

ABSTRACT

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

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

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# 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.

# **RATIONALE - RESEARCH DESIGN**

	Individual interview	Take advantage of TA course - GAIQ				
Characteristics	•	Igments about concrete acts				
	Pre-defined questions	Answered in worksheets				
	Negotiating meaning: Via E2E discussion	Negotiating meaning: Via sequence of				

## 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.

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**

### 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

### **Problem Context for Study**

he correct answer is 1292 N

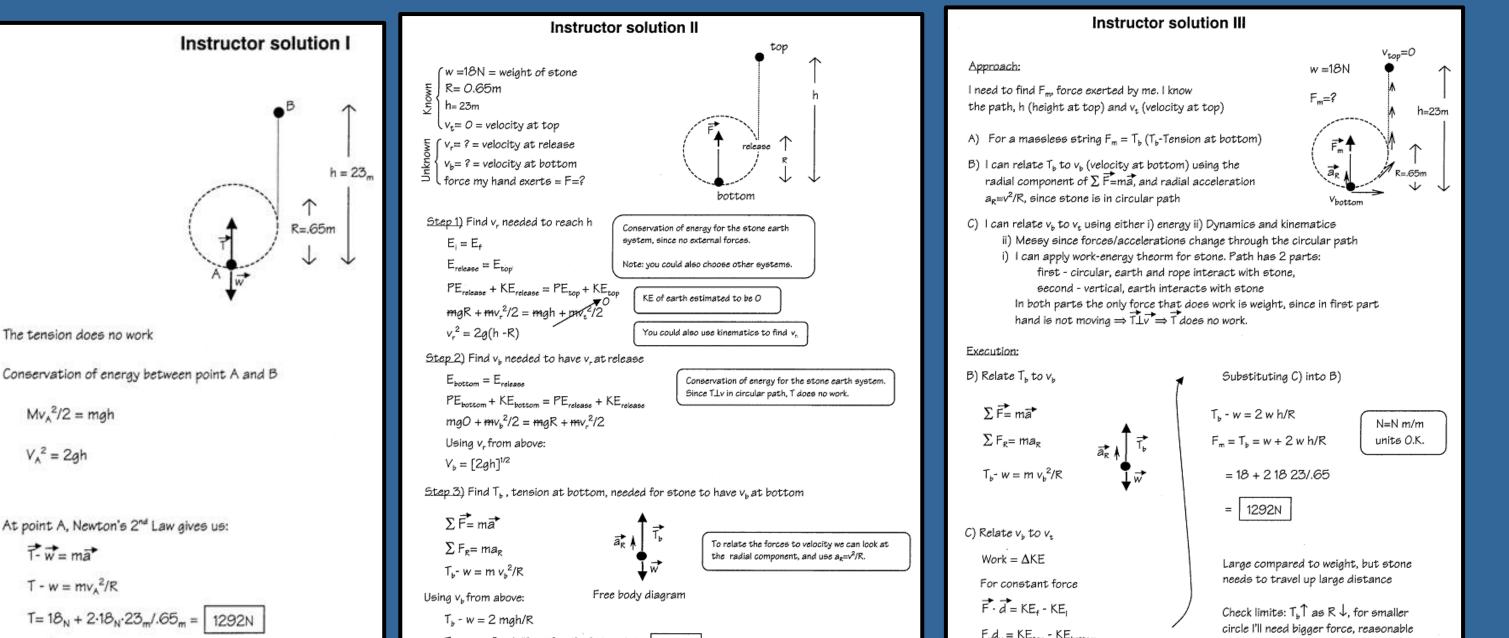
Homework Problem ou are whirling a stone tied to the end of a string around in a vertical circle having a radius of 65 cm. You wish to whirl the stone fast enough so that when it is released at the point when the stone is moving directly upward it will rise to a maximum height of 23 meters above the owest 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, yo are holding the end of the string at a fixed position. Assume also that air resistance can be neglected. The stone weighs 18 N.

#### Reasonably difficult for an introductory calculus-based physics course, e student to use an

		worksheets					
Concerns ⇒ solutions	Practicality: Time consuming	Less time consuming for researchers					
	Reliability: Interviewer intervention [3]	No interviewer intervention					
	Validity: Ambiguity in categorization of data	The respondent assists in the categorization					

### **Solution Artifacts Used**

T<sub>b</sub> = w + 2 w h/R = 18 + 2 18 23/.65 = 1292N



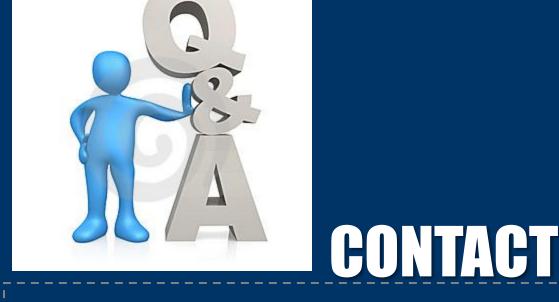


- 1. L. Hsu, E. Brewe, T. Foster, and K. Harper, "Resource Letter RPS-1: Research in problem solving", American Journal of *Physics* **72** (9), 1147 (2004).
- 2. C. Henderson, E. Yerushalmi, K. Heller, P. Heller, V. Kuo, "Physics Faculty Beliefs and Values about the Teaching and Learning of Problem Solving Part II: Procedures for Measurement and Analysis", *Physical Review* Special Topics: Physics Education Research, **3** (2), 020110 (2007).
- 3. S. Kvale, "An Introduction to Qualitative" Research Interviewing", Thousand Oaks, CA: Sage, 1996.
- 4. J. Gubrium and J. Holstein, "Handbook of Interview Research: Context & Method", Thousand Oaks, CA: Sage Publications, 2001.

	ay you do. DATA COLLECTION PROCEDURE	e • F a	Requires an average student exploratory decision making Rich enough to allow for seve and interesting variations	pro
Time	Activity		Identify TA 'natural'	
Pre	Solve homework problem Answer individually general questions and specific questions related to 3 Instructor solutions		instructor solution and initial ideas about instructor solution features	
Lesson	Whole class discussion regarding general questions in the pre- discussion individual worksheet In groups of 3, answer <u>THE SAME</u> predefined questions Whole class discussion sharing group work		Allow TAs to clarify ideas	
Post	Update answer for <u>THE SAME</u> predefined questions individually		<ul> <li>Identify TA final ideas</li> <li>while the TAs make</li> <li>use of a-priori feature</li> <li>list</li> </ul>	

allow for several	concepts							T <sub>b</sub> equals F,	the force i	ny hand exerts, for a massle	ess string			-w h = m	y <del>21</del> 2 - m v <sub>b</sub> ²/2			
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		Pre Wo	rkshe	et								<b>U</b>				ed diagram arate overvi		
	actual instructo	r solutions. Take a lo	ok at each of these	e instructor s clude in solu	solutions a ations you	ind describe are writing	e the prominent fea for your students?	tributed to students. tures of those solution Please explain your r	ns. reasons	based on	<ul> <li>Skip</li> </ul>	s det	ails	vs. T	horou	gh derivations backward	on	
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circle I'll need bigger force, reasonable  $F_y d_y = KE_{top} - KE_{bottom}$ -w h = m y 212 - m y 2/2



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### 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

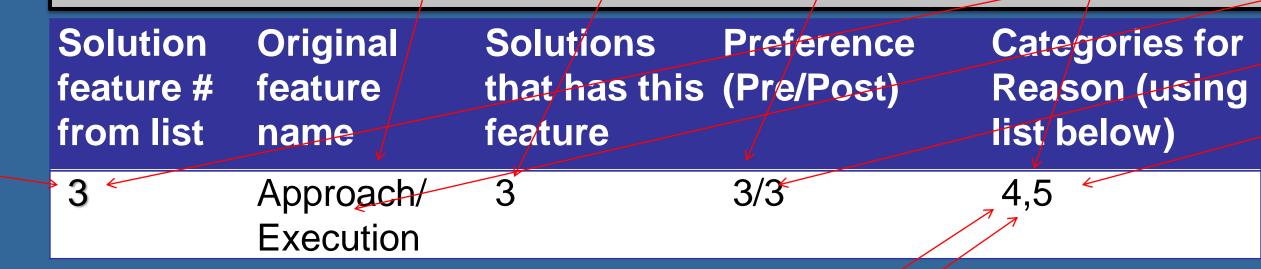
#### tackled Explicit sub-problems

- Reasoning is explained in explicit words
- The principles/concepts used are explicitly
- Thorough derivation
- Long physically
- Includes details that are not essential 10. Provides alternative approach 11. Solution is presented in an organized and clear manner

12. Direction for the progress 13. Symbolic solution 14. Provides a check of the final result 15. Solution boxed 16. Gives the meaning of the symbols

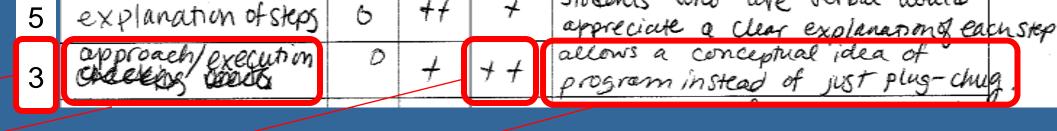
17. In first person narrative

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



**STEP 2: Emergent Categories for Reasons** Keeping students emotionally involved Keeping students cognitively involved . Setting the standard for an adequate solution . Promoting conceptual understanding 5. Modeling expert-like problem solving 6. 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.