

# The Group Administered Interactive Questionnaire (GAIQ): An Alternative to Individual Interviews

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## ABSTRACT

Individual interviews are often considered to be the gold standard for researchers to understand how people think about phenomena. However, conducting and analyzing interviews is very time consuming.

Thus, we present the Group Administered Interactive Questionnaire (GAIQ) as an alternative to individual interviews and discusses the pros and cons of each data collection method. Use of GAIQ is discussed in the context of a study that seeks to understand teaching assistants' reasons for the design of problem solutions for introductory physics.

## INTERVIEW OR GAIQ: A TOOL TO STUDY INSTRUCTORS' BELIEFS

Problem solving plays an important role in most physics instruction and graduate teaching assistants play a central role in the teaching of problem solving. Teaching assistants lead recitations in which they present students with worked-out examples for physics problems, guide students in solving problems and assess students' solutions. While various curricular materials and pedagogies have been shown to improve student problem solving performance [1], their acceptance depends to some extent upon instructors' beliefs about the role that problem solving should play in introductory physics instruction.

A former line of research investigated physics faculty beliefs and values about the teaching and learning of problem solving [2] via an interview asking respondents to make judgments about concrete instructional artifacts. We present a study that builds on this former line of research to investigate graduate teaching assistants beliefs about the role that worked examples should play in introductory physics instruction. Instead of interviews, we developed the Group Administered Interactive Questionnaire (GAIQ) to gather similar data from the teaching assistants.

## IN BOTH TOOLS (INTERVIEW AND GAIQ) RESPONDENTS MAKE JUDGMENTS ABOUT CONCRETE ARTIFACTS

## RATIONALE - RESEARCH DESIGN

	Individual interview	Take advantage of TA course - GAIQ
<b>Characteristics</b>	Respondents make judgments about concrete artifacts	Answered in worksheets
	Pre-defined questions	Negotiating meaning: Via sequence of worksheets
<b>Concerns → solutions</b>	Negotiating meaning: Via F2F discussion	Less time consuming for researchers
	Practicality: Time consuming	No interviewer intervention
	Reliability: Interviewer intervention [3]	The respondent assists in the categorization
	Validity: Ambiguity in categorization of data	

## Solution Artifacts Used

Artifacts vary in several important ways, e.g.:

- Rough sketch vs. Detailed diagram
- Straightforward vs. Separate overview
- Skips details vs. Thorough derivation
- Works forward vs. Works backward

## REFERENCES

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- S. Kvale, "An Introduction to Qualitative Research Interviewing", Thousand Oaks, CA: Sage, 1996.
- J. Gubrium and J. Holstein, "Handbook of Interview Research: Context & Method", Thousand Oaks, CA: Sage Publications, 2001.

### Interview question

**GENERAL QUESTIONS:**  
 What is your purpose in providing solved examples in your class. How would you like your students to use the solved examples you give them? Why?"

**SPECIFIC QUESTIONS**  
 Take a look at each of these instructor solutions and describe how they are similar or different to your solutions. Please explain your reasons for writing solutions the way you do.

### Problem Context for Study

**Homework Problem**

You are whirling a stone tied to the end of a string around in a vertical circle having a radius of 65 cm. You wish to whirl the stone fast enough so that when it is released at the point where the stone is moving directly upward it will rise to a maximum height of 23 meters above the lowest point in the circle. In order to do this, what force will you have to exert on the string when the stone passes through its lowest point one-quarter turn before release? Assume that by the time that you have gotten the stone going and it makes its final turn around the circle, you are holding the end of the string at a fixed position. Assume also that air resistance can be neglected. The stone weighs 18 N.

The correct answer is 1292 N

- Reasonably difficult for an introductory calculus-based physics course,
- Requires an average student to use an exploratory decision making process,
- Rich enough to allow for several concepts and interesting variations

## GAIQ DATA COLLECTION PROCEDURE

Time	Activity
Pre	Solve homework problem Answer individually general questions and specific questions related to 3 Instructor solutions
Lesson	Whole class discussion regarding general questions in the pre-discussion individual worksheet In groups of 3, answer <b>THE SAME</b> predefined questions Whole class discussion sharing group work
Post	Update answer for <b>THE SAME</b> predefined questions individually

Identify TA 'natural' instructor solution and initial ideas about instructor solution features

Allow TAs to clarify ideas

Identify TA final ideas while the TAs make use of a-priori feature list

### Pre Worksheet

Attached are several instructor solutions for the problem you solved that were designed to be posted or distributed to students. They are based on actual instructor solutions. Take a look at each of these instructor solutions and describe the prominent features of those solutions. Which features of these solutions would you like to include in solutions you are writing for your students? Please explain your reasons.

Features noticed	Representative solution			Features valued			Reasons for preferences
	Solution I	Solution II	Solution III	Solution I	Solution II	Solution III	
diagrams-freebody	+	+	+	C	B	A	I like having diagrams etc. it's easier to visualize what is happening. By listing what you know, it's easier to see what you don't know. Some students are more verbal than others and need more steps.
knowns/unknowns		+		A			Knowing the approach you can apply this to other problems.
explanation of steps	+		+	C	A	B	
approach/execution			+	C	B	A	

### Post Worksheet

Features from list	Updated preference			Updated reasons for preferences
	Solution I	Solution II	Solution III	
freebody diagrams	+	++	++	allows students to visualize the problem
knowns/unknowns	0	++	0	by listing knowns + unknowns, you can more easily see what equation to use
explanation of steps	0	++	+	students who are verbal would appreciate a clear explanation of each step
approach/execution	0	+	++	allows a conceptual idea of program instead of just plug-chug

## DATA ANALYSIS PROCEDURE

### STEP 1: Adding Solution Features to a-Priori List

- Visualization
- List of knowns/unknowns
- A "separate" overview of how the problem will be tackled
- Explicit sub-problems
- Reasoning is explained in explicit words
- The principles/concepts used are explicitly
- Thorough derivation
- Long physically
- Includes details that are not essential
- Provides alternative approach
- Solution is presented in an organized and clear manner
- Direction for the progress
- Symbolic solution
- Provides a check of the final result
- Solution boxed
- Gives the meaning of the symbols
- In first person narrative

### STEP 3: Categorizing Features and Reasons for Each TA

Solution feature # from list	Original feature name	Solutions that has this feature	Preference (Pre/Post)	Categories for Reason (using list below)
3	Approach/Execution	3	3/3	4,5

### STEP 2: Emergent Categories for Reasons

- Keeping students emotionally involved
- Keeping students cognitively involved
- Setting the standard for an adequate solution
- Promoting conceptual understanding
- Modeling expert-like problem solving
- Saving time
- Preventing exposure of mistakes

## SUMMARY

- Survey interviewing [4] takes a positivistic standpoint, aims at reproducible knowledge via pre-determined questions.
- Qualitative interviewing [4] takes a Constructivist standpoint, aims to reach shared understanding via probing questions.
- The GAIQ methodology shares characteristics of both approaches, and, thus is well suited to understanding how people think about a phenomenon. We have shown that it can be used to study TAs perceptions of the use of instructor solutions.

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