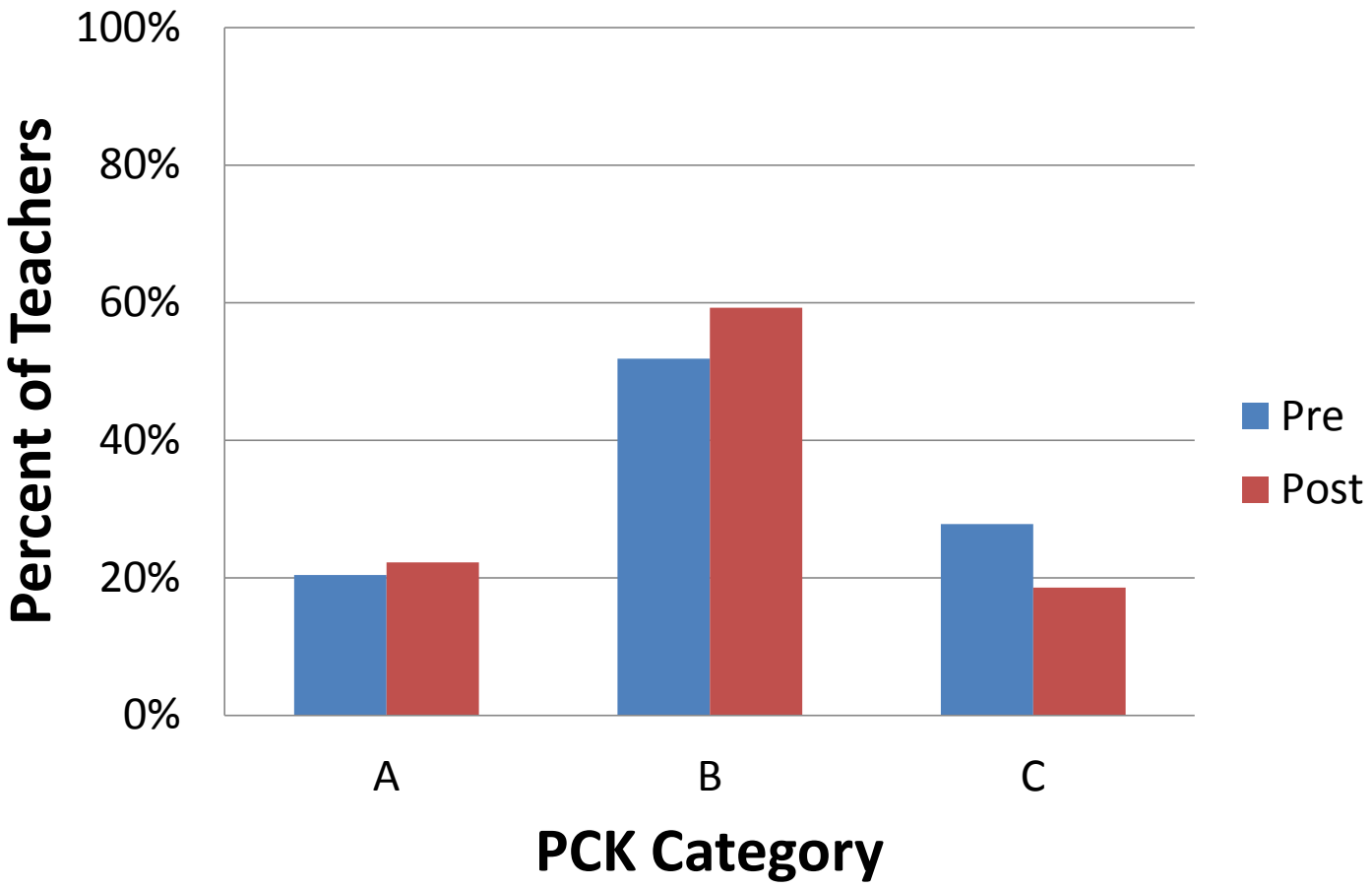
Knowledge of Curriculum



Knowledge of Students



Knowledge of Instruction



Teacher CK & PCK Correlation to Effect Size

Correlation	Pearson's r (df)
CK and effect size	0.254 (35)
Overall PCK and effect size	**0.406 (35)***
KC-LG and effect size	**0.399 (35)***
KS and effect size	0.310 (35)
KI and effect size	0.288 (35)

* $p<.05$

Discussion

Discourse of School Science (phenomenological reasoning) limits teachers' instructional potential and caps student understanding at level 3 (phenomenological reasoning.

Discussion

Using LP-based curriculum materials may support teachers in developing more sophisticated content knowledge and PCK, but may require more than 1 year.

Discussion

Knowledge of curriculum (learning goals) may develop first, followed by knowledge of students, then knowledge of instruction.

Paper available at

http://www.pathwaysproject.kbs.msu.edu/?page_id=499

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