

# Is it Possible to Reveal Tacit Knowledge with ACJ and RGT? Unpacking Teachers' Assessment Practices

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*The tacit knowledge of recognizing quality in student work is difficult to explicate in words, concepts like gut feeling or intuition is sometimes used. Is it possible to reveal such knowledge? Adaptive Comparative Judgment (ACJ) shows a high degree of consistency among teachers when assessing quality in student work. Central to the method is that judges assess the quality of student work and write a comment where their choices are justified. The ACJ procedure, combined with providing comments, makes the implicit ability of assessment to some extent explicit. In this paper, we explore possibilities to combine ACJ with Repertory Grid Technique (RGT) to make in-depth analysis of technology teachers' assessment practice. The theoretical framework of RGT follows the argument that we interpret our world based on our experiences and provides arguments for claiming that teachers with similar education and work experiences have shared values in their professional practice. Consequently, teachers' agreement in assessments in the ACJ studies can be a result of shared experiences. This study is a follow-up of a previous study (Hartell, Isaksson Persson, Bartholomew & Strimel, 2018); reasoning will be further investigated and new insights on how to combine ACJ and RGT is reported in this paper.*

Keywords: Adaptive comparative judgment, repertory grid theory, assessment, technology education, engineering education, STEM education

## Introduction

Studies conducted with Adaptive Comparative Judgment (ACJ), show a high degree of consistency among teachers when assessing quality in student work (Bartholomew & Yoshikawa-Ruesch, 2018). This study is the second pilot study (Figure 1) where Repertory Grid Technique (RGT) is applied on qualitative data collected through ACJ. This project investigates teachers' assessment practices and values in an open-ended design across cultures in the USA, UK, and Sweden, see Bartholomew, Hartell, & Strimel, 2017; Bartholomew, Ruesch, Hartell & Strimel, 2019; Hartell, Isaksson Persson, Bartholomew & Strimel, 2018.

Data from this ACJ project is used and organized in accordance with Repertory Grid Technique (RGT) in pilot study 1 (Hartell et al., 2018; Figure 1). The aim is to investigate the potential of RGT as a tool for deeper analyses of judges' comments from the ACJ procedure. Pilot study 1 (Hartell et al., 2018) shows benefits of combining RGT and ACJ to unpack judges' assessment practices to elicit evidence of their values and beliefs.

In order to find out more in a second pilot study [Pilot 2, this paper] (Figure 1), the Swedish judges are interviewed with RGT methodology. This paper presents results from one of these interviews.

The aim is to investigate if the combination of ACJ and RGT can elicit the informant's view on quality in student works.

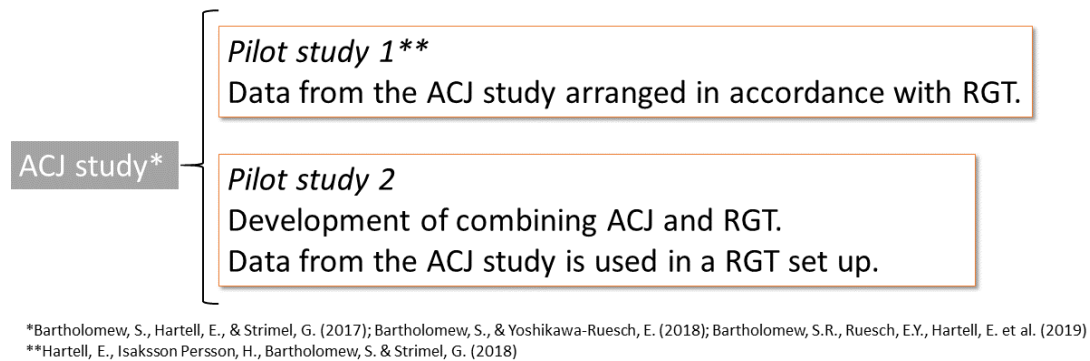


Figure 1. Research design

### Ability to assess quality

As a teacher-educator, it is common to receive questions and concerns regarding assessments and grading from student teachers. This concern is perfectly reasonable and needs to be addressed during teacher education. According to Swedish regulations (Skolverket, 2018), teachers must recognize, understand, and interpret, as well as communicate, the quality of students' knowledge to students and their guardians. The Swedish National Agency for Education states that the ability to assess is a professional act (Skolverket, 2018). Having the ability to identify quality is a sign of expertise and when these abilities are internalized and used intuitively, they can be hard to express (Dreyfus & Dreyfus, 1986). Research shows that tacit knowledge can be verbalized (Hartell & Skogh, 2015; Jönsson, 2011; Lindström, Lindberg, Pettersson, 2013). Tsagalidis, (2008) also highlights the importance of the collective when defining quality: professional culture, steering documents, and colleagues are of importance for the teacher.

In the knowledge area of architecture, Rönn (2018) discusses *en skolad blick [in Swedish]*, which corresponds roughly to an educated/informed gaze, or trained eyes (2018, p. 66) when the architect assesses architectural qualities. Similar abilities are defined in other areas of research like *professional vision* (Goodwin, 1994) and, within engineering, the *mind's eye* (Ferguson, 1992). Based on previous reasoning, teachers are viewed here as experts, familiar enough to assess quality based on shared collective knowledge.

### Theoretical background

#### The Repertory Grid Technique, RGT

The Repertory Grid Technique (RGT) is a method based on the psychologist George Kelly's theory of personal constructs. The fundamental postulate of his theory states that people predict events and interpret the world based on experiences (Jankowicz, 2004; Kelly, 1963). According to the theory, we make this interpretation with the help of bipolar structures, called *constructs* (Fransella, Bell, & Bannister, 2004; Jankowicz, 2004; Kelly, 1963). It is easier to understand a person's worldview if we understand that person's constructs.

One dimension of a construct that is often easy to express is called the *emergent pole*. In contrast to this pole is the *implicit pole*. (Fransella, Bell, & Bannister, 2004; Jankowicz, 2004). Both poles of a construct make the construct complete and reflect the informant's view on a certain *topic* (the theme for the interview). The outcome of the elicitation procedure is "[...] a kind of mental map: a precise statement of the way in which the individual thinks of, gives meaning to, **construes**, the topic in question." (Jankowicz, 2004, p. 14). For example, if a student work is described as "neat", neat becomes the emergent pole of a construct, the contrast (implicit pole) gives the construct its full meaning. The meaning of the construct changes if the implicit pole is a "sloppy student work" or an "elegant student work".

## **Methodology**

This paper reports findings from one pilot interview with one of the judges [Informant A] in the Bartholomew et. al. study. Informant A teaches STEM subjects in years 4 to 9 (10 to 16-year-olds) in Sweden. The semi-structured interview was conducted to fit the structure of an RGT analysis and focused on *photos of the prototypes* from the comparative judgment procedure of the Bartholomew et. al. 2019 study. The interview was conducted at the informants' school and was recorded and transcribed. Outcomes of the interviews are repertory grids and the informants' reasoning during the RGT procedure.

### **Linking ACJ and RGT**

Central in the ACJ procedure is choice; in Bartholomew et. al. (2017; 2019) judges compare two pictures of students' work (models of medicine dispensers). The next step is to decide which of the two is best and comment on the choice. This procedure is repeated and results in a rank order; the number one in rank is most appreciated, as opposed to the last one.

From the previous pilot (Hartell et. al., 2018) we see that the Swedish judges' comparative judgments were short, for example "B is better organized" or "Good construction/design" (ibid p. 6), another example is "B provides a better overview" (ibid p. 5). Bartholomew et al. (2019) shows that the Swedish judges' comments relate to the theme's size, usability and design.

For developing understanding of the judges' comments, RGT is used on the judges' comments from five of the rank order's top ten prototypes [named W1–W5] and two from the bottom ten prototypes [named L6 and L9]. In the ranking list, W1 represents the top one and L6 represents the rank order's bottom six.

The combination of data from the ACJ project used in an RGT set up is from now on called the ACJ-RGT set up.

### **The elicitation of constructs during interviews**

1. The elements are presented three at a time.
2. The informant chooses two elements that have shared characteristics.
3. The characteristics are noted in a grid, representing the emergent pole of a construct.
4. The next step is to elicit the implicit pole represented by the characteristics of the third element, this is also noted in the grid and the construct is complete.
5. All elements are then rated, 1 to 5. Elements associated with the emergent pole are rated with a 1 and elements associated with the implicit pole with a 5.
6. If an element is rated with a 3, it is associated equally to both poles. The procedure continues and new constructs are elicited and the rating procedure proceeds.

The outcome is a grid with constructs, elements and ratings. Informant A's grid is showed in figure 2.

The outcome of the ACJ-RGT set up interview with informant A is a repertory grid with constructs (Figure 2, 1), elements (Figure 2, 2) and ratings (Figure 2, 3).



Figure 2. Repertory Grid, informant A.

## Analysis

### Cluster analysis

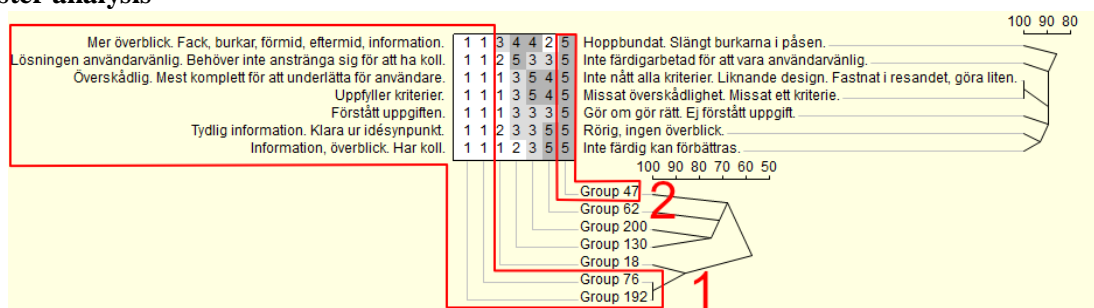


Figure 3. Cluster analysis, informant A.

Figure 3 shows informant A's cluster analysis generated with the software Rep Plus V1.1 (<https://pages.cpsc.ucalgary.ca/~gaines/replusplus/>). Figure 3 (1) shows that both elements Group 192 and Group 76 have the same low ratings and consequently match the statements to the left (the emergent pole) (Figure 3, 1). Element Group 47 has the highest ratings and hence corresponds well to the statements to the right (the implicit pole) (Figure 3, 2). The rest of the elements are in between.

The ACJ rank order is applied to informant A's ratings (Figure 4, 1). The rating list matches the rank order quite well; only W2, W3, W4, and W5 are swapped (Figure 4, 2). At the end of the interview informant A is asked to arrange the elements according to quality. This individual rank order matches the ACJ rank order and the rating list quite well (Table 2). W1 is number one and seems to possess features of high quality (Table 2).

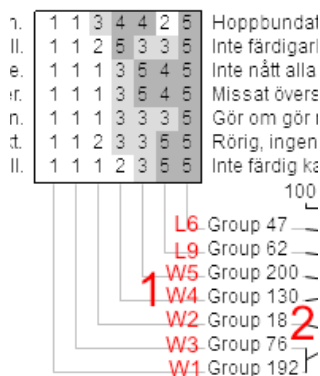


Figure 4. ACJ rank order applied to the cluster analysis.

### Analysis of constructs

For a better understanding of the quality of W1 are the constructs examined. The cluster analysis shows two constructs with the same ratings (Figure 5, 1). According to RGT, this indicates that they both have similar importance to the informant. Figure 5 (2) also shows that W1 is rated with a 1 on both constructs and hence associated to the emergent pole to the left. Table 1 (1:1, 1:2) shows both constructs (Figure 5, 1) translated to English. Informant A frequently uses the Swedish words *överblick* and *överskådlig* (translated here to *overview*) (Table 1, 1:1, emergent pole), which are recognized from pilot study 1 (Hartell et al., 2018).

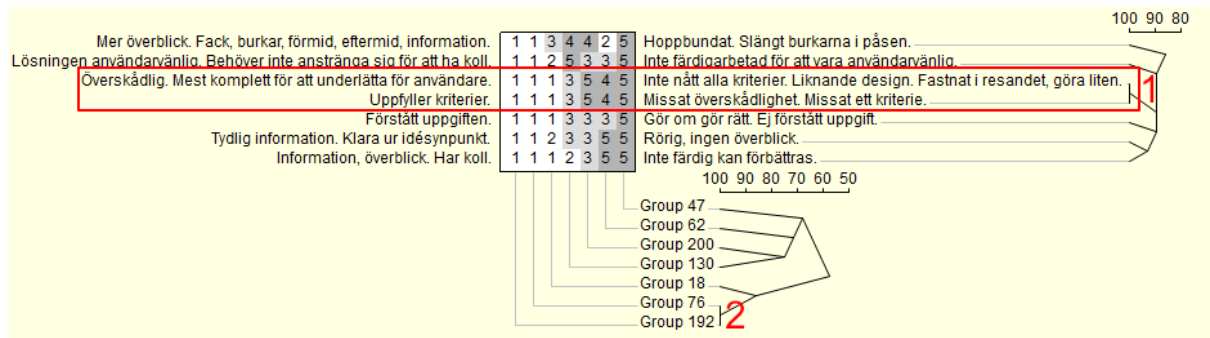


Figure 5. W1 associated with constructs.

Opposite is *did not meet all criteria* (Table 1, 1:1, implicit pole). The next construct (Table 1, 1:2) tells us that W1 *meets criteria* (emergent pole), as opposed to *lack of overview* and *missed one criterion* (implicit pole).

Table 1. Translation of constructs in Figure 5, 1.

Construct	Emergent pole	Implicit pole
1:1	Overview. The most complete to facilitate for the user. /Överskådlig. Mest komplett för att underlätta för användare.	Did not meet all criteria. Similar design. Stuck in travel, make it small. /Inte nått alla kriterier. Liknande design. Fastnat i resandet, göra liten.
1:2	Meets criteria. /Uppfyller kriterier.	Lack of overview. Missed one criterion. / Missat överskådlighet. Missat ett kriterium.

### Informant A's rank order

At the end of the interview, informant A ranked all elements used in the interview in accordance to quality. W1 is the top one (table 2), and informant A finds it to be most complete and having the greatest potential to be a prototype for a commercial product.

Interviewer: [...] 192 can you say something about it, why is it good?

Informant A: Yes, I think it has an overview, yes user friendly, [...]. [...] if it were out on the market [...] I could buy a dispenser like that. [...], so this one [Group 192/W1, author's comment], I think, has the greatest potential. (Interview 250919, transcript, p. 16)

When discussing and comparing W2 with W1, informant A states that there is a difference in quality between W2 and W1. W2 lacks an overview and is not as user friendly because it lacks the feature of being able to see inside, as the lid is opaque.

Informant A: [...] if we look at 18. It is actually the same construction as 92 [192, author's comment], the difference is [...] a lid, dark lid [...] cannot see inside and it does not become equally user friendly or have an overview. (Interview 250919, transcript, p. 17)

Table 2.

Rank order (ACJ) Swedish judges	Ratings RGT cluster analysis	Informant A's rank order according to quality
1. W1	1. W1/W3	1. W1
2. W2	2. W2	2. W2
3. W3	3. W5	3. W3
4. W4	4. W4/ L9	4. W5
5. W5	5. L6	5. W4
6. L9		6. L9
7. L6		7. L6

## Discussion

Table 2 shows a consistency between the rank order of the Swedish judges, informant A's individual rank order, and ratings from the RGT cluster analysis. W1 possesses appreciated qualities described by the construct developed with RGT (Table 1). To some extent, it is possible to argue that the results reveal tacit knowledge. In line with the arguments of Kelly (1963), the constructs give a multidimensional view on how informant A assesses W1. The results show that informant A links the appreciated qualities of W1 to assessment criteria.

## Conclusion

The result of this study is in line with pilot study 1 (Hartell et al., 2018), and ACJ and RGT combined can unpack judges' assessment practices, at least in this particular case. The results encourage further investigations and the interview with the other Swedish judge will be analyzed.

Experiences from pilot study 1 and 2 (Figure 1) can be used in new ACJ studies. If judges in a comparative judgment session are encouraged to develop their comments, the results will have a structure similar to RGT constructs and can be analyzed as such in a more comprehensive way.

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*Helena Isaksson Persson*, KTH Royal Institute of Technology, Sweden. Recognizing and being able to assess qualities in students' work is a necessity for teachers. As a lecturer in teacher education, I meet students who find this difficult. The aim of this study is to find ways to reveal and verbalize tacit knowledge in qualitative assessment. The results are used to develop seminars where student teachers can practice their assessment skills

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