Using Research to Improve Instruction

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selecting chapters for, editing, and printing each yearbook. Moreover, the time from when

In Appreciation

that the panel decided were at the forefront of mathematics education: Change; Problem Solving;

Creating the Inaugural Volume

Promoting Mathematical Reasoning through Critiquing Student Work

Catherine Bénéteau, *University of South Florida, Tampa*
Sarah K. Bleiler, *Middle Tennessee State University, Murfreesboro*

Mathematical reasoning, eventually resulting in formal proof, is an essential component of mathematical learning and can range "from informal explanation and justification to formal deduction, as well as inductive observations. Reasoning often begins with explorations, conjectures at various levels, false starts, and partial explanations before a result is reached" (National Council of Teachers of Mathematics [NCTM], 2000, p. 56).

Context

A group of mathematicians and math[illegible] collaborated to design and teach a geometry course and then a [illegible] in the subsequent semester with many of the same PSTs. Within geomet[illegible]

PSTs would learn mathematics through an inquiry approach.

[illegible] learning in writing mathematical proofs, and use mathematical

Critiquing Sample Student Work

Because one goal was to improve PSTs' ability to understand and write proofs, our critique tasks addressed two areas where PSTs demonstrated misconceptions. The first area focused on the

of mathematical statements. We viewed both [illegible] PST

the central angle subtended by the two arcs is the same angle. This response could have been even stronger had the student clearly indicated that the two arcs were not congruent, so completeness is not an absolute standard but falls along a continuum.

Thus, this task forced the PSTs to examine not only mathematical inaccuracies (criteria 1) but

Sample Tasks Involving the Identification of Hypotheses and Conclusions

As we began instruction on proof, we realized that PSTs struggled with identifying the hypotheses and conclusions of statements. Sometimes, as instructors, we spend considerable time trying to

communicate sophisticated ideas relative to proof development, such as ideas related to appropriate modes of argumentation (e.g., direct vs. indirect reasoning) or modes of argument representation (e.g., symbolic or narrative), when the basic concepts of the initial assumptions and the conclusion

are not clear to our students. As a preliminary task relative to this issue, PSTs examined sample responses in which the theorem "Bisectors of supplementary angles are perpendicular" had been written in if-then form. Indeed, the statement of the theorem appears to some PSTs to reflect

A B C D

(1) Since ∠1 and ∠2 are alternate interior angles AB ∥ DC.

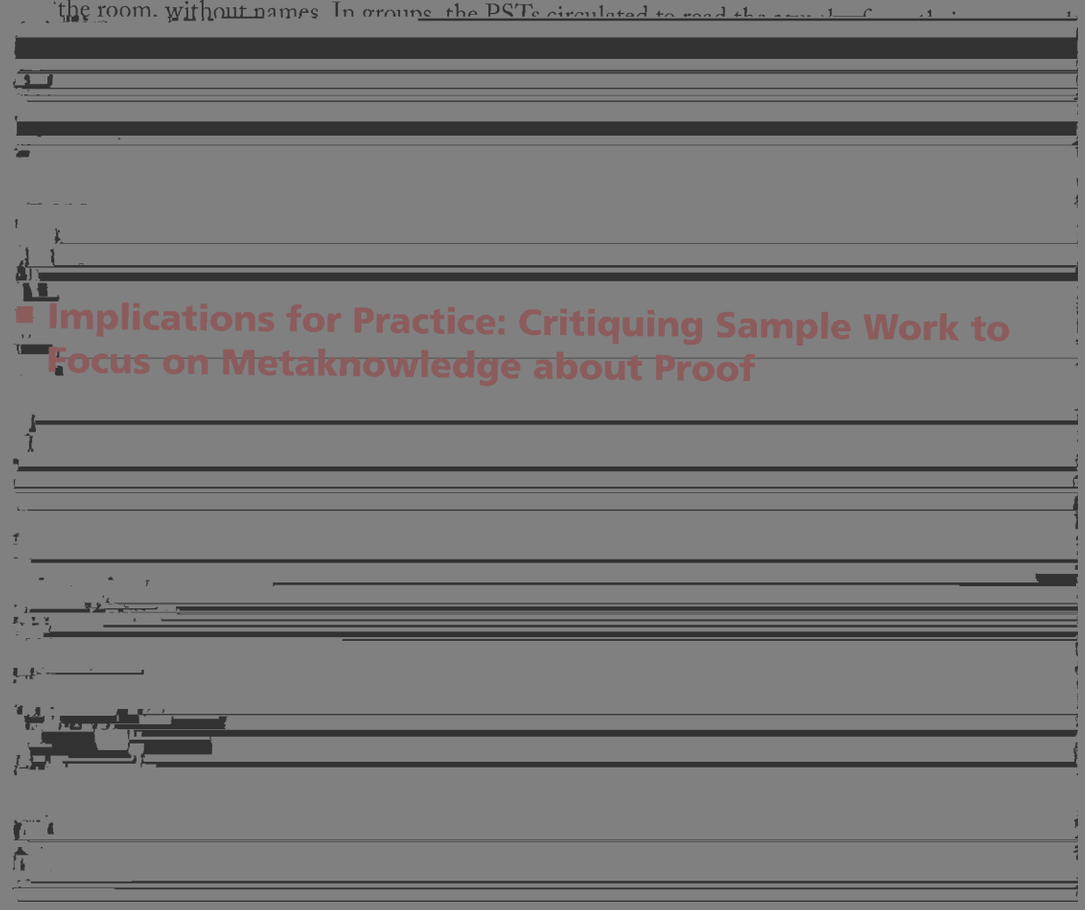
(2) Since the diagonals bisect each other, AO ≅ OC and DO ≅ OB.

∠COD are vertical angles,

Implementing Critiques of Sample Work

We used varied implementation approaches to engage PSTs with critiquing sample student work.

the room, without names. In groups, the PSTs circulated to read the ...



Implications for Practice: Critiquing Sample Work to Focus on Metaknowledge about Proof

PART IV

Seeing Structure and Generalizing