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Flowcharting and Visual Literacy: Exploring Tacit Knowledge Through the Visual

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Abstract

This paper discusses the flowcharting process undertaken by classroom teachers to explain how they transfer professional learning into classroom practice as a type of visual literacy that utilised a combination of both textual and visual concepts to assign meaning and share understanding. The ability to create and interpret information from a multiplicity of visual sources is becoming a 'survival skill' in today's schools in particular and society in general; a necessity for the visually literate consumer. This is an ability that is supported by the use of reflection[1,2] and the capacity to engage in critical thinking. Visual literacy is the segue between these two aspects '…the ability to assign meaning to a visual field so it can be predictably interpreted' [3]. Flowcharts, diagrams and graphic symbols have the ability to provide an alternate semiotic system through which a personal and complex narrative can be conveyed to the viewer in a more compressed and abstract form:

> The diagram establishes itself as a democratising device and a conduit through which complex worlds can be described to the lay observer' [4].

Using the power of image and/or graphics in combination with text to form a flowchart demands higher order thinking skills to ensure the developers' tacit knowledge [5,6] is clear and accessible to the viewer.

Search Terms: Flowcharting, Visual Literacy, Tacit Knowledge, Reflection.

1. Introduction: Influence of the Visual

Where once the creation and development of a range of complex graphic organisers was the domain of computer programmers, increasingly the need for and use of these structures and the skills that support them are becoming more commonplace. In fact some researchers consider that the ability to 'create' and critically interpret information from diverse visual sources is increasingly becoming a survival skill today, both at school and in the wider professional sphere [7]. While others [8,9] contend that the time has passed when a reliance on text-based literacy alone is sufficient or desirable in the modern age. This move towards a greater inclusion of a visual element into most

types of texts has been the focus of research for more than a decade [10]. The rise of a computer culture appears to have increased the number of visual images and the power of these images to influence contemporary culture.

> 'These media carry messages equally through image or through an integrated composition of print and image…[r] eading such messages and texts requires both verbal and visual literacy, and the ability to read the interaction between both verbal and visual elements. Without these literacy skills, it is difficult to see how we could survive in the contemporary world' [11]

Not all of the visual images easily accessed via the computer are photographs or illustrations and a number of other visual representations play an equally powerful role in the twenty-first century.

2. Developing Reflection and Critical Thinking Via the Visual

To successfully access, interpret and create information from a range of visual sources requires the implementation of both critical thinking skills allied with reflection. In describing how professionals engage their reflective capabilities [12] describes two types of reflection: reflection-in-action and reflection-on-action. Reflection-in-action often occurs as professionals engage in their everyday activities, this type of process allows them to recast what they are doing while they are in the process of doing it.

> 'Phrases like "thinking on your feet", "keeping your wits about you", and "learning by doing" suggest not only that we can think about doing but that we can think about doing something while doing it. Some of the most interesting examples of this process occur in the midst of a performance' [13]

In order to situate their reflection professionals can create a 'virtual world, a constructed representation of the real world of practice' [14] in order to test out ideas, to experiment with what is possible. In this type of world it is possible to ' slow down phenomena which would ordinarily be lost to reflection. Actions which might be otherwise irreversible can be examined for their meanings, revised, and tried again' [15]. In this space some things can be ignored while others are explored in greater depth, a variety of different actions can be explored for their value and some of the potential inhibitors of the situation controlled.

Professionals make sense of their present situation because they have already 'built up a *repertoire* of examples, images, understandings, and actions' [16] and use their previous experiences or repertoire to make sense of what is occurring in their present situation. This use of past experience to understanding the current situation is an important component of reflection according to Schon:

> ' When a practitioner makes sense of a situation he perceives to be unique, he *sees* it *as* something already present in his repertoire. To see *this* site as *that* one is not to subsume the first under a familiar category or rule. It is, rather, to see the unfamiliar, unique situation as both similar to and different from the familiar one, without at first being able to say similar or different to what. The familiar situation functions as a precedent, or a metaphor, or….an exemplar for the unfamiliar one' [17]

This use of past experience to understand the present situation as an important component of reflection was also raised earlier by Dewey [18] who labelled the ability 'to seize what is evidential or significant and to let the rest go is the mark of the expert, the connoisseur, the *judge*, in any matter' [19] For Dewey, thinking reflectively was a particular aspect of the thought processes that involved a series of specific phases that enabled the thinker to deal with and solve a particular problem that was causing confusion.

In many professions such as architecture (one of the professions that were a focus of Schon's [20, 21] work on reflection) the relationship between the reflective process, critical thinking and a visual/diagrammatic representation is a symbiotic one:

> '…architects think through the end of a pencil, the freehand sketch is still widely used for its quality of immediacy and can transform representational diagramming. It brings together, examines and then illustrates the complex levels of thinking implicit in the architectural design process, then presents it back to the architect for consideration' [22]

It is through the construction of and reflection upon a sketch, flowchart or diagram that the architect renders the visual as a type of complex narrative that serves as both a conduit to understanding and a means of representing that understanding [23]

3. Simplifying Complexity- The Power of the Visual

As previously demonstrated, the use of the visual has the capacity to express complex understandings in simple terms, to unlock information and allow access and understanding to a wider, less esoteric audience. The use of visual diagrams

and graphic symbols serve to move information and definitions from more abstract and inaccessible to more concrete and available. A visual organiser or diagram could be thought of as a type of 'visual shorthand' [24] a device that has the capacity to simplify complex information. A prime example is the diagrammatic representation of DNA, the resulting double helix in fact represents an extremely complex definition based upon scientific knowledge and an understanding of molecular biology. However, the rendering of this information in visual form ensures access to a wider audience interested in both the 'great diagram of life' [25] as well as the supporting scientific knowledge base.

Diagrams and graphic organisers represent '…a form of intellectual midwifery that brings complex ideas into consciousness, through interpretation' [26] In other words, the creation and development of a visual diagram is representative of a complex and subject specific type of understanding that is often inaccessible to those outside a field or profession. The rendering of a visual often marks an individual or professional journey towards current understanding that the visual is designed to reflect. The resulting diagram could be thought of as a type of 'visual narrative' with different aspects serving as a means to explore and discuss various features of a professional journey.

4. A 'Flow' of Flowcharting
        The use of graphic organisers to illustrate logical thought
structures has a long history. Some of these graphic organisers are still commonly in use today for example, schools still use John Venn's diagrams to illustrate the similarities and differences between two sources of information [27, 28.]The use of this visual structure assists students to identify common conditions and to organise their thoughts prior to moving on to more text-based activities [29, 30]. Disciplines such as science and botany have long used flowcharts as tree figures used to represent relationships between and among different species. While those used in genealogy serve to depict the connections between people in a family tree [31]. One of the most famous flowcharts created in 1933 by Harry Beck- The London Underground Diagram is still in use today and has influenced the depiction of transport systems worldwide. A series of logic devices or logic machines created by logicians such as Carroll, Jevons, Marquand, Babbage and Zuse, among others, flowed from the initial use of flowcharts. These machines played a significant role in the later development of the computer [32, 33, 34].

Although the types of flowcharts mentioned previously are the most easily recognised, a flowchart may assume a variety of forms or structures dictated by the task at hand.

McQuigg and Harness identify the use of flowcharts in planning, remembering and problem solving:

> 'A properly prepared flowchart is like a road map. It can be used to plan important steps in your thinking. It can be used to help you remember how you arrived at a certain point in your thoughts. Sometimes a flowchart will help you find a better way to solve a problem' [35]

5. Flowcharting and Teacher Professional Learning

My study sought to explore the process that five literacy teachers engaged in as they moved to translate their professional learning experiences into their classroom practice.

One of the most commonly used ways to initiate teacher directed change is through the implementation of some type of professional learning experience. Here teachers are provided with new or additional knowledge about a topic in order to influence or change their existing practice. Researchers have variously called for greater investment in teacher professional learning [36, 37, 38] and further research into its impact upon teacher beliefs [39]. In considering the notion of educational change the role of the teacher is pivotal:

> ' In schools, the teacher's role is so central that change theories and projects which ignore the personal domain are bound to end up wide of their target' [40]

In order to better understand each teachers translation process I needed a device that teachers could use to demonstrate their individual change process. I chose to use a flowchart because as a visual diagram it lent itself to being constructed in ways that reflected the idiosyncratic nature of each teachers process and was easy to use without being prescriptive. Teachers needed to feel free to construct their flowchart in the way that best represented their individual process- and they did! Some teachers produced flowcharts that were circular, while others depicted a series of interconnecting boxes. Each flowchart was a construction devised by an individual teacher to represent their own personal learning journey and in fact represented a series of 'in vivo codes' [41] due to the fact that they were created by each respondent by using emic language to explain their own process.

> 'In vivo codes tend to be the behaviours or processes which will explain
> to the analyst how the basic problem of the actors is resolved or
> processed. These codes fracture the data directly because they represent
> analytic categories as used by the researcher. In vivo terms have a very
> vivid imagery, inclusive of much local interpretive meaning: they have
> 'grab' for the participants' [42]

The use of teacher made flowcharts provided me with a means to move
their tacit knowledge about their professional learning journey into more
experiential knowledge and thus making this more explicit and accessible.
Ensuring access to teacher tacit knowledge about their process was an vital tool
in unlocking and understanding the means by which teachers translate
professional learning into classroom practice. As a term tacit knowledge has
varied meanings. '…tacit knowledge is a widely distributed phenomenon which
has acquired a wide range of meanings' [43]. Polanyi [44] illustrated his use of the
term by connecting it to the riding of a bike- knowing how to accomplish
something without actively thinking about it. Sternberg [45] identifies tacit
knowledge as developed over time and incorporating a range of mental models
and perceptions that allow us to make sense of our world. While Smith links tacit
knowledge to an experiential function defining it as

> '…practical, action orientated knowledge or 'know-how' based on
> practice, acquired by personal experiences, seldom expressed opening,
> often resembles intuition' [46].

This experiential connection is one supported by both Eraut [47] and
Fehring [48]. The use of teacher made flowcharts ensured entrée to this tacit
knowledge and functioned as an aide de memoire where they also provided
access to a complex and personal narrative in a 'compressed' and abstract format
[49] that was then able to be explored, discussed and expanded upon in a later
interview.

6. Using Flowcharts to Explain a Process

My access to the teacher made flowcharts enabled me to make a series of
connections regarding the process they undertake in order to translate their often
abstract professional learning experiences into the reality of their classroom
practice:

- The majority of the teacher made flowcharts used both textual and
  visual devices to describe and discuss this translation process.

Teachers often toggled backwards and forwards between these elements in constructing their flowcharts- the visual elements they encoded required the most explanation and discussion.

- The flowcharting process involved teachers in an extensive drafting and re-drafting process in order to encode the 'correct' meaning that conveyed their translation process. They discussed this draft-redrafting to best facilitate understanding as both difficult and rewarding in order to construct a flowchart that 'best' represented their process. The task involved both abstract and higher order thinking and they needed to utilise both focussed reflection and their critical thinking skills.
- My access to the flowcharts of each individual teacher also allowed me access to their current professional understanding as each flowchart was a visual representation of their current process. The flowcharts allowed me entrée into ' a moment in time' as each teacher grappled with delineating their professional understanding. This entrée became more important as I was later able to use the flowcharts as one of the means of determining that there was a difference between how less and more experienced teachers engaged with the offerings provided by professional learning opportunities.
- The flowcharts themselves required exploration, explanation and discussion in order to enable me to access the underlying narrative that supported its development. They also served as a type of intellectual 'short-cut' that provided me with the means to focus more deeply on one particular aspect of each teacher's process and ask for additional explanation.
- The most gratifying (although unplanned) aspect of this study was the fact that teachers were able to appreciate the power of flowcharting as a teaching and learning tool and later appropriated it into their classroom practice.

My exploration of the teacher flowcharting process could be located within the 'ideational aspect' of [50] visual grammar that concerns content and ideas and the relationships between these. The flowcharts also are examples of one of the categories of visual materials labelled 'abstract graphics' [51]. However, my contention regarding these flowcharts is that the previous connections to aspects

of visual grammar and abstract graphics are of secondary importance and devalue their finer and more far more personal importance. These teacher created flowcharts are examples of a type of visual narrative and perform a similar function to others like the DNA Double Helix or Beck's Tube flowchart mentioned previously. These flowcharts tell a story and signpost a journey towards professional understanding- they serve as a means by which teacher tacit knowledge can be made accessible enough to explore and discuss. Along the way they provide the means to demonstrate the powerful role that teachers play in accessing, translating and appropriating new sources of information into their classroom practice.

Notes

1.   Schon, D. (1983).
2.   Schon, D. (1987).
3.   Rakes, G. (1999).
4.   Philips, A. (2006).
5.   Polanyi, M. (1967).
6.   Eraut, M. (2000).
7.   Rakes, G. (1999).
8.   Stokes, S. (nd).
9.   Roberts, S. & Philip, R. (2006).
10.   New London Group. (1996).
11.   Roberts, S. & Philip, R. (2006).
12.   Schon, D. (1983).
13.   ibid
14.   ibid
15.   ibid
16.   ibid
17.   ibid
18.   Dewey, J. (1933).
19.   Dewey, J. (1933).
20.   Schon, D. (1983).
21.   Schon, D. (1987).
22.   Philips, A. (2006).
23.   ibid
24.   ibid
25.   Philips, A. (2006).

26.   Philips, A. (2006).
27.   Gardner, M. (1982).
28.   Maxfield, C & Brown, A. (1998).
29.   Philips, A. (2006).
30.   Stokes, S. (nd).
31.   Gardner, M. (1982).
32.   Goldstine, H. (1972).
33.   Shurkin, J. (1984).
34.   May, W. (1996).
35.   McQuigg, J & Harness, A. (1970).
36.   McKenzie, J. (2002).
37.   Vinson, A., (2001).
38.   Ramsay, G. (2000).
39.   Rodgers, C. (2002).
40.   Goodson, I. (2001).
41.   Strauss, A. L. (1987).
42.   ibid
43.   Eraut, M. (2000).
44.   Polanyi, M. (1967).
45.   Sternberg, R. (1997).
46.   Smith, E. (2001).
47.   Eraut, M. (2000).
48.   Fehring, H. (2001).
49.   Philips, A. (2006).
50.   Kress, G. and van Leeuwen, T. (1996).
51.   Rakes, G. (1999).

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