Developing Preservice and Inservice Teachers' Mathematics Knowledge side by side through Collaborative Planning

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Growth of Content Knowledge

- “American educators assume that you need to know content knowledge before you can plan lessons. Chinese teachers think you learn content knowledge by planning lessons.” Liping Ma

Situated cognition (Lave & Wenger, 1990)

- Most learning occurs naturally through activities, contexts, cultures
- Schools too often abstract learning "unsituate" it, teach concepts removed from natural contexts and applications
- Situated examples include more "apprentice-like" situations

Collaborative planning results in teachers' awareness of alternative instructional strategies.

- Walther-Thomas, 1997
- Chazan, Ben-Chaim, & Gormas, 1998
- Roth, Masciotra, & Boyd, 1999
  - In discussions with a collaborating teacher, the pre-service teacher noted "she found it interesting to experience questioning which was different from her own. She was learning to feel another way of being and questioning, another way to think about teaching" (p. 780).
- Glazer & Hannafin, 2006
  - As teachers collaborate to develop lessons, "peer-teachers explore various uses of resources, such as different mathematics-based technology tools, and various instructional approaches, such as exploratory or directed questioning" (p. 184).

Conflict resolution and problem solving occur as teachers share their perspectives and expertise to achieve joint decision-making.

- Davison, 2006
  - “Role conflicts [between ESL and general education teachers] appear to be seen as inevitable, and accepted, even embraced, as a continuing condition that will eventually lead to greater understanding” (p. 469.).
- Chazan, Ben-Chaim, & Gormas, 1998.
  - In coplanning, “you need to allow everyone to have input and be heard. This was not always easy, but as we got used to each other’s way of thinking about the mathematics and the students we were able to use our individual strengths to make it work” (p. 698).

Collaborating teachers develop a deeper understanding of concepts and pedagogy.

- Chazan, Ben-Chaim, & Gormas, 1998
  - “The discussions we had about content and the way we wanted to approach it were some of the most exciting conversations I have had in my career” (p.698).
- Hawbaker, Balong, Buckwalter, & Runyon, 2001
  - “Building consensus about what is most important fosters useful discussions about priorities, the goals of the class, and what students need in their futures. Defining the big ideas can also help the nonmath special education teacher (who might not be present in the classroom itself) to understand the material better” (p. 25).

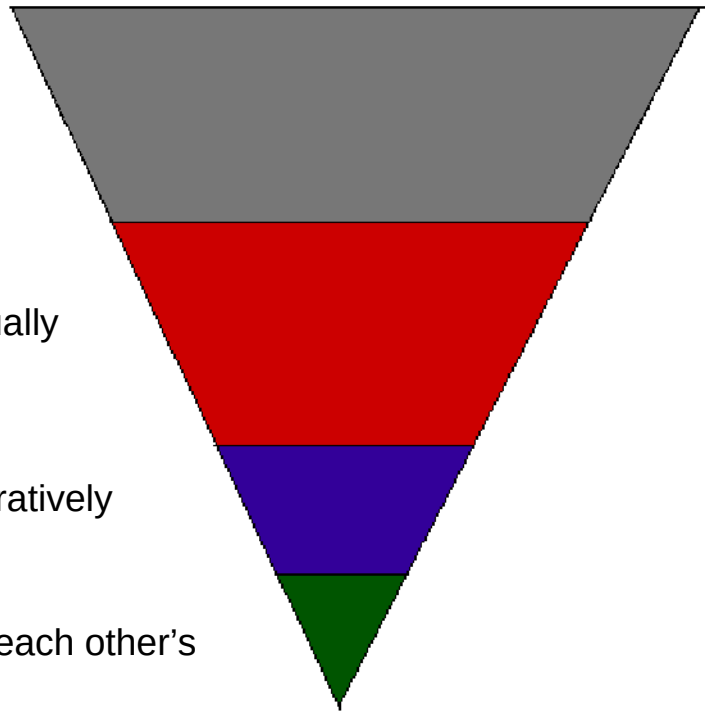
Teachers' Activities to Improve Instruction

Choose curriculum, write curriculum, align curriculum, write local standards

Plan lessons individually

Plan lessons collaboratively

Watch and discuss each other's classroom lessons



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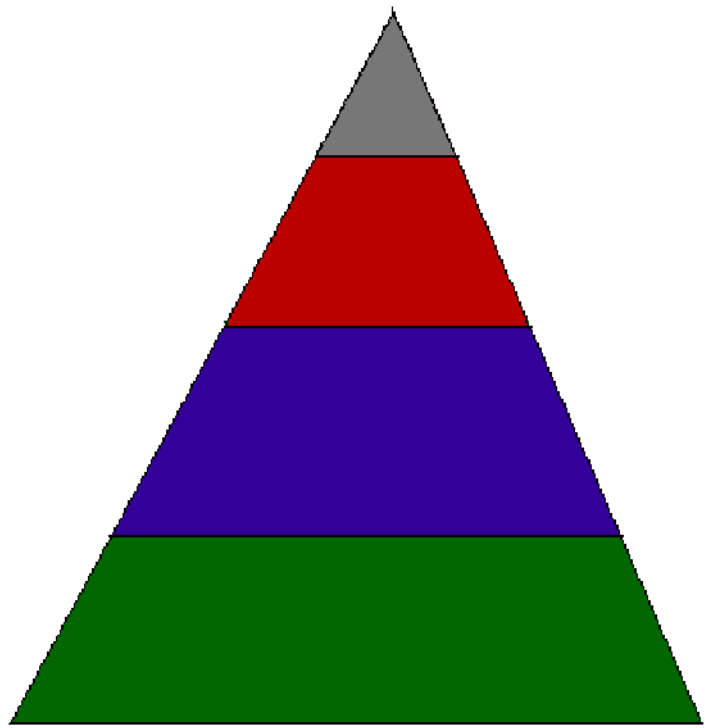


JAPAN

Collaborative Planning

- Translating broad goals- specific objectives
- Identify background knowledge
- Develop strategies for posing problems and presenting opportunities for students to problem solve
- Anticipate student responses (misconceptions and error patterns)
- Remark on teaching (supports, questions, etc.)

Methods

- Subjects:

  In both case studies, pre-service teachers were enrolled in a 3 credit course called Elementary Mathematics Methods placed in Title one schools

Case study 1: part-time students who were in field placement (practicum)

Case study 2: full-time students enrolled in education courses while doing a yearlong internship.

Procedure-Case study 1

These teachers were divided into collaborative groups based on grade level bands

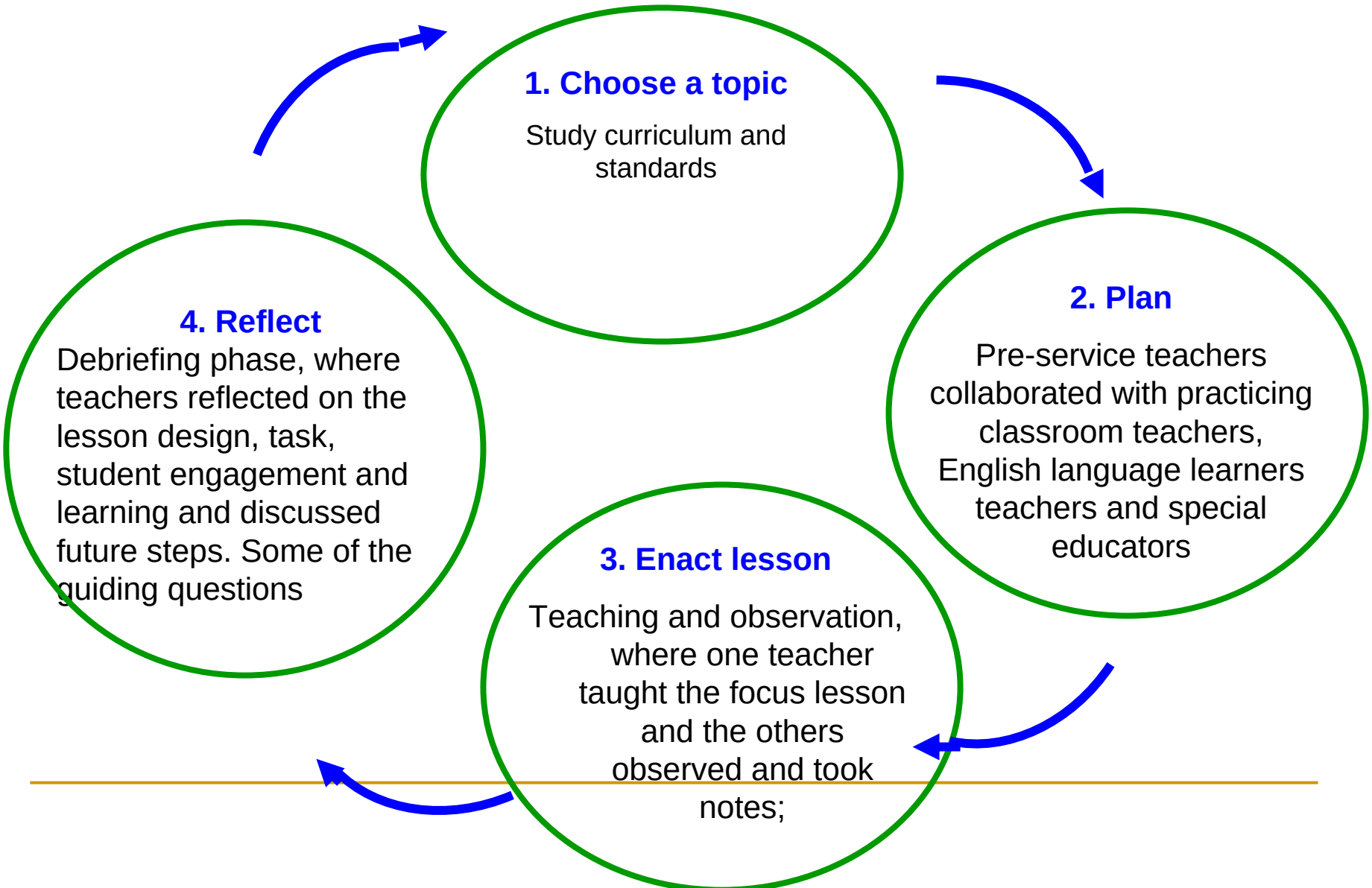
1) Found a lesson that would be appropriate for their grade level.

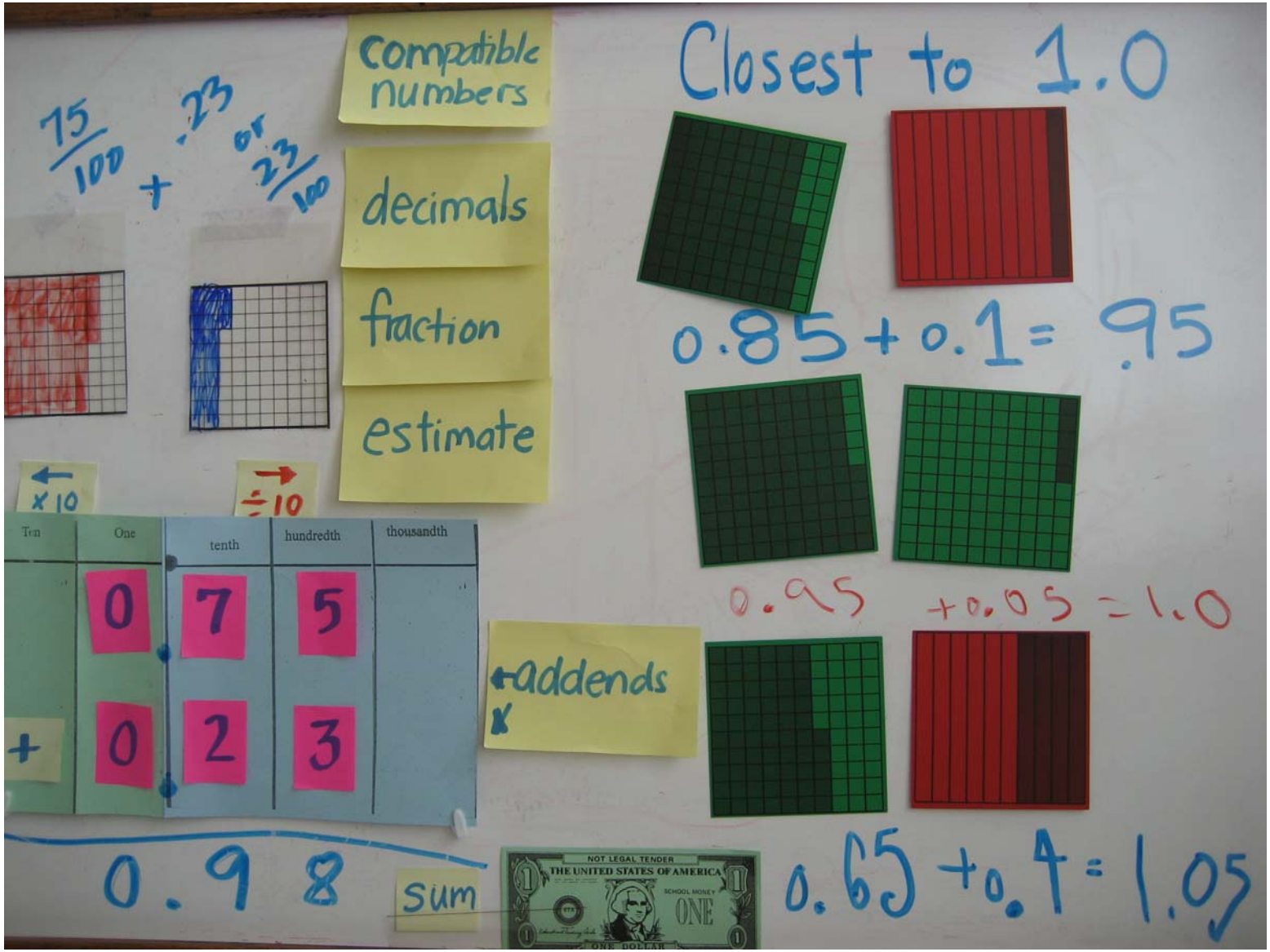
2) Next, each group worked on a concept map illustrating all the important mathematical ideas related to the lesson.

3) Teachers used the four column lesson format

Steps of the lesson: learning activities and key questions (and time allocation)	**Student activities/ expected student reactions or responses** Potential Barriers & Misconceptions	**Teacher's response to student reactions / things to remember** DIFFERENTIATION: List adaptations for GT, ESOL, LD	**Assess for Evidence of learning** Attach assessments
LINK			.

Procedure- Case Study 2




Compatible numbers
decimals
fraction
estimate
75/100 + .23 or 23/100
Closest to 1.0
0.85 + 0.1 = .95
0.95 + 0.05 = 1.0
x 10
÷ 10
Ten
One
tenth
hundredth
thousandth
0 7 5
+ 0 2 3
addends
0.98
sum
0.65 + 0.4 = 1.05
NOT LEGAL TENDER
THE UNITED STATES OF AMERICA
SCHOOL MONEY
ONE

Data collection and analysis

1) anecdotal notes during the collaborative planning and debriefing sessions.
2) pre-service teachers reflection of the process: Using a document analysis process, researchers drew common themes from pre-services' reflections from both case studies.
3) two pre-service teachers from each group were interviewed individually about their experiences.
4) a survey with a likert scale and short responses was administered to all of the participants to collect more information about the collaboration.

Results from *Case study 1:*

Outcome 1: Preservice teachers valued collaboration

Ninety-five percent of the teachers agreed with the statement, “I see the value of planning a lesson collaboratively.”

Results from *Case study 1:*

Outcome 2: Sharing ideas and generating novel teaching strategies

" I got a chance to get more ideas for mathematical models and ways to teach my lesson."

"It helped to talk about the concepts and get ideas for manipulatives and activities to use during the lesson."

" My colleagues had experiences and ideas that were new to me!"

" I found that my classmates came up with ideas and models that I would not have thought of by myself."

Results from *Case study 1:*

Outcome 3: Challenges in implementation

"It is a challenge to collaborate and stay aligned with the guidelines of the classroom teachers. In addition, some teachers prefer to work alone, especially when time is precious."

Results from *Case study 2:*

Outcome 1: Reciprocal learning

- *" In the beginning, I did not really participate because I was a little intimidated to be surrounded by so many teachers with years and years of experiences. I was not sure about in what way I could contribute to the planning of the lesson. But as the planning processes continued, I was encouraged to share some of the new ways we have been incorporating technology in mathematics instruction through our methods class. There were many teachers who were not aware of the website that had great interactive virtual manipulatives to teach fractions. In this way, I was able to bring to the table a new innovative teaching strategy and tool to enhance the lesson."*

Results from *Case study 2:*

*Outcome 2: D*eeper understanding of concepts and pedagogy.

- “The mapping of prior knowledge needed and future knowledge was illuminating – it just got me thinking more deeply about the concept. The brainstorming helped to see what kids need to know and where they are headed. It makes it easy to see all of the standards that are tied into one concept. I learned about multiple models of representations and strategies.”

This allowed pre-service teachers to discuss the prior knowledge and future building blocks and the important vocabulary and mathematical knowledge necessary for students to access the lesson.

Results from *Case study 2:*

Outcome 3: Appreciation of the complexity of teaching and learning

- "I was amazed that even experienced teachers wrestle with the ideas that we do when we plan lessons, like how to hook the students and link and engage the students. I thought it just came to them so naturally since they make it seem so easy when I observe them teach. Now I see how much thought is put into the actual sequencing of a lesson."

- " It was really eye opening to see how the teachers had to pick and choose which mathematical model to use for the lesson and how to design the tasksheet so that students could reveal their learning. There were even times, when teachers questioned each other about the use of certain models fearing that it may confuse students down the road and whether using multiple models might actually confuse the special needs learners. "

Designing the tasksheet

Adding Up Decimals: **Target 1**

Name_____ Partner's Name_____ Date_____

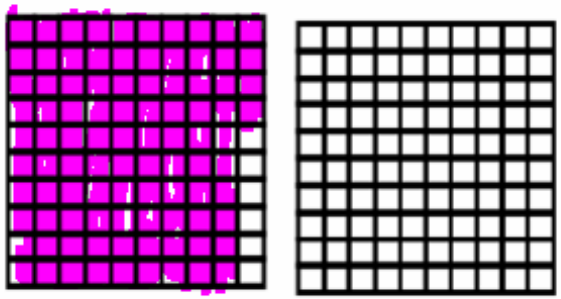
ROUND ONE

1, 3, 4, 5, 8

1. Place your numbers and add them up!

Ones	•	Tenths	Hundredths
0	.	4	3
0	.	5	1
0	.	9	4

2. Shade in Your Sum!



3. Was your sum greater than or less than 1?

less than 1

4. How far away were you from 1?

.06 or $\frac{6}{100}$

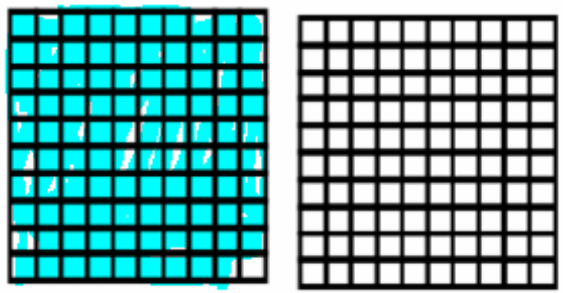
ROUND TWO

2, 5, 7, 9, 0

1. Place your numbers and add them up!

Ones	•	Tenths	Hundredths
0	.	2	9
0	.	7	0
0	.	9	9

2. Shade in Your Sum!



3. Was your sum greater than or less than 1?

less than 1

4. How far away were you from 1?

.01 or $\frac{1}{100}$

Conclusion

Are we challenging our pre-service and in-service teachers to maximize on their planning processes to develop their mathematical knowledge of teaching?

How does collaborative planning engage teachers in discussing and designing meaningful lessons, mathematically accurate explanations, conceptual models, and applications?”

References

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