

What students know about showing what they know: A key in effective learning and teaching

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At the end of one economics lesson, Ms Taggart gave her students a homework assignment that was unique both for them and for her. She told her class that, for their next double lesson, each student would be required to show to the class what she or he knew about a topic they had just finished learning. They would do this in any way that they wanted; they could talk about the ideas in an interview, a mock newspaper article or a poem, draw a poster of them, develop a multi-media display, teach the ideas in a games context, act them out in a play, describe them in formulae or show how they could be used to solve problems. Each student was free to choose the mode of display. All that they had to do was to convince the other members of the class that they had learnt the ideas.

Following the display of ideas during the next lesson, Ms Taggart asked the class to suggest how the different ways of displaying the ideas provided fresh ways of understanding them. The group compared the different display formats and investigated whether each type of format taught particular aspects of the ideas. They suggested when they might use each type.

As well, students discussed how and why they used particular formats, why they felt comfortable with each and what they learnt about the ideas while organising them for display. Some who had written down the ideas said they felt shy or were reluctant to talk about them to the group. Others preferred to talk; they would have had difficulty showing what they had learnt by writing. Those who had preferred to draw or to act out the ideas said that trying to talk about the ideas wasn't the best way for them.

The discussion led some students to admit that they had thought of more creative ways of showing what they knew but were reluctant to use these formats because they thought that they may not be right or that class peers or Ms Taggart might think that they 'were silly' or laugh.

Ms Taggart directed students' attention to how the assignment helped them to understand the ideas. Did thinking about how to show what they knew help them understand the ideas better? Did displaying what they knew and receiving feedback from their peers help sharpen understanding? Did the feedback motivate them to want to know more? Most of the students answered the questions in the affirmative.

The class reflected on how they usually displayed their economics knowledge. What opportunities usually existed? Did they need to know 'all about' ideas they were learning before they showed their knowledge? Were they allowed to 'be on the way' with an idea and to change their minds about it when the ideas 'didn't fit exactly'?

Ms Taggart introduced the notion of 'conventional ways of showing what one knows'. What formats did they generally use in economics? Had any student, in earlier lessons, attempted to show her or his knowledge in unusual ways? Was there a 'language of economics' that the students needed to learn in order to show what they knew? Would it help some of the students to display what they knew in unconventional ways first and then 'translate' them into the conventional ways? Ms Taggart led the students to see that they had a range of ways or options for showing what they know about a topic. Some of these formats can be intermediate ones that they can use to help themselves to display their knowledge in the final acceptable format.

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Ms Taggart was inquiring into an often neglected component of learning; the display of knowledge - feedback link. She was interested in two aspects; explicit teacher management of the link and student knowledge and management of it. She was asking two related questions: Can the quality of learning in my classroom be improved by changing how I provide students with the opportunity to show what they know and to receive feedback at any time? Can it be improved if students know more about this process themselves?

Her questions came from several anecdotal observations of student learning. She had noted that

- (1) some students had difficulty showing what they knew in 'conventional' ways and became reluctant learners, while those who displayed their knowledge well were more successful learners in the future,
- (2) some students 'unloaded' what they knew in their own ways first and then translated their knowledge into acceptable formats as a second step and
- (3) students were less likely to become behavioural and discipline problems if they could get positive feedback for their learning.

She was also influenced by a brief article she had read about a student who, though he had failed a physics examination, displayed a great deal of knowledge about the ideas assessed on subsequent tasks (Calandra, 1993). She could see that the display of knowledge-feedback link was a major interface between learners and the culture in which they learn, providing the opportunity to match their knowledge with cultural references. She could also see that her economics students could do this in a variety of ways and contexts, much more broadly than she had allowed them to in the past. Would they be more successful learners?

The display of knowledge- feedback dimension is implicit in theories of learning

The influence of the display of knowledge-feedback dimension on learning has been identified, at least implicitly, in studies of learning from several perspectives. One perspective is provided by Skinner and other researchers working within the behavioral area. A plethora of studies in the 1950s -70s showed that how the environment responds to the display of knowledge changes the likelihood of whether it is displayed in the future (Delprato & Midgley, 1992; Sparzo, 1992). When a particular behavior received positive feedback, it was more likely to occur in the future. These studies, it should be noted, ignored learner knowledge influences such as learner management and control of the display and learner beliefs about acceptable behaviours. While I am not advocating behavioral conditioning principles, the feedback that follows the display of knowledge can influence the later display of the knowledge.

The socio-cultural theories of learning exemplified by Vygotsky also imply this dimension. While not referring directly to the display of knowledge, they emphasise the importance of social interaction in learning through constructs such as the 'zone of proximal development' and 'co-construction' (Nicolopoulou, 1993; Tudge & Winterhoff, 1993) and 'goal-directed action' (Gauvain, 1995). They propose that learners develop ways of thinking and organise their knowledge through the use of tools and signing systems that are in turn learnt through the social mediation of the display of knowledge at any time.

Some contemporary theories of learning focus on the types of information learners process while learning. Examples of these theories are the 'parallel distributed processing models' (for example, Plunkett & Sinha, 1992). These theories assume that a learner can process several types of information at once (hence the term 'parallel'). They also assume that when a learner detects particular information, (for example, sees four hairy legs and hears a bark) the learner may expect other information (for example, a nose and two eyes). This is the 'distributed' aspect of the processing; detecting particular information leads learners to expect other information.

These theories also assume that learners need to learn how to process information, that is, they need to 'program' their information detectors. This is where the display of knowledge by learners (or 'behaviors') comes in. Learners display at any time what they think about information they have detected. The culture in which they are learning at the time responds to their display by giving them feedback. This feedback allow them to align their network processing systems with the culturally defined information.

Motivation to achieve and self-regulated learning have attracted considerable interest in recent years. A major influence here relates to the feedback available to students during learning and its mediating role in students' goal orientation, motivational beliefs and self-regulation of learning (Wolters, Shirley & Pintrich, 1996) Student self-evaluations of ability, self-confidence and the quality of task performance are influenced by a stress on social comparison versus self-improvement and progress in earlier learning (Elliot & Dweck, 1988). Students develop beliefs about whether positive feedback is contingent upon differential performance or upon effort (Brophy, 1989), personal progress towards short term goals (Schunk, 1989) or on meaningful aspects of performance (Brophy, 1983).

Researching the display of knowledge- feedback dimension in teaching

While the display of knowledge- feedback dimension is implicit, then, in a range of theories of learning, its nature and influence, particularly in naturalistic classroom contexts, has received little explicit examination. Unlike its 'flip-side', the assessment of learning, it has not attracted a high level of research. Teachers intending to investigate it within their teaching need to set their own agendas. For teachers like Ms Taggart, intending to research this dimension in their teaching, questions might guide the investigation include the following.

To what extent does having students display what they know help them to learn better ?
Ms Taggart decided to investigate this in several ways:

- first, she audio-taped some of her lessons and examined the opportunities students had to show what they know while learning new ideas in economics. She realised how little she had exploited the knowledge display- feedback link in her teaching. The tapes indicated that comparatively little of the class time or activity involved her students showing what they knew, either to themselves, peers or her. Trying out impressions, seeing how well the ideas worked in different situations, debating and discussing them didn't occur much during the teaching. There was, therefore, little opportunity for corrective feedback. Most of the class time involved the students being presented with what they needed to know and what they should be able to display. There was little time for displaying, let alone practising how to display what they knew.

She began to plan ways in which she could implement the knowledge display- feedback link. In the early stages of developing a topic, she could have students display their existing knowledge of the topic. This would be inefficient in a teacher-centred format. Small group activities for brainstorming the given topic, suggesting questions that might be answered by the content or that students might be able to do answer at end of the learning unit seemed useful here.

During the learning she decided to focus more on students sharing their change in impressions, questioning, analysing and debating the ideas, generalising them across specific episodes and recording their impressions in a range of ways. She decided to change the way in which she talked about displays of knowledge. Statements such as "You're on the way with that", " You have got this much in place already" and "But where does ... fit in ?" increased in frequency.

She decided to implement similar opportunities for display and feedback at the consolidation, transfer, long term memory and automatizing stages of the development of sets of ideas. Drawing network maps of ideas learnt, small groups writing review questions for other groups, investigation of how ideas related to the lives of her students seemed possibilities.

How would her class react to this change in the teaching-learning regime ? How well could her students 'read' and use different types of feedback ? If the feedback were seen to be immature or irrelevant, it was unlikely to bring about optimal learning. She was aware that her Year 9 students were often not tolerant of peers having 'ideas on the way'. They seemed to believe that you displayed your knowledge when you knew something, not when you were gradually learning it. It was possible that these values may have been learnt in earlier classroom experiences, that their teachers had valued more the finished product rather than half-baked understanding. She would have to take steps to ensure that she showed a genuine valuing of the display at intermediate times.

How could she provide feedback that, over time, would optimise learning for all students ? This would be a 'tall order' for any teacher. To start to think through it, she reflected on how she provided feedback now. From the tapes she noticed that it finished or 'closed on' an idea, for example, "That was a good idea" or "You are not right" Little of her feedback indicated directions for taking an idea further, for example, "But what about ? Where does fit on ?" She knew that if students believed they were rewarded because their display was better than other students' displays, future displays are more likely to be based on competitive criteria. If, on the other hand, they believe that they were rewarded because their display showed progress towards personal goals or understanding in its own right, future displays are more likely to be oriented in these directions (Brophy, 1987; Schunk, 1989).

- in parallel with this, she decided to implement a display-feedback schedule. To see whether changing the link might change the level of engagement for some of her more dis-engaged students, she decided to make a point of targeting the display of two of the more dis-engaged students each fortnight. She reasoned that if it had an impact on their learning it was likely to work with others. Her intention was to encourage these two students to display whatever they knew about the topic at hand and to move them, through feedback, to a greater understanding.

To what extent do students differ in how they prefer to show what they know ? This was a question that Ms Taggart had already begun to investigate. Was her teaching in a formative sense and her ways of assessing knowledge in a summative sense restricting the ability of some students to display their knowledge and receive supportive feedback ? Calandra (1993) suggested that this was possible. Discussing this with other teachers led her to the area of cognitive style and the possibility that students differ in how they structure their knowledge. She found research that indicated that two dimensions of cognitive style influenced students' ability to recall (and therefore to display) their knowledge (Riding & Ashmore, 1980; Riding & Caine, 1993; Riding & Mathias, 1991; Riding & Douglas, 1993). One dimension referred to how the students linked up their knowledge; whether, over a range of task situations, they linked ideas in abstract networks or with other ideas that co-occur in the same context (the verbaliser-imager dimension). The second dimension referred to how the learners manipulated the ideas; the extent to which they used general broad aspects of the ideas as opposed to specific detail aspects (the wholist-analytic dimension).

She believed that she had already observed evidence for the two dimensions in her classes. Some of her students for example, seemed to find it easier to display what they knew in words rather than in actions, while others preferred the opposite format; they preferred either to 'show you' in actions or by drawing a picture Further, the more a student used a particular mode of expression, the more that mode seemed to be used automatically and the

less the person was to use other modes. She remembered how, when some students began to write or to talk about what they know, they forgot what they intended to say. Because they needed to put attention into how they are going to show the idea, they are more likely to forget part of what they wanted to show. This led her to question whether she should teach those students who did not use spontaneously the preferred modes in economics to do so.

She readily recalled examples of the effect of the wholistic - analytic dimension on how students showed what they knew. Some of her students found it easier to display detail and specific facts, particularly in short answer and multiple choice type contexts, while others found it easier to display the overall idea and often missed or ignored detail. Some could readily organise their display in conventional, predictable, learnt ways while others displayed the ideas in less predictable unusual, creative ways. She had not understood why some of her students learnt how to show what they knew in a report format with relative ease, while others found learning the conventional format extremely difficult. Some made rapid, impulsive, intuitive guesses about ideas while others displayed a bit at a time and appeared 'cautious' in their display. Some preferred open-ended formats for displaying what they knew while others preferred much more structured, constrained display formats. They felt uneasy with the more open-ended contexts.

The issue of the preferences interested Ms Taggart. Were they fixed or could they be changed through learning? This was important to her; she saw the challenge in having her students learn how to deal with both types of display formats; how to help them align what they knew with the constraints of more structured contexts and how to develop their own action plans for display in the open-ended contexts. Reflecting on her anecdotal experiences suggested that the preferences were linked with students' beliefs about learning and themselves as learners. As well, however, they also seemed to be linked with what students believed they knew about a topic. Those who believed they had a good knowledge of the topic were more likely to display knowledge in an open-ended way as long as they believed that this was the valued outcome in that context.

Her reflections also led to the opinion that the majority of classrooms tend to favour the use of analytic-sequential rather than synthetic-global strategies when students displayed their knowledge. Her experiences suggested that requests for the display of knowledge were more likely to tap specific details rather than more general, open-ended aspects of ideas. Students who used synthetic-global strategies were often given less opportunity to show what they know in acceptable ways. As a result, they were less likely to receive positive affirmation for what they knew or to perfect their means for doing this.

This led Ms Taggart to question whether her teaching permitted her students to show what they knew about a topic first in their preferred ways and later in the acceptable way. She reflected on how she used questions around the class during a discussion as a formative feedback technique. She knew that there were some students who had difficulty 'putting their understanding into words'. Based on her reading, she now suspected that some of these students may have built the ideas in an imagery-episodic way that may not have easily matched the verbal form of the questions she had asked. There had not been time for her to help these students put their understanding in a verbal form, although she realised now that it was probably more important for them than for the more verbally-oriented students. She added yet another 'to do' to her list.

To what extent can students learn to manage and regulate their display of knowledge to best effect?

Ultimately, Ms Taggart saw that it was to the mutual advantage of her and her students if they could learn to take more strategic control over their display of knowledge. She believed that they would benefit by increasing their awareness of a number of issues; an awareness of

- ***how showing what they know helps them to learn the ideas better.*** Ms Taggart believed that her students should be aware that showing what they know helps them learn the idea better. When they show what they know they can
 - see how their learning is progressing, what ideas they have in place, whether they are on the right track.
 - receive feedback that can alter their understanding by helping them to refine the idea.
 - make new links between ideas that they are learning.
- ***how they can make opportunities for displaying what they know.*** Students differ in how well they go about making opportunities to display their knowledge. Ms Taggart was aware that this didn't come easily to all students in her class. Some had more opportunity to display what they knew than others. A key issue was how she could help more students to do this. As a start, she planned to discuss with her students the dynamics in her classroom and how they can be changed. She was aware that students' personalities may be such that some were reluctant to display in particular ways. Similarly, the social and cultural groups to which some belonged may not encourage the display. She was keen to have her students discuss what they believed about the opportunities they had to show what they knew in her classes, how they perceived it to be distributed across the students and whether there was an obvious link between learning/ personality styles and who made opportunities for themselves.
- ***their preferences for showing what they know*** and that they can broaden these. The activity described at the beginning of this article gave her students the opportunity to explore alternative ways in which they can show what they know and the advantages and limitations of each way
- ***their beliefs about the display-feedback process,*** for example, whether they felt comfortable about displaying what they knew about something when they are not sure that it is correct, whether the idea needs to be compatible with group knowledge and logic to be displayed, whether it is acceptable to give corrective feedback to peers.
- ***their self-confidence to display what they know*** Learners obviously need a level of self-confidence to show what they know, particularly in the presence of evaluative others. Ms Taggart saw that she needed to examine ways, in the dynamics of the regular classroom, in which she could foster this self-confidence in students who currently lacked it. She also wanted to build learner awareness of it.
- ***how to obtain and make maximum use of corrective feedback.*** She was aware that her students already had beliefs about the nature of the feedback, for example, when they are deserving of feedback, the forms that the feedback should take, how to read feedback, how to deal with positive / negative feedback. She realised that she may need to give them the opportunity to explicate their beliefs about feedback and help them to modify these if necessary. Some students would need to learn how to deal with feedback of various types; the vicarious feedback usually used in classrooms as well as the positive and negative feedback. She planned to encourage her students to discuss the ways in which they would like to receive feedback, the feedback they saw as most useful, the ways in which they interpret the feedback that they receive.
- ***how peer group pressure can influence students showing what they know.*** She believed her students would benefit by increasing their awareness of peer group evaluation of what they knew, their need to be valued by their group, the ways in which groups can differ and change in what they value. As noted, Ms Taggart had already begun to think through her role in this. She planned to have her students display what they knew in various group structures; with one person, in a small group and in the large group and have them identify the values and limitations of each.

- ***the different formats in which they need show what they know.*** In a similar way, students who are aware of the different formats in which they need to show what they know, that is, the types of opportunities that they will have, should be more able to manage themselves as effective learners.
- ***how to 'read' display contexts including formal assessment tasks,*** for example, they can learn to recognise when a display context values open-ended opinions versus learnt knowledge, how to display at the beginning of a new topic or during an on-going learning activity and in tests. They can learn how to organise what they know for display in short answer tests and in extended projects, focusing on how each context expects ideas to be organised in particular ways. They can also learn how to recode imagery understanding into a verbal form and vice versa and to decide when each form is appropriate. Ms Taggart planned to have her students discuss how teachers and peers indicate what it is valued to display. She believed that it was important that her students learn to understand their audiences when displaying what they know.

She knew that some of her students believed that when they were asked questions, they were expected to know the answer. The purpose of the question, on the other hand, may be to see what they know, rather than to suggest to them that they should know it. This may be true, for example, at the beginning of a topic.

- ***conventionally preferred ways for showing what is known,*** how these can be learnt and how ideas can be expressed in idiosyncratic ways as an intermediate form of display. Ms Taggart intended to teach the recoding process, to give her students time to carry it out and to automatize some of the conventional ways of displaying knowledge so that they can show what they know in a relatively attention-free way.

Taken together, these areas of awareness constitute one aspect of metacognitive knowledge; that aspect relating to the selective display of knowledge and the use of the contingent feedback.

Conclusion

There are obviously issues not covered in this paper. One relates to the ownership of the displayed knowledge. When learners display what they know to others, does the knowledge move from belonging to the individual to being available to the group, at least for scrutiny and possibly for becoming part of group knowledge? Depending on its ownership, it will be treated differently. Participants in formal learning often neglect different beliefs about display ownership. At the very least, it needs to be negotiated by individuals who will learn together.

Ms Taggart's agenda for change is, if it develops, likely to be long term. Similarly, the ideas that she plans to explore with her students stretch far beyond the teaching of economics. Issues such as learning to 'read' the different situations in which learners will display knowledge stretches far beyond the bounds of single subjects at school and into the realm of 'life long learning'. Building up this type of knowledge in students would be expected to equip them to cope more effectively in all situations.

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