Am I an Innovative teacher?

Address to Innovative Teacher Awards meeting by Gerald Roos

I do not pretend to be an authority on innovation, although, having written these notes I have an idea of my state of innovativeness. However, I would like to present you with some research findings and case studies that may throw some light on aspects of learning and effective teaching. My aim is to leave you with more questions than answers, because it is questions that stimulate thinking.

You are all present here today because you have decided that some things that you do can be regarded as innovative. That in fact begs the question whether innovativeness is a state of being or just an act. It may therefore be appropriate to pose a focus question for this address and its follow-up discussions.

Am I an innovative teacher?

This question will require reflection, analysis of what you do and a self-assessment. I hope that we will be able to assist you in not only finding some answers to this question, but being able to ask the right questions as you reflect further on this apparently desirable state of being.

The basis of my address will be a few chapters from John Bransford’s compilation of research findings, published by the US National Research Council in a book called *How People Learn* (National Academic Press, 2000)

Note that Bransford was commissioned to develop the materials for Microsoft’s 21st Century School Leadership course, which was recently introduced in South Africa. He uses material from this same book, amongst others that he has had a hand in authoring. I will show some excerpts from the case study in these materials.

I will start by sharing some key research findings in brief and then try to illustrate these by looking at some case studies. As we do so I will draw heavily from the chapter on how experts differ from novices.

In assimilating all the research findings, Bransford identifies 3 key findings about how people learn.

1. **Learners come to the classroom with preconceptions about how the world works. If there initial understanding is not engaged they may fail to grasp the new concepts and information that they are taught, or they may learn this for a test but revert to their preconceptions outside the classroom.**

   This is perhaps why a newsreader on a local radio station recently informed me that voting attendance would be high in the Western Cape because it was raining and people would not be able to go to the beach. I could just imagine the news script writer producing such flawed logic in his/her class test some years ago at school, with the only response being a big red cross or (horrors) tick. The flawed logic would not have been corrected by the teacher, since teachers are not accustomed to providing formative feedback to individuals after tests.

2. **To develop competence in an area of inquiry, learners must a) have a deep foundation of factual knowledge, b) understand facts and ideas in the context of a conceptual framework and c) organize knowledge in ways that**
facilitate retrieval and application.

Later in this presentation I will illustrate this by relating some research on chess players, but a simpler illustration may be the way that Geography and History is taught. Both have (or should have) progressed beyond names of rivers and capitals, or dates of significant events. If we teach about rivers in a conceptual framework of its geographical importance then a learner can transfer learning of the Liesbeeck / Vaal River and this sets the stage for their understanding of the Nile or any other river.

3. A metacognitive approach to learning can help learners learn to take control of their own learning by defining learning goals and monitoring their progress in achieving this.

Teachers seem to have great difficulty in believing that learners are capable of this and I would suggest that the reason for this is that many teachers do not take full responsibility for their own learning. Thinking about how we think and learn is key to developing 21st Century skills as lifelong learners.

What are the implications of these three key findings for teaching? Firstly, teachers must draw out and work with the pre-existing understandings of learners. This requires assessing prior learning, which is one hundred percent in line with the curriculum assessment principles. Frequent formative assessment provides feedback that guides learners in modifying and refining their thinking. I will further illustrate this when I talk about pedagogical content.

A second implication for teaching is that teachers must teach subject matter in depth, providing many examples of how a concept is at work. We notice this in our curriculum when we see topics re-occur over several years. We need to ensure that we use this repetition to build deeper understanding of key concepts. This also means that teachers must be subject area experts. Subject knowledge is the foundation stone of effective teaching. Assessment should test deeper understanding.

The third implication for teaching is that the teaching of metacognitive skills should be integrated into the curriculum in a variety of learning areas. Metacognition is often an internal dialogue, but the teacher must model this thinking. This is what we do when we say that we are developing independent learners.

We could go on to examine classroom learning environments, but instead I would like to focus on our purpose here today. You may be wondering whether being innovative is an advanced state of being or whether an innovative person is just an expert, or something more than an expert.

Let us examine the essential differences between a novice and an expert. Is an expert innovative? If you think so, let us see if you find answers to this in a simple comparison of experts and novices. If you do not think so then, mathematically speaking expert + x = innovator (solve for x).

1. Experts notice features and meaningful patterns of information that are not noticed by novices.
2. Experts have a great deal of content knowledge, so do some novices, but experts have organized this knowledge in ways that show deep understanding.
3. Experts’ knowledge is conditionalised. i.e. it is more than factual, but reflects context of applicability in a set of circumstances.
4. Experts are able to flexibly retrieve important aspects of their knowledge with little effort.

5. Experts may know their discipline thoroughly but are not necessarily able to teach others. The reason for this is that their knowledge of how people learn and how to lead learning may be lacking.

6. Experts have many levels of flexibility in their approach to new situations.

Considering what you have heard so far you may have noticed several recurring ideas, such as patterns of knowledge, organisation of knowledge, metacognition and conditionalised knowledge. All of these have significance for teachers.

A pattern of information refers to how information relates to other information. De Groot's study of chess players in 1965 exposed this. He hypothesized that chess masters were more likely than non-masters to a) think through all the possibilities before making a move and b) think through all possible counter moves of the opponent. In fact both masters and non-masters exhibited this depth and breadth of thinking. But why were chess masters playing higher quality chess?

De Groot concluded that chess masters were more likely to identify meaningful configurations of knowledge and realize the strategic implications of these situations. Chess masters, being experts, could perceive these patterns with relative ease. Similarly, mathematics experts quickly recognize patterns of information when solving problems while novices grapple with individual equations or laws.

This introduces the idea of organization of knowledge. Many experiments have shown experts to organise information more on the basis of principles and their significance while novices restrict their activity to surface level knowledge. As a simple example, consider the question: “there are 26 sheep and 10 goats on a ship. How old is the captain?” An adult with some expertise will immediately realize that the problem is unsolvable, but many school learners (75% in fact) attempt to provide an answer.

Another occurring idea is content and access to knowledge. Experts do not search through all available knowledge before tackling the problem; they immediately identify a subset that is relevant to the problem. This is known as “conditionalised” knowledge. The opposite of this might be inert (not activated) knowledge. This is hugely important for us as teachers and curriculum designers.

Many forms of curricula and assessment practice do not conditionalise knowledge. Math textbooks are better at presenting laws and theorems than explaining when these laws and theorems may be useful in solving problems. Assessments ask learners to remember these laws and theorems more often than asking them to apply them to unique problems. Through formative feedback we can actually improve conditionalising knowledge but we have to give the right challenges and model good procedures of thinking.

In the literature class, explaining the meaning of proverbs is not conditionalised learning. This does not explain the condition under which the proverb is useful. Learners need to know when to apply "too many cooks spoil the broth" and when to apply "many hands make light work" – two proverbs that appear to contradict each other.

Experts retrieve these patterns, organizations and conditions of knowledge fluently. It becomes routine. They do not necessarily perform tasks faster than
novices because they attempt to understand problems rather than jumping quickly to solution strategies.

That concludes a brief look at experts. We have already agreed that experts may not make good teachers. I would like to suggest that expert teachers will be good teachers. What are expert teachers? This case study of two teachers may assist us in finding an answer.

Two new English teachers, Jake and Steven, with similar subject-matter backgrounds from elite private universities, set out to teach Hamlet in high school (Grossman, 1990).

In his teaching, Jake spent 7 weeks leading his students through a word-by-word explication du texte, focusing on notions of "linguistic reflexivity," and issues of modernism. His assignments included in-depth analyses of soliloquies, memorization of long passages, and a final paper on the importance of language in Hamlet. Jake's model for this instruction was his own undergraduate coursework; there was little transformation of his knowledge, except to parcel it out in chunks that fit into the 50-minute containers of the school day. Jake's image for how students would respond was his own responses as a student who loved Shakespeare and delighted in close textual analysis. Consequently, when students responded in less than enthusiastic ways, Jake was ill-equipped to understand their confusion: "The biggest problem I have with teaching by far is trying to get into the mindset of a ninth grader."

Steven began his unit on Hamlet without ever mentioning the name of the play. To help his students grasp the initial outline of the themes and issues of the play, he asked them to imagine that their parents had recently divorced and that their mother had taken up with a new man. This new man had replaced their father at work, and "there's some talk that he had something to do with the ousting of your dad" (Grossman, 1990:24). Steven then asked students to think about the circumstances that might drive them so mad that they would contemplate murdering another human being. Only then, after students had contemplates these issues and done some writing on them, did Steven introduce the play they would be reading.

What did the second teacher have that the first one lacked? He knew how learners learnt and he knew how to lead the learning process. This latter knowledge is known as pedagogical content. Expert teachers are good teachers because they have knowledge of pedagogical content. Many teachers strive for this but of course are faced with the harsh realities of the classroom. This video clip illustrates such a situation. (History 101 video clip) ...

Are all expert teachers innovative? Consider two sushi experts. One excels at following fixed recipes; the other is able to prepare sushi in a flexible way according to the needs of his clients and the situation. The first is highly skilled; an artisan. His actions are routine. He approaches his task as an opportunity to use his expertise to do tasks more efficiently. This is a valued asset in a busy
restaurant. Good teachers, expert teachers, are often like this – especially if they have been a teacher for a long time. They do things well and efficiently and learners get good results. The second sushi expert is more of a virtuoso, a maestro. He treats the task as an opportunity to explore and expand current levels of expertise. He exhibits these qualities despite the fact that his training has been identical to that of the first sushi expert, mainly focused on skills. What this second sushi expert has is adaptive expertise. He remains flexible and adaptive to new situations.

When we are able to monitor our own levels of understanding and decide when it is adequate and when it is not adequate, then we are being adaptive experts. Adaptive experts are able to approach new situations flexibly and to learn throughout their lifetime. They continually assess and try to move beyond their current levels.

Figure 1: Efficiency and innovation in transfer

Hypothetical “Optimal Adaptability Corridor” (OAC)

From Dan Schwartz & John Bransford (personal communication)

Figure 1 suggests that efficiency has a tendency to produce “functionally fixed behaviours”\(^1\). Routine experts are good at what they do but do not learn new things while doing so. Efficiency is important because it frees a person up to concentrate on other aspects of the new situation that may require non-routine adaptation. Innovative interactions involve reaching beyond the immediately known. According to Bransford, interacting with other people, and with artifacts, is a powerful way to accelerate the development of innovation. In some way one

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\(^1\) Schwartz, Bransford, Sears, *Efficiency and Innovation in Transfer*, p29
can state that idea as “you learn the most when you try it out”. Being an adaptive expert means being efficient and innovative.

In this video clip we will see a principal who thought he was an expert. He was innovative in inviting past students back to address his school leavers, but then he found something out from these students. In the 21st Century School leadership course you are challenged to be the adaptive expert. ..\CD\21C_schools\e00\e00_scenario.swf

References:

Bransford, J, How People Learn, National Academy Press, 2000