

# Investigating Subject Knowledge for Teaching

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**Abstract:** Questioning is a teaching method most frequently used by teachers in the actual teaching process. Effective classroom questioning can not only help teachers understand the actual learning situation of students, but also promote the communication between students and teachers, and finally achieve a significant increase in the quality of classroom teaching. To better study how to ask questions effectively in the classroom, the author interviewed and observed the lectures of geography class and gave conclusions based on the findings.

**Keywords:** Teacher Knowledge; Knowledge of Questioning

## 1. Focus of Investigation

This study investigates teacher knowledge, specifically focusing on their use of questioning, and addresses the following research questions:

RQ1. What knowledge of questioning is revealed through a teacher's planned questions?

RQ2. What knowledge of questioning is revealed when a teacher enacts their planned questions in a lesson?

## 2. Context and Rationale

The focus of this study is an experienced teacher who has taught geography for over 30 years in Chinese middle schools. On analysis of her teaching, it would seem that she taught in what Mortimer and Scott (2003) would describe as a non-interactive-authoritative manner. Informed by the work of Manson (1973) and Chin (2007) and employing the knowledge quartet (KQ) of Rowland (2013) to understand teacher knowledge and facilitate effective teacher critical reflection, I decided to focus on Ms. Zhang's planning for teacher questioning to foster improved student learning and use lesson observations to determine the extent to which her use of questioning is effective.

## 3. Investigation

### 3.1 Methods

Table 3.1 Methods of inquiry in exploration of the research questions.

Research Questions	Data Collection Methods
RQ1. What knowledge of questioning is revealed through a teacher's planned questions?	1. Lesson plans 2. Semi-structured interview.
RQ2. What knowledge of questioning is revealed when a teacher enacts their planned questions in a lesson?	1. Pre and post lesson interview. 2. Lesson observation.

#### 3.1.1 Data Collected to Answer RQ1

To answer RQ1, I first conducted an audio-recorded semi-structured interview with Ms. Zhang, on the advice of Drever (1995) to enable greater depth of qualitative data, with questions specifically chosen to unpick her knowledge with regards to planning teacher questioning. Following this, we found a time in which I could collaborate with Ms. Zhang on her lesson planning, similar, to what was described by Burn (1997). The KQ (Rowland, 2013) was used to analyze the data gathered in the interview and lesson planning and used to unpick the knowledge revealed by Ms. Zhang in her planning for questioning and so answering RQ1.

#### 3.1.2 Data Collected to Answer RQ2

To answer RQ2, a 50-minute geography lesson of Ms. Zhang was observed, with a pre-lesson and post-lesson interview to further

unpick Ms. Zhang’s knowledge revealed through her questioning. Manson’s (1973) framework was used to categorize her questions, and, as I had previously introduced Ms. Zhang to the questioning approaches of Chin (2007), I was able to make note of any questions that resonated with this framework and postulate how they could be developed.

### 3.2 Findings and Discussion

#### 3.2.1 RQ1 - What Knowledge is Revealed Through a Teacher’s Planned Questions?

To answer RQ1, the KQ of Rowland (2013) was applied to analyze the data (interview transcript and the collaboratively planned lesson) and so unpick Ms. Zhang’s knowledge with respect to the four knowledge bases of the KQ.

Firstly, through collaborating with Ms. Zhang, in line with the advice of Burn (1997), it became clear that Ms. Zhang had an in-depth understanding of her subject and she was able to talk me through her ideas for the content she intended to teach. On probing Ms. Zhang for explanations of the more advanced topics of the lesson, she was able to discuss the complexities of the transportation industry concerning economic and environmental factors. Thus, Ms. Zhang demonstrated she had ample foundation knowledge through demonstrating her SMK (Shulman, 1986) and theoretical comprehension of teaching pedagogy that I would argue underpins effective questioning.

Secondly, Ms. Zhang demonstrated strong connection knowledge in terms of her ordering of tasks and how she sought to build complexity to facilitate student engagement and meaning-making.

#### 3.2.2 RQ2 - What Knowledge is Revealed When a Teacher Enacts Their Planned Questions in a Lesson?

Firstly, resonating with what both Mortimer and Scott (2003) and Chin (2007) describe as a traditional approach to questioning, though clearly exhibiting her foundation knowledge (Rowland, 2013), it would appear that Ms. Zhang taught in a non-interactive-authoritative manner that did not make use of students’ response to questioning to take advantage of the contingent moments that arose, and thus a lack of contingent knowledge (Rowland, 2013).

Secondly, key insights into Ms. Zhang’s knowledge of questioning, particularly about the transformation and contingent knowledge of members of the KQ (Rowland, 2013) were revealed through analysis of the questions planned for and employed in the lesson and are presented in Table 3.2 with Manson’s (1973) framework first applied to categorize the type of question and understand Ms. Zhang’s purpose for this question and Chin’s (2007) framework applied to understand the subsequent discourse and offer suggestions for improvement.

Table 3.2 Selected salient questions asked by Ms Zhang analysed with Manson’s (1973) and Chin’s (2007) frameworks.

Questions asked	Analysis of question type through Manson’s (1973) Framework	Analysis of resultant discourse and development through Chin’s (2007) framework
What are the pros and cons of each transportation?	Understanding question ‘facts’	Ms Zhang actively engaged students with this question, however, Socratic questioning reflective toss would have been useful to place the responsibility on the students to cultivate student understanding.
Have you travelled by train/ aeroplane before? Is it convenient?	Synthesising question ‘generalisations’	Semantic tapestry stimulating multimodal thinking, requiring effective transformation knowledge, would have been helpful to encourage students to consider the convenience of travel from different perspectives.
What kind of transportation should we choose from one city to another?	Solving question ‘concepts’	As there is no objectively correct answer, employing Socratic questioning constructive challenge would have been useful in fostering students’ meaning making (Mortimer & Scott, 2003).
What kind of transportation was used during your last trip?	Remembering question ‘facts’	Socratic questioning pumping would have been helpful here to allow Ms Zhang to foster extended student talk rather than the short responses received.

The analysis in Table 3.2 and discussion with Ms. Zhang resonates with Manson’s assertion that teachers express concerns about “teaching students how to think” (Manson, 1973, p.25), however, their questioning usage does not line up with this, and in Ms. Zhang’s case, indicates her transformation and contingent knowledge would benefit from further development.

Finally, as discussed above, the utterances of students could have been further utilized to foster students’ cognitive engagement rather than enforcing knowledge transfer, and so, further highlights a lack of contingent knowledge and resonates with the findings of Kang and Que (2020) who observed teachers in a similar context. This was most apparent from instances where students were eager to engage in classroom talk, however, rather than capitalize on the resultant contingent moments to explore the students’ ideas through a dialogic approach, Ms. Zhang would evaluate their responses and continue with her plan.

## 4. Conclusions and Implications

### 4.1 Conclusions

In answering RQ1, Ms. Zhang’s knowledge of questioning was revealed through her planning. With reference to the KQ

(Rowland, 2013), Ms. Zhang demonstrated significant foundation knowledge of geography teaching. The sequence of events and the corresponding increase in complexity of questions Ms. Zhang planned for revealed strong connection knowledge. Ms. Zhang demonstrated good transformation knowledge with her consideration of making questions comprehensible to students, though this could be further developed to facilitate student meaning-making (Mortimer & Scott, 2003). Finally, Ms. Zhang's contingent knowledge appeared to be lacking as she seemed unwilling to plan for questions that allow students to explore their own ideas and consequently would have demanded she thinks on her feet.

In answering RQ2, Ms. Zhang's knowledge of questioning was revealed through her teaching. Though Ms. Zhang posed appropriately leveled questions, she could have utilized her transformation knowledge to foster greater student meaning-making. Ms. Zhang did not encourage students to expand on their responses in a constructivist manner that would allow them to explore their ideas and so suggests that Ms. Zhang's contingent knowledge (Rowland, 2013) could benefit from development, possibly through using the questioning approaches of Chin (2007) but convincing her of the value of asking questions and then having to think on her feet may be challenging.

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