

# THE ROLE OF INTUITION IN THE ASSESSMENT OF MATHEMATICS

Jan Winter

University of Bristol, Graduate School of Education

## **Abstract**

*A group discussion was conducted with four teachers and excerpts from the transcripts of the discussion were presented in this session. The aim of the discussion was to draw out certain aspects of their assessment practices and for the researcher to consider how the teachers were using intuition in these practices. The excerpts were discussed in the session and participants' views on the important points made will be used in the researcher's continuing work on this subject. The session also considered points from writers on intuition to illuminate our understanding of intuition in this context.*

## **Introduction**

My interest in this topic has been prompted by collaborative work in the Graduate School of Education in considering aspects of the work of professional practitioners. Changes in the assessment procedures used by teachers in recent years would seem to have led to a degree of undermining of teachers' confidence in their professionalism and in their security in their use of various forms of professional knowledge. I wanted to investigate how teachers felt that they had been affected by national changes and to what extent they recognised the place of intuition in the assessments they made of pupils. I was also interested in how they valued assessments made by different methods and how they incorporated, if at all, 'gut feelings' about pupils' achievements.

## **The discussion and the excerpts used from it**

Four teachers, all of whom I have known and worked with for some time, joined me for a session of about one hour to discuss the assessment methods they use in their teaching. Two teachers were Heads of Department and two were relatively 'newer' teachers, being within their first five years of teaching. The discussion was a very open one, with me taking part, rather than remaining 'outside' as interviewer. This seemed more natural and appropriate and allowed me to follow up some points and let the teachers in the group follow up others.

The discussion was then transcribed and sections of it extracted for use in the BSRLM session. These excerpts were chosen to fall into certain areas of interest and had the following headings:

Gaining experience

Constraints

Criteria, ephemeral evidence, coursework

...

## Confidence

In fact, discussion was only possible on the first two excerpts, because of time constraints.

I also used a collection of quotes on intuition, both in the discussion and presented to the BSRLM session. In the discussion with teachers I did not offer the readings until towards the end of the discussion so that they would not dominate teachers' responses. In the BSRLM session we began by considering the readings and their relevance to the assessment of mathematics.

In the remainder of this paper I will present some of the readings, one excerpt from discussion, some of the comments made on the excerpt by participants in the session and finish with some general points from my analysis of the discussion.

## On intuition

'In its anticipatory form, intuition offers a global perspective of a possible way of solving a problem, and, thus, inspires and directs the steps of seeking and building a solution. In its conclusive form the role of intuition is to condense - again in a global compact manner - an analytic solution previously obtained. In this form, too, the role of intuition is to prepare action. That final concentrated interpretation is destined to make the solution directly useful in an active, productive, thinking process.' (Fischbein, 1982, p 12)

'In mathematics intuition is used with two rather different meanings. On the one hand, an individual is said to think intuitively when, having worked for a long time at a problem, he rather suddenly achieves the solution, one for which he has yet to provide a formal proof. On the other hand, an individual is said to be a good intuitive mathematician if, when others come to him with questions, he can make quickly very good guesses whether something is so, or which of several approaches to a problem will prove fruitful.' (Bruner, 1960, p56)

'Intuition implies the act of grasping the meaning, significance or structure of a problem or situation without explicit reliance on the analytic apparatus of one's craft. The rightness or wrongness of an intuition is finally decided not by intuition itself but by the usual methods of proof (Bruner, 1960, p60)

Other references from Gattegno(1987) and Dewey (1958) were also considered .

Excerpt 1 - 'Gaining experience'

*[In this excerpt 'I' refers to the interviewer, other initials are teachers in the discussion]*

I - One question that I have arising out of what you've been saying is, do teachers get better as they get more experienced at making these kind of judgements about children? That are not necessarily just reflected in the numerical scores from tests, but making 'the right decision' about pupils' achievements.

JS - I hope so and I think so!

S - I'd say yes, because you get much better at picking up information from a variety of sources but I suspect as well you get a little bit more set in your ways of things you might be looking for and maybe you might be tempted to ignore other sources of information that maybe someone coming in with a fresh eye might actually suddenly look at.

I - Right, so ~here' s pros and cons?

K - I was thinking of my first year of teaching when I had a top set year seven and there was a girl there consistently came at the bottom of any assessment that we formally did and there were many rows that she should be moved down at least one if not two sets and I maintained she had a real pizzazz about her, how she did the maths when I worked with her, and wouldn't let her go and at that point I couldn't see why all this formal assessment was being used as ammunition it felt like when I'd only just started teaching. Now actually she is and has won many awards and is in our year eleven top set and likely to be an **N A \*** pupil. Now I felt then that that I think I was uncluttered, I think what S was saying was true for me. I didn't have all the pointers for, if you like, I couldn't have picked out a lot of in between scales on assessment scales, I couldn't have done a sort of mental rank order which I might be able to do more now, but I could certainly pick out the anomalies. Whereas I feel a lot more pushed by the outside to, because I can do a mental rank order I'm tempted to think, well those people who are at the bottom might well be, but it's because of experiences like that that I have to keep holding on to the first year of my teaching.

JB - I think for the ones at the top and the bottom it's always been easier to pick them out, maybe as you're saying you don't have enough experience to explain why or understand but with the middle its been easier for me the older I've got, the more experience I've got.

K - Yes, I'd say the same.

JB - Just to compare and differentiate those people in the middle.

I - And what do you think you've learned over the years that has made that easier for you?

JB - I don't know. I suppose in the first couple of years, just knowing the material and knowing what things to look for and knowing when you're teaching something how someone might react if they've understood it or if you think they've understood it. And what things to look out for with a sort of flag saying this has gone wrong or whatever, so the same thing comes when you're assessing them.

S - You sort of build up a bank of past experiences of how pupils in the past have reacted and maybe you're in a better position to make comparisons. I mean that's basically how people do things like predicted grades, isn't it? It's from past experience.

JB - That was so difficult in the first few years ...

S - That's right.

JS - It gets much easier, doesn't it?

### **Discussion of excerpt 1**

Some points made by participants in the BSRLM session on the above excerpt:

1 - 'There's a great gap between what people say, however imperfectly, and the ability to express that well in writing and I think that comes out to a certain extent in mathematics .... And I think that's why I'm interested in intuitive assessment because a lot of my intuition about how a pupil can grasp mathematics is based on the way in which they express themselves .... '

2 - 'They're definitely looking at assessment as assessment of success rather than assessment of difficulties with the content. I think there is a big difference in the use of intuition in those. I feel much happier with the use of intuition in trying to understand where difficulties lie than in putting students on a continuum of achievement. '

3 - 'In a way perhaps this is a methodological issue, the fact that you're talking with them in this sort of context free setting - we haven't got any children or any pieces of children's work to be assessed .... It's actually very difficult to talk about assessment in general in that particular way about how you know whether somebody understands something. '

4 - 'Maybe it's easier for a teacher to use intuition to get a feel that a pupil has **not** understood something - that way round - rather than that a pupil does understand. '

5 - 'It does raise the issue of the culture of the classroom because people are going to be giving various different non-verbal indicators according to the culture of the classroom. '

6 - 'What struck me was how for these people intuition was about staying fresh.'

## Some general points drawn from the discussion

The following points were raised at the end of the BSRLM session. They have arisen from the whole body of the transcript, not just the sections used during the session.

- Teachers can still act in quite a unilateral way within constraints
- Teachers have more faith in the judgements they make than in those of their colleagues.
- Teachers don't really trust others in making 'fair' judgements if they are made subjectively.
- Teachers grow to trust their own judgement more with experience - 'educated intuition'.
- Teachers adapt to the situation they are in.
- Teachers have varying views of when assessment is happening and when it is not.

I would not claim these are statements about 'all teachers', simply that these are the views expressed by this small group. They do in some instances accord with what others have found (e.g. Watson, 1995).

Suggestions from participants for future development of this work were most helpful and indicated areas of weakness or limitation of the existing data. My interests are to work collaboratively in this area, perhaps with specialists in other curriculum subjects, in order to look at what underlies the experience of teachers of mathematics which may be different from the experience of teachers of other subjects. I also hope to follow up the existing data to draw out some specific examples in certain areas from the teachers involved in the initial discussion.

## References

- Bruner, J. (1960) *The Process of Education*, Harvard University Press, Cambridge
- Bruner, J. (1972) *The Relevance of Education*, George Allen and Unwin, London
- Dewey, J. (1958 reprint of 1934) *Art as Experience*, Putnam, New York
- Fischbein, E. (1982) 'Intuition and Proof in *For the Learning of Mathematics*, Vol. 3, No.2. (pp 9 18, 24)
- Gattegno, C. (1987) 'The Science of Education', Educational Solutions
- Watson, A. (1995) 'Evidence for Pupils' Mathematical Achievements' in *For the Learning of Mathematics*, Vol. 15, No.1. (pp 16 - 20, 28)