

Mastering the Skill of Question Formulation for Learning and Research

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Overview of sessions

Session 1
February 2

Faculty and graduate students (11:00 am - 1:00 pm)
Introduction to the Question Formulation Technique

[virtual facilitation]

Session 2
February 7

Faculty (2:30 pm - 4:30 pm)
The Art and Science of the Question Formulation Technique: applying the QFT for teaching and learning purposes

Graduate students (1:00 pm - 2:20 pm)
The Question Formulation Technique for Research

[on-site facilitation]

Session 3

Faculty **March 6 (2:30 pm - 4:30 pm)**
Lessons from QFT Practice and introduction to Question Formulation Theory

Graduate students **February 28 (1:00 pm - 2:30 pm)**
Exploring how to get to better questions

[virtual facilitation]

Symposium
May 8

CSLA - RQI Symposium presenting applications and advances in question formulation for learning and research. Presentations by both faculty and students

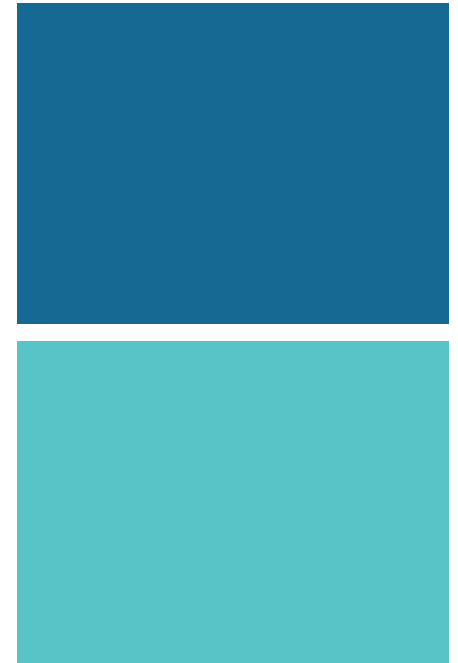
[on-site facilitation]

Day 2: The Art and Science of the Question Formulation Technique: applying the QFT for teaching and learning purposes

February 7, 2024

Today's agenda

- Power of question formulation
 - Question Formulation Theory for Learning
- Examples of using the Question Formulation Technique in college classrooms
- Applying the QFT for learning and learning purposes
An art and science of the QFT



+ Power of question formulation:
Question Formulation Theory for Learning

Question Formulation Theory for Learning

: explains the phenomenon of what changes consistently occur when people formulate their own questions in learning

- ★ Developed based on the work on the ground for over the past 30 years and supported by the literature on questioning and learning
- ★ Question formulation: Generating questions divergently and then working to improve them through convergent and metacognitive thinking”

Question Formulation Theory for Learning

QUESTION FORMULATION

RQI's definition:

"Generating questions divergently and then working to improve them through convergent and metacognitive thinking"

Engagement

- Focused
- Interested
- Curious
- Joyful
- Autonomous
- Personalized learning agenda

Comprehension

- Activate prior knowledge
- Make connections and meaning
- Assess information
- Gain new knowledge

Discovery

- Confirm or challenge knowledge
- Create
- Hypothesize
- Problem-name
- Explore
- Generate new ideas and new questions

Greater agency

Motivated Learners & Nimble Thinkers

- | | | |
|-----------------|--------------|---------------|
| • Purposeful | • Persistent | • Responsible |
| • Committed | • Flexible | • Agile |
| • Self-directed | • Analytic | • Independent |



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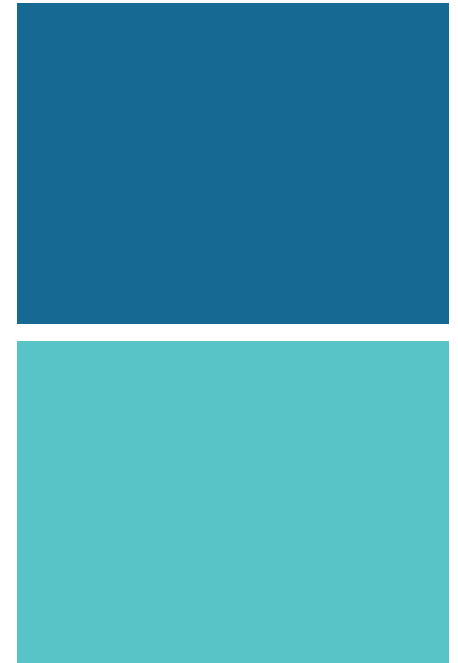
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- + Examples of using the Question Formulation Technique in college classrooms
-

The QFT, on one slide...

1) Question Focus

2) **Produce** Your Questions

- ✓ Follow the rules
- ✓ Number your questions

1. Ask as many questions as you can
2. Do not stop to discuss, judge or answer
3. Record *exactly* as stated
4. Change statements into questions

3) **Improve** Your Questions

- ✓ Categorize questions as Closed or Open-ended
- ✓ Change one Open to Closed and one Closed to Open

4) **Strategize**

- ✓ Prioritize your questions
- ✓ Action plan or discuss next steps
- ✓ Share

5) **Reflect**

Closed-Ended:

Answered with "yes,"
"no" or one word

Open-Ended: Require
longer explanation

Various Teaching Purposes for using the QFT

- Introducing new content
- Formative assessment
- Research
- Summative assessment
- Peer review
- Skill development
- Problem-solving

Classroom Example: College Engineering

Professor: Claudia Torres Garibay, Ph.D., Oregon
Institute of Technology

Topic: Materials for Renewable Energy Applications

Purpose: To assess topic understanding and
expectations

Question Focus

Materials for Renewable Energy Applications
(course name)

Student reflections

- “It’s definitely an interesting approach. I did enjoy this method because **it helped me ask more questions regarding the class.**”
- “would definitely use this technique again. **The technique almost forces you to look at the subject from many different angles.**”

Professor observed:

- There were more questions and ideas to be explored
- They were able to explore a topic with more depth than originally expected“

Classroom Example: College Biology

Professor: Emily Westover, Ph.D., Brandeis University

Topic: Molecular Mechanisms of Disease

Purpose: To generate a research topic

Question Focus

HbS is the molecular cause of Sickle Cell Disease, a heterogeneous and devastating disease

* Background reading on Sickle Cell assigned before class

Next Steps with Student Questions

- Groups generated questions about Sickle Cell Disease and chose their top 3 questions
- Each group chose a question to research
- Students researched the literature and made a 15-minute presentation on their findings

Reflections

- Students reported the QFT helped them feel ownership of the assignment and generated excitement during the research process
- The QFT helped Professor Westover assess the level of students' content knowledge and conceptual understanding and informed her instruction

Classroom Example: College Biology

Teacher: Rachel Woodruff, Assistant Professor of Biology,
Brandeis University, MA

Topic: Molecular Biology

Purpose: To open up discussion around the homework, and the
attributes of a good biological question

Students were assigned a complex molecular biology article for homework and asked to generate and submit questions as a part of their homework

Next steps

- The next day, students convened in groups to categorize their questions as open or closed, and worked to improve them by changing them from one category to another
- By thinking about types of questions and the information different types of questions elicit, they began to analyze key attributes of a good biological research question
- Later in the semester, students applied their understanding of how to formulate questions and designed a question for their own research project

Classroom Example: College Biology

Professor: Emily Westover, Ph.D., Brandeis University

Topic: Post-Exam Review

Purpose: To assess what the students were not understanding about the content

Question Focus

Students performed poorly on exam question #6

Ask as many questions as you can about
exam question #6

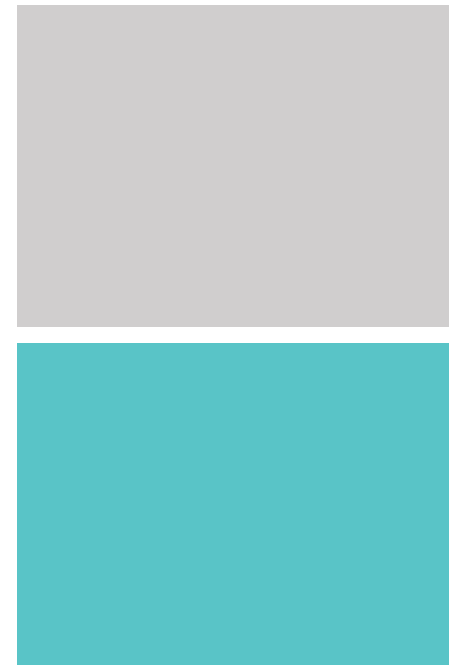
Educator Reflections

- Students were thinking more deeply about the exam question
- Professor Westover was able to gather insight into why they may have had difficulty with the exam question

Discuss

What did you notice about these examples?

Art and Science of the Question Formulation Technique



QFT: An Art and a Science

The Science:

The QFT is a rigorous protocol, with specific steps and sequence, that produces consistent results



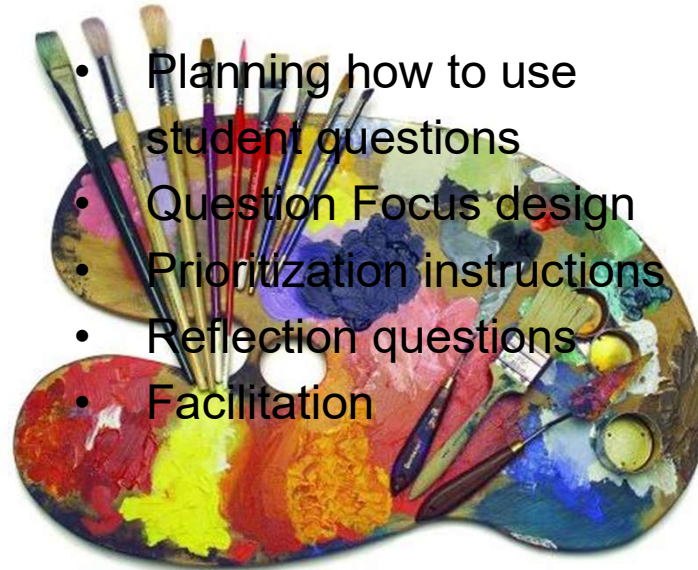
QFT: An Art and a Science

The Art:

You should tailor the QFT process to the specific content and people you are working with.

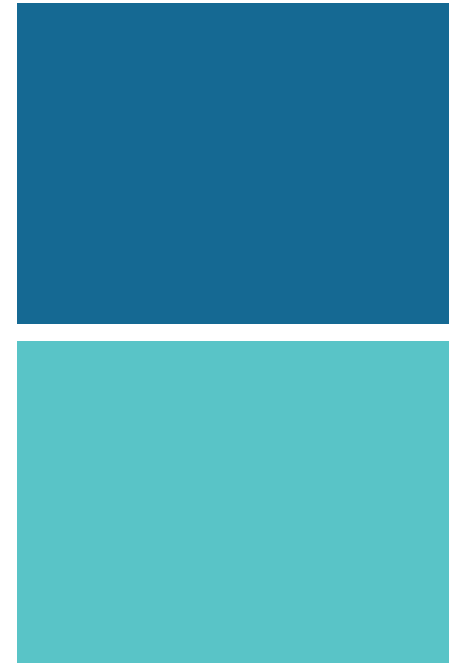
Tailor the QFT through:

- Planning how to use student questions
- Question Focus design
- Prioritization instructions
- Reflection questions
- Facilitation



Five Areas Related to the Art of the QFT

1. **Starting at the End**
2. QFocus Design
3. Prioritization Instructions
4. Reflection Questions
5. Facilitation



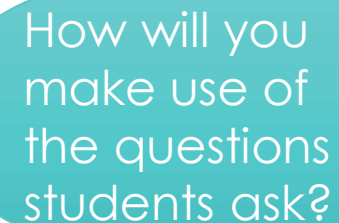
+ The Basics of QFT Design for course work

Various Teaching Purposes for using the QFT

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Is the QFT the right tool for your objective?



How will you make use of the questions students ask?

Your teaching purpose

➤ **For what purpose would you like to use the QFT?**

Something you may want to consider

- What do you want to accomplish by using the QFT?
- At what point in the lesson will you use the QFT?
- How will students' questions be used? (research paper, designing experiments, for developing questions for the lecturer to respond to instead of using the prompt: "any questions?")

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Developing a Question Focus (QFocus)

The Question Focus (QFocus) is a stimulus for jumpstarting questions. It is the focus of question formulation.

**Only one requirement for the Question Focus:
*It should NOT be a question.***

Some guidelines:

- Simple and clear - encourages question generation quickly
- Promotes divergent thinking and different lines of questioning
- Meets your purpose in using the QFT

Examples of different forms of a Question Focus

(QFocus: stimulus or prompt for student questions)

- A phrase or quotation
- An image or video
- A primary source
- A podcast or speech
- A hands-on experience or experiment
- An equation or data set
- Some combination of the above

The QFocus is *not* a question!

Examples of QFocus

- “Distribution and Abundance of Organisms”
- “Materials for Renewable Energy Applications” (course name)
- “HbS is the molecular cause of Sickle Cell Disease, a heterogeneous and devastating disease”
- Exam question #6 (exam question that entire class could not answer)
- Reading assignment

Process for designing a QFocus: Example

Teacher: Joan Soble, High school, Cambridge, MA

Topic: Albert Camus's The Plague

Purpose: Pre-reading engagement and prediction of central themes going into the text

Initial Question Focus:

"Rieux replied that . . . [the sanitary] conditions were not good. But before he said any more, he wanted to know if the journalist would be allowed to . . . 'publish an unqualified condemnation of the present state of things' . . . 'I've no use for statements in which something is kept back,' he added. 'That is why I shall not furnish information in support of yours'" (12).

" . . . Everybody in town is talking about the rats, and the local newspaper has taken a hand. The town-topics column, . . . is now devoted exclusively to a campaign against the local authorities. 'Are our city fathers aware that the decaying bodies of these rodents constitute a grave danger to the population?'"(28)

" . . . It has small importance whether you call it plague or something rare kind of fever. The important thing is to prevent its killing half the population of this town"(49).

Individuals and organizations are similarly responsible in times of threat and crisis.

*"But [the
dead rat]'s the concierge's
headache, isn't it?" (13)*

*"The thing was to do your job as
is it should be done" (41).*

*"Stupidity has a knack of getting its way; as we should see if we
were not always so much wrapped up in ourselves.*

*"In this respect, our townsfolk were like everybody else, wrapped
up in themselves; in other words, they were humanists: they
disbelieved in pestilences" (37).*

Revised Question Focus:

The city fathers were aware that the decaying bodies of these rodents were making people sick. (*page 28*)

Revised Question Focus:

The city fathers were aware that the decaying bodies of these rodents were making people sick. (page 28)

Practice designing your Question Focus

1. Work individually to design a QFocus
 - i. Brainstorm QFocus possibilities that are related to what you need to teach/what the students need to learn.
 - ii. Choose one of the QFocus options
 - iii. Quickly test the QFocus by naming some questions different students might ask.

Practice designing your Question Focus II

2. Share in pairs and get feedback
 - Do not give any context or explain it
 - Partner will ask questions following the rules
3. Feedback
 - What worked well?
 - What recommendations do you have (if any) to strengthen it?
4. Revise QFocus as needed

The QFT on One Slide

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Examples of Prioritization Instructions

Choose three questions...

General Instructions:

- that you consider most important
- that you are most curious about

Specific Purposes:

- that you need to research further
- to help you solve the problem
- that you need to answer first
- that will help you understand the text
- that require analyzing data
- that you consider “outside the box”

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Tailoring Reflection Questions

QFT Process

- What did you learn about asking questions?
- How did you learn it?
- What did you notice about the order/sequence of questions?
- How can you use what you learned about asking questions?
- How do you feel about asking questions?
- How has your thinking changed since last time we did the QFT?

Content Specific

- What did you learn about the (content)?
- What do you understand differently now about [topic]?
- How did your questions help you think about...
 - key concept
 - specific assignment
 - overarching topic
 - theme in the course

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Making a small shift in practice

Who is asking the questions?

Some facilitation practices we use

1. Monitor student adherence to the process
2. Do not give examples
3. Do not get pulled into group discussion
4. Acknowledge all contributions equally

The Science of the QFT:
a protocol

The Art of the QFT:
Your Design

Reflection

- What do you understand differently now about using the QFT in your course?

 - ★ To maximize the value of our March 6th session, we recommend using the QFT at least once, but preferably twice!
-

“Questions are the engines of intellect, the cerebral machines which convert energy to motion, and curiosity to controlled inquiry.” *

David Hackett Fischer
Professor of History, Brandeis University

“It[QFT] helps me by getting me to think about questions on my own. Also, it gets my mind in motion to think about the questions other people make.”

8th Grader, Austin, TX

Students in Harvard Rising Scholar Program reflected after the QFT for Research experience

“This activity was actually super insightful in the creation of my research question. I was able to narrow down what I would like to ask within the matter of one class period... something I have not really been able to do since I got here. I think that this a result of the QFT, a really efficient model at helping us gauge important questions.”

“I believe it is such a useful technique to begin before any research is ever conducted because it will help guide the research process and create a foundation for what the research is centered on.”

Office hours

We have office hours before the next session on February 28.

- 1:30 pm - 2:30 pm on Wednesdays
- 12 pm - 1 pm on Fridays

➤ Please sign up for a 30 minute session at <https://bit.ly/RQIOfficeHours>



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Thank you.

Please contact tomoko.ouchi@rightquestion.org for any questions!

Free resources available at www.rightquestion.org
