The world in which students inhabit is increasingly digital, multimedia and online. A multimedia writing pedagogy is urgently needed to prepare students to be effective authors and participants in such a world. This paper draws on a study which has sought answers to questions surrounding the nature of a multimodal narrative authoring pedagogy in the middle years of schooling. In particular, it discusses a range of challenges encountered in both the development of such a pedagogy and in research into it.

Introduction

For some years, it has been argued that “literacy pedagogy now must account for the burgeoning variety of forms that are becoming increasingly significant in the overall communications environment” (New London Group, 1996, p. 60). Indeed, students are active consumers and producers of a very wide range of text, for example: books, newspapers, magazines, movies, radio, television, DVDs, texting, youtube, Web pages, facebook, blogs, twitter, MSN, podcasts, ipods, and online games. In the face of this reality, traditional forms of literacy are necessary but not sufficient in the present-day reality of students needing be multiliterate.

This paper draws on the experiences arising out of a project which is developing a 3D multimodal authoring pedagogy for middle school students¹. Some features of the project and its design will be articulated throughout this paper, but the central purpose is to describe challenges encountered in the first phases of the project, along with corresponding opportunities and (tentative) solutions. As van Maanen (1995) has suggested, research involves ‘fieldwork’, ‘headwork’ and ‘textwork’, then this paper concerns the ‘headwork’ – the need to work through methodological issues of how the research should proceed.

This paper is shaped by a perspective articulated by Wagner (1993), in a paper which emphasizes how the value of educational research may be improved. Wagner uses the idea of a matrix to describe the elements which may be researched within a particular discipline. In this characterization of research, columns might indicate “phenomena under investigation” and rows the “themes of analysis”. Wagner goes on to suggest that much educational research concerns the identification of ‘blank spots’, or populating the disciplinary grid as fully as possible. Wagner’s interest, by comparison, is in encouraging researchers identify the ‘blind spots’ or “areas in which existing theories, methods and perceptions actually keep us from seeing phenomena as clearly as we might” (p. 16). The challenges which we describe below arose because of issues which were presumed to be understood but, upon

¹ The Australian Research Council Linkage Project “Teaching effective 3D authoring in the middle school years: multimedia grammatical design and multimedia authoring pedagogy” (LP0883563) is funded for 2009-2011. The Chief Investigators are Prof. L. Unsworth (University of New England) and Dr A. Thomas (University of Sydney), in conjunction with the Australian Children’s Television Foundation.
investigation, turn out to be ‘blind spots’. The ‘headwork’, then, is about attempts to generate an applicable ‘disciplinary matrix’, so that the project is manageable, and about avoiding the danger of becoming prematurely interested in certain newly-defined ‘blank spots’.

Challenge 1: The paucity of research into student engagement with 3D multimodal authoring

The world which students inhabit is increasingly digital, multimedia and online. Unquestionably, students are active consumers of a very wide range of text, but they are also producers: it has been reported that over half of all American teens, and 57% of those who use the internet, are media creators, having published some form of multimedia such as blogs, webpages or videos (Jenkins, 2006), and it would be reasonable to suggest that the situation is similar in Australia. Although several studies report sophisticated multimedia authoring by children out of school (eg Chandler-Olcott & Mahar, 2003; Davies, 2006; Hull & Schultz, 2001; Lankshear & Knobel, 2003, 2006; Thomas, 2007), few studies have addressed digital multimedia authoring in schools.

Creative and strategic use of sophisticated 3D multimedia is considered crucial in emerging media communications (Livingstone, 2002; Seiter, 2005) and to advancement in the rapidly growing knowledge and communication economies (Herbert, 2006, pp. xvi-xvii). While there are some digital technologies that most young people master independently (e.g. Instant Messaging (IM), chat, SMS), there are others they do not use so readily, intuitively, or automatically, and these are typically the 3D authoring tools of animation and digital video editing and their hybridizing capacity to integrate both traditional and new literacies (Burn & Durran, 2006, pp. 273-274).

This first challenge is the paucity of research into the field, but with such a challenge comes an opportunity. The commitment of some Australian Education Departments (such as the Victorian Department of Education and Early Childhood Development) to provide authoring software such as Kahootz (http://www.kahootz.com) to all primary and secondary schools in their jurisdiction, has created an ideal opportunity for research and development into multimodal authoring. Kahootz is Australian-made, 3D multimedia software “designed... to empower children aged from seven to 15 to create fantastic 3D environments that incorporate animation, linking [and] sound. It provides students in the primary and secondary years with an open-ended set of 3D construction tools” (Maggs, 2008, p. 28). The growing availability and use of software tools such as Kahootz in conjunction with the recognised need for a supportive curriculum and multimodal authoring pedagogy framework has led to the development of an Australian Research Council (ARC) project focussed on the middle years of schooling. This project aims to:

1. Explicate the design features and characteristic uses of language and images in high quality student 3D multimedia narratives.
2. Describe students’ knowledge and compositional processes used in producing quality artefacts
3. Design optimal pedagogic contexts for developing students as 3D multimedia authors

Challenge 2: The paucity of research into “composition literacy”

To achieve these objectives, the project is grounded in ‘grammatical design’, or the systematic deployment of the resources available for meaning-making available in that environment. A starting point for conceptualizing how this might proceed is research into the teaching of grammatical knowledge and school literacy (that is, conventional ‘words only’ composition tasks). A number of studies have shown that explicit teaching of grammatical knowledge has benefited school literacy development (eg Quinn, 2004; Schleppegrell, 2004; Schleppegrell, Achugar, & Oteiza, 2004; Torr & Harman, 1997; Williams, 1999, 2000). A number of studies by Andrew Burn extend this line of thinking into multimodal literacy, by emphasizing the need for explicit teaching of grammatical design in middle school students’ use of animation and digital video (Burn & Durran, 2006; Burn & Leach, 2004; Burn & Parker, 2003). This work showed that when grammatical design was taught,
students made very sophisticated commentaries on their reformulated movie texts (Burn & Durran, 2006).

Whilst the above indicates important work, the relatively small number of studies indicates the relative paucity of research into ‘composition literacy’, and in particular the particular teaching and learning activities (that is, a learning framework – see below) which may lead to optimal outcomes. Moreover, grammars for exploring the co-articulation of image and verbiage are just emerging (Kress, 2001; Macken-Horarik, 2003), although they are a research priority for improving multimedia literacy (Lemke, 2006). It follows that those applicable to the co-articulation of language, image, sound and movement at a theoretical level are still some way off. In short a full-scale ‘disciplinary matrix’ (to use Wagner’s term) is far from being articulated, and this is the challenging circumstance in which the project is situated. The opportunities that this affords the project are discussed under the heading of ‘learning framework’, below.

Challenge 3: The need to modify the research framework in relation to actual circumstances

The research model which was first proposed was to draw upon the student-created resources which were already available (for example in the ‘showcase’ or ‘schools’ sections of www.kahootz.com). In simple terms, the idea was to identify a range of quality pieces, to understand the composition/learning processes undertaken by the student, and also to understand the pedagogical environment in which this occurred. In other words, to take a ‘good’ product and reverse engineer it back to the teacher’s work and teaching context which enabled it to appear; in doing so there might emerge some kind of ‘recipe’ for a consistent production of quality pieces. This is a fairly simplistic overview, but it emphasizes that the starting point was to be quality pieces of work.

And therein lay the next challenge – finding such pieces. (The development of an analytical framework by which ‘quality’ might be articulated is discussed in the next section). The identification of ‘quality’ pieces was a process which was commenced in hope, spurred on by the analysis of one particular piece of Kahootz work², ‘Taken’, described by Thomas (2008) as “a richly layered text which deploys careful multimodal texturing to convey the meanings of the narrative”. As we looked through a great many narrative texts, it became clear that extremely few (if any) could be described as ‘quality’ in the same sense as ‘Taken’³. Common problems were incompleteness (student had never actually finished the work) or lacking narrative structure (ie ‘Orientation, complication, evaluation, resolution’ – see Unsworth, 2001). Pieces could also be criticised on the basis of the quality of the audio, lack of attention to perspective and size of 3D object, too little use of the camera, and too many wide shots. In short, few (if any) pieces were suggestive of sophisticated implicit or explicit knowledge of multimedia grammatical design. From a research design point of view, the challenge was the need to re-design the research approach because the afore-mentioned starting point did not exist.

We have thus turned our attention to ‘getting something happening’ rather than analysing a setting which could be thought of as generating quality work. It has thus been necessary to adopt a research/development model which can support the development and refinement of a 3D multimodal pedagogy. We set about working with two class teachers in a manner described by Dick (1993, p. 2) as action research, that is: being participatory and focussed on both action (ie to bring about a change in some community, organisation or program) and research (ie to increase understanding on the part of the researcher or the client, or both). Such a model implies successive cycles of planning, action, observation and reflection/

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² The piece, ‘Taken’, is available from the ‘showcase’ section of the Kahootz website, http://www.kahootz.com
³ That is not to say that there are not classes doing excellent work somewhere, just that we haven’t found them yet. We have reviewed sufficient number of Kahootz xpressions to be convinced that it is less, rather than more, likely that there is ‘quality’ work somewhere, awaiting discovery.
It is premature to report on the outcomes of this approach, as we are barely through one cycle. The reflection on planning and action to date, by both teachers and researchers, has generated a number of important ideas developed in the following section on the ‘pedagogic framework’. What we seek to identify here is the sense of working from the point of view of ‘blind spots’, not only from the point of view of background research and theory, but from the point of view also of classroom practice. This has led to the need for a research approach for which the starting point is generative and collaborative rather than ethnographic and descriptive.

**Challenge 4: Analytical framework**

Our goal is to create a useful, practical, easily accessible multimodal authoring framework that will support multimodal authoring for students and is user friendly and appealing to teachers. We have begun to research this, starting with trying to identify the key multimodal elements required in 3D multimodal composition from both theoretical and practical classroom practice perspectives. This being said, there are two related challenges. Firstly, there is need for a sophisticated theoretical model by which ‘quality’ of pieces can be established. Secondly, there is the need to provide students and teachers with explicit and contextual guidance about what counts in multimodal composition. The broader theoretical model needs to be an explicit systemic framework that works across the multiple modes of meaning found in many moving image screen texts. This includes metalinguage that “…describes the ‘grammar’, or structural elements and their relationships, of images and language in terms of the functions or meaning-making roles of such elements and relationships” (Unsworth, 2005, p. 14). Teaching the systems of options for meaning-making in language, image, sound and movement gives students access to the metalanguage of multimedia grammatical design. This also provides a means of comparing texts, of determining what semiotic choices were made in constructing meanings, what alternatives might have been chosen, and the effects therefore, of particular choices.

As noted by Unsworth (2006), in the absence of any other resources for describing multimodal meaning-making, we like some other teacher educators and teachers have made use of the “grammar of visual design” developed by Kress and van Leeuwen (1996), extrapolating from systemic functional linguistics (SFL) accounts of language. Unsworth (p. 7) describes how these ‘interpretive tools’ provided by functional descriptions of verbal and visual grammar, enable students and teachers to read literary texts grammatically, so that they are able to read the ‘constructedness’ of the texts, simultaneously focusing on the ‘what’ of the story and the ‘how’ of its verbal and visual construction. This SFL model offers a strong language of description and support for explicit teaching and the metalanguage to achieve this across multiple and differing modes of language construction. (Unsworth, 2005, p 14). This metafunctional model has been used in the development of grammars or metalanguages of other modes of meaning: modes which include the visual (Kress and van Leeuwen, 1996), action, (Martinec, 2000; Martinec, 2001; Martinec, 2004) and audio (van Leeuwen, 1999; Noad & Unsworth, 2007).

The challenge which is before us, the rather large ‘blind spot’ in the disciplinary matrix, is the fact that whilst there is quite a collection of accounts of analytic work (eg Baldry & Thibault, 2006; Burn & Parker, 2003; Cope & Kalantzis, 2009b; O’Halloran, 2004) which is broadly relevant to 3D multimodal authoring, there is nothing which exactly tailored to the task or easily reducable to a form which can provide students and teachers with explicit and contextual guidance as to what really matters when creating texts in this mode. The contribution Maken-Horarik (2009) as to the qualities which metalanguages should exhibit to be valuable for school-based education in this era of multiliteracy may provide an important theoretical frame, but is insufficiently specific to be directly applicable. According to Macken-Horarik (p. 5), any metalanguage needs to:

- connect with semiotic practices (what people do and how they do it);
- embrace student repertoires (formal and informal ‘know how’);
- enable pattern recognition within and across texts (systemic development);
- recognize emergent potential in students’ texts (development)
Challenge 5: Learning framework

Jenkins (2006, p. 56) has suggested that the teaching of multimedia authoring (let alone ‘3D multimedia’) is haphazard at best. Yan and Fischer (2004) have also observed that remarkably little attention has been paid to how people learn information technology from the point of view of cognitive development. Drawing on Kalantzis and Cope (2004, p. 6), we use the term “learning framework” to identify those arrangements of one or more alternative learning pathways across a number of learning elements, but it is clear that the lack of systematic attention to learning frameworks for 3D multimedia authoring represents a considerable blind spot with which the project must engage. This being said, there are several perspectives from which a teacher might come to the task of 3D multimodal authoring. These are briefly described in the following paragraphs.

The teacher of information and communications technology (ICT) may be inclined to firstly teach the skills necessary, followed by an application of these. Certainly, working through a catalogue of skills in engaging and interesting ways is the essence of most Kahootz training programs (through which the teachers we have been working with would have first encountered Kahootz), and that structure is similar to the popular ICDL\(^4\) and INGOT\(^5\) programs).

The approach draws (possibly implicitly) on both minimalism and the ‘waterfall model’. Ben-Ari (2001, pp. 64-65) describes minimalism as an approach to instruction that arose in the design of manuals for software documentation, but is apparently little known outside of this community. It proceeds by allowing learners to start immediately on meaningful realistic tasks, reducing the amount of reading and other passive activity in training, and by finding ways to make errors and error recovery less traumatic and more pedagogically productive. However, it de-emphasizes any conceptual material, even the conceptual model of how the system works often found in the preface or early chapters of a software manual. The waterfall model (eg Waterfall Model, 2009) is a sequential software development model where one purports to know the requirements of the final product, knows the skills required to implement these and has knowledge of design practices which mediate between the requirements and the implementation; the developer (or team) then proceeds step-wise and without back-tracking through the stages of design.

Though our project is described as “3D”, the product that students create is in fact a video. Therefore pedagogy arising from filmic practices might contribute a valuable approach. Indeed, the design practices mentioned about certainly draw on the practice of storyboarding, which are likely to be very important for technical previsualisation, (Storyboarding, 2009). Filmic practices contribute some important insights which may help the young, inexperienced 3D multimedia author attend to the meaning-making rather than the technical detail. By identifying with roles typical in filmmaking, this could help students focus their attention and activity: to ‘be’ the cinematographer by moving the camera around the virtual space, and separately to ‘be’ the director by animating characters. Similarly, the film maker frequently needs to develop some ‘workarounds’ to construct the activity or objects required to portray the meaning desired. The 3D multimedia author, similarly, will not be working with software which is perfect or perfect for every need can help students see beyond limitations by links with real film practices. Additionally, the filmic stages of “rough cut” and “final cut” are potentially helpful for students to identify stages of development of their work.

Thirdly, as the project is fundamentally about communicating meaning within the genre of narrative, it might be expected that aspects of literacies pedagogy would translate to 3D multimodal authoring pedagogy. Among these are the explicit teaching of ‘grammatical design within a genre-based approach have been mentioned previously. Indeed, that is where we started with the school we have worked with most intensively throughout 2009. Using the “Learning by Design” framework of Cope

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\(^4\) The International Computer Driving Licence, http://www.icdl.com

\(^5\) An abbreviation of “International Grades - Open Technologies”, http://www.theingots.org
and Kalantzis (2009a), the second author developed a sample unit of work which would introduce students to Kahootz and also to the metalanguage of multiliteracies, which are described in Table 1. The framework recognises that engagement with these is not step-wise, and there is inevitably a fairly fluid movement backward and forward across and between all four.

### Table 1: Outline of initial unit of work

<table>
<thead>
<tr>
<th>Knowledge processes</th>
<th>Key components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiencing</td>
<td>Introduction to Kahootz</td>
</tr>
<tr>
<td></td>
<td>Introduction to the deconstruction of screen text</td>
</tr>
<tr>
<td></td>
<td>Understanding narrative structure</td>
</tr>
<tr>
<td>Conceptualising</td>
<td>Modelled authoring of a multimodal narrative, through the retelling of a existing narrative</td>
</tr>
<tr>
<td></td>
<td>Planning through storyboarding</td>
</tr>
<tr>
<td>Analysing</td>
<td>Introduction to multimodal literacy metalanguage</td>
</tr>
<tr>
<td>Applying</td>
<td>Students develop a jointly constructed 3D multimodal narrative</td>
</tr>
</tbody>
</table>

### Challenge 6: Practical realities of school life

We have worked intensively with one particular school – a Catholic school in metropolitan Melbourne with a generally high achieving student population. The two teachers we have worked most closely with have been very committed to developing 3D literacy as an integral part of the literacy program at years 5 and 6. Students spent around 20 hours engaged on the above ‘initial unit’ during Term 2. So, the investment of time was significant, in a situation which might be considered as conducive as any to generating ‘quality’ results.

The realities of school life meant this initial unit of work was too ambitious. Access to computers was limited – there was one, maybe two, hours of access per week in a laboratory, and no access in the regular classroom. As is typical of schools, numerous events such as sports days and musicals have also impacted on the time available. As we progressed through this unit of work, it became apparent that even under ideal circumstances, the quantity of work was considerable – starting early in Term 2, the final piece (jointly constructed narrative) was not completed until midway in Term 4.

The range of difficulties encountered covers the full range of realities associated with technology, curriculum and professional development. Teachers have felt uneasy with the technology and some of the metalanguage. Some technical problems due to the age of computers and the version of Kahootz used meant that some students either lost work or found it hard to progress quickly. Teachers were not familiar with an overall production process and the purpose, and potential value, of storyboarding and editing to improve first or rough cuts. When it came to production of their own, jointly constructed narrative, students spent considerable time writing stories. These were very rich, detailed and commendable, but because the composition had started with the focus on using words to create meaning, rather than the multimodal elements, the process of realising that work in Kahootz became quite laborious.

In short, the realities of school life means that the duration of expected products will need to be short (well less than a minute), the phase of introducing students to Kahootz will need to be efficient, and students will need to be taught how to develop 3D multimodal products in a particularly efficient way.

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6 Kahootz 3.1.0 is contains a number of important bug fixes over Kahootz 3.0.0
How we have begun to respond to these realities is developed below, but before discussing it, a particular area of interest which has emerged out of our engagement with classes warrants attention, and that concerns storyboarding.

**Challenge 7: Problematising the practice of storyboarding**

Storyboarding occupies a valued position as a planning and thinking tool in a range of communication genres within the school setting (for example, the recent article in a practical teaching publication, Rendes [2009]). Many find that it is a useful as it helps learner filmmakers know what they are doing. The visual sequencing of shots and scenes is where a lot of the ‘thinking’ about how they are going to do this occurs. Otherwise, the whole film might be shot on one camera position. From her research, Frølunde (2009) observes that...

storyboarding can serve pedagogically to focus the students on working with their main idea and planning out the unique semiotic code as well as selecting the right images and sounds appropriate to the communication of that idea. Film ideas can still be altered in the process, as observed in the case study (p. 19)

Alongside this, we need to present what we have seen in classes so far, and that has been storyboards of a very wide range of usefulness, but certainly including work which is incomplete and trivial, not showing any evidence of having thought through the visual material. In addition, to produce a ‘complete and highly detailed’ storyboard is a tedious and intricate process. Discussion with students would suggest that are often all-too-ready to set their ‘written’ planning aside and work only from what’s in their head, and as a result they are either insufficiently planned or too interested in the technology at the expense of the meaning-making. We might say that the teachers need to be better versed in storyboarding practices, and there is no doubt considerable truth in that. For the present purpose, though, it is pertinent to problematise the practice of storyboarding itself; to wonder whether it is an import from the domain of the film-making professional (or at least, practices associated with much older learners), and ask questions about its place in 3D multimodal authoring in the middle years.

This is, no doubt, a provocative suggestion, but some parallels between storyboarding and written planning in materials technology can be conjectured. Mawson and Maor (2001) observe that a linear process of design-make-appraise is not the way professional designers work, and the necessity for written plans to precede production of an artifact is an intention of the school system. Some (Storyboarding, 2009) have asserted that storyboarding is not a universal practice amongst filmmakers (and thus, by implication, there may be other ways of approaching visual planning). Mawson and Maor believe that the idea that young children can use drawing as a means of modelling and developing ideas has been challenged and it has been suggested that this may represent an inappropriate paradigm in the primary school. They further observe that there are a number of studies which show there is a weak link between design and making, and that children don’t refer to their drawings when modeling.

We have seen examples of good work where students have a complete and thoughtfully constructed storyboard and have been willing to refer to their storyboards in detail when working at the computer; we have also seen examples of good work where students have a complete and thoughtfully constructed piece of work existing ‘in their head’, even though the storyboard might itself be incomplete. In the same way that budding orchestral conductors are encouraged to ‘have the score in the head, not the head in the score’, it seems that it is important to find methods and approaches which help students with their planning and to effectively internalize what they really want to achieve through their work. With respect to difficulties and limitations encountered by some teachers and students, the prominence of storyboarding as a visual thinking tool, and with respect to the reality that we are constructing objects which very similar to, but non synonymous with, films, the practice of storyboarding at least deserves to be problematized. Our response to this, and the preceding two challenges, is now discussed.
Response to Challenges 5 and 6: An emerging learning framework

As a result of working with teachers, culminating in a workshop with them, we have developed a “second draft” learning framework for teaching 3D multimodal literacy, which is presented below. It is informative to reflect on some considerations on the ICT, filmic and literacy practices mentioned above.

Firstly, it should be observed that learning frameworks such as “Learning by Design” (Cope & Kalantzis, 2009a) and the “Curriculum Cycle” (Derewianka, 1990) are very broad, and the type of learning framework we believe is necessary is one which is more fine-grained, with advice as to the particular teaching/learning activities which are appropriate.

Work with classes suggested that approaches derived from ICT practice such as minimalism or the waterfall model would not always be helpful. It is not possible (certainly with middle years students, new to learning the basis of the software) to perfect one phase of software development before moving to the next. An unwieldy and laborious learning process resulting in incomplete pieces of work with scant attention to the meaning-making devices available would be a likely result. Our experience suggests that treatment of a storyboard as a component of an entirely linear model is unlikely to be successful. Teachers may well need some guidance to ensure that their classroom practice and the development model embraced by their students is a responsive one, perhaps more akin to Rapid Application Development (RAD, 2009).

It is also important to build explicit understanding of the software functions and the meaning which can be made from them, something which would be denied by minimalism or delayed through a ‘skills first’ approach. Chandler (in press) has advanced the “instrumental approach” found in mathematics and technology education (Trouche, 2004; Vérimon, 2000; Vérimon & Rabardel, 1995) as a teaching approach to bring the ‘what’ (eg design element) and the ‘how’ (eg software function) together in a simultaneous learning act.

In essence, a key pedagogical challenge is the social construction of this ‘pedagogical matrix’ by the researchers and teachers engaged, in a way which provides adequate practical certainty to teachers, combats any tendency to uncritically keep teaching according to existing disciplinary frameworks, but for which the emerging ‘pedagogical matrix’ is more ‘frame’ than ‘cage’.

As a result of working with teachers, culminating in a workshop with them, we have developed a “second draft” process for teaching 3D multimedia literacy which reflects these respective advantages and disadvantages. A key challenge is the social construction of this ‘pedagogical matrix’ by the researchers and teachers engaged, in a way which provides adequate practical certainty to teachers, combats any tendency to uncritically keep teaching according to existing disciplinary frameworks, but for which the emerging ‘pedagogical matrix’ is more ‘frame’ than ‘cage’. For this “second draft”, there are two phases, which are shown in Diagrams 1 and 2.

One of the features of the teaching/learning processes described in Diagram 1 (overleaf) is the choice of activities which deliberately scaffold both meaning-making and technical skills, bringing the ‘what’ and the ‘how’ together in a simultaneous learning act. Until such time as the resources for the ‘development of literacy/thinking’ are fully developed and trialled, we are uncertain of the role of stand-alone technical-based training. We are certainly moving forward on the assumption that the teaching/learning process outlined in Diagram 1 provides for the modelling and explicit teaching of grammatical design.
Diagram 1: Process for teaching ‘development of literacy/thinking’

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>View</td>
<td>A very short film clip, chosen deliberately to exemplify certain codes/conventions (e.g. use of camera, framing, colour, sound effects)</td>
</tr>
<tr>
<td>Deconstruct</td>
<td>Review and understand how meanings have been made using certain codes/conventions</td>
</tr>
<tr>
<td>Demonstrate</td>
<td>The teacher to model construction of an element of a Kahootz xpression which uses those codes/conventions to create meaning. Joint construction with the class.</td>
</tr>
<tr>
<td>Do</td>
<td>Work on a Kahootz xpression to use exactly these codes/conventions to create meaning</td>
</tr>
<tr>
<td>Reflect</td>
<td>Consider how effective each effort has been at creating meaning using these codes/conventions</td>
</tr>
</tbody>
</table>

Repeat this process for several pieces of work (possibly up to a dozen), each taking no more than a lesson to complete, which are cumulative in their complexity and deliberately scaffolding the learning in meaning-making and technical skills.

The teaching/learning process described in Diagram 2 (overleaf) reflects the value of several things which we have learnt in our early engagement with Kahootz and classes. Firstly, the value of collaboration is reflected in the need for brainstorming, the ‘sandpit’ (see below) and the benefit of early work being jointly constructed pieces. It has become apparent that when students are developing ideas and how these might be represented, ‘two heads are often better than one’. Secondly, the need for planning is considered. It seems that storyboards can be either too large or too small to be useful, both from the point of view of physically drawing and also visualising how things might look when one is deliberately planning to use ‘depth’ and carefully constructed camera angels and framing in a 3D space. It is also the case that students planning should be made manageable and focused through clear scoping.

Our (tentative) view of planning has two novel inclusions, at least in part arising from our observation that teachers may not have had any direct experience with storyboarding or the planning process, and it is important to provide a model which would guide them and guard against certain difficulties. Firstly, it is unrealistic to expect upper primary school students to plan every last detail on paper before moving to a phase of ‘production’. It is laborious and unproductive to spend lesson after lesson insisting that every last character, camera shot, sound effect, sentence of dialogue etc be scripted or written down before ‘moving forward’. Balancing this view is our recognition that students who move prematurely into production are likely to generate a piece of work which has limitations, and therefore we recognise that a ‘good level of planning’ may exist ‘somewhere between the page and the head’. As a software development enterprise, it has more in common with Rapid Application Development (RAD, 2009) which emphasises minimal planning and rapid prototyping, than it does with the waterfall model (2009). How students and teachers may be guided to recognise that the milestone of adequate planning has been achieved is something which will need to be worked on in the next cycles of the project.

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7 This process is deliberately shown in the diagrammatic form of a Nassi-Schneiderman Diagram, familiar to computer programmers. It shows a sequential set of four steps and the conditions under which they are repeated.
8 A Kahootz file is called an ‘xpression’
Diagram 2: Process for teaching ‘development of planning’

<table>
<thead>
<tr>
<th>Brainstorm</th>
<th>Generate ideas for a narrative</th>
<th>Include scoping/limitations to scaffold student learning.¹⁰</th>
</tr>
</thead>
<tbody>
<tr>
<td>Story outline</td>
<td>Produce a story outline (theme, plot, characters)</td>
<td></td>
</tr>
<tr>
<td><strong>Kahootz ‘sandpit’</strong></td>
<td>Need to ‘play’ to effectively develop scene selection, choose characters, develop workarounds and swatching.</td>
<td></td>
</tr>
<tr>
<td>Storyboard</td>
<td>A storyboard which identifies scenes, shots, camera directions and sound effects is a vital thinking tool.</td>
<td>Voice, point-of-view, characters and dialogue will be identified and ‘rehearsed’ to a limited extent in the planning phase. They should be fully understood, if not in physical form, by the end of the planning. Dialogue or narration should be scripted.</td>
</tr>
<tr>
<td>Plan</td>
<td>The plan will be fully developed ‘somewhere between the page and the head’. The storyboard is necessarily 2 dimensional and cannot capture all details.</td>
<td></td>
</tr>
</tbody>
</table>

A second novel inclusion is that of Kahootz as a sandpit. There is a need, as Rieber (2001) has discussed in an article entitled designing learning environment that excite serious play to promote “experience first, explain later” (p. 4). Indeed, when students have had the opportunity to simultaneously explore characters, swatching and other ideas in Kahootz, they have done so in conjunction with the prescribed storyboard. We have therefore come to see this dynamic interaction between the computer environment and 2D planning as beneficial, and indeed a continued ‘playful’ interaction is important for the psychology of learning associated with this a 3D authoring environment. Our work moves forward on the assumption that planning is important, but is non-linear and not constrained to one form of representation. Grammatical design is not only learnt through explicit teaching in the ‘development of literacy/thinking’ phase but also through this kind of playful interaction.

**Conclusion**

Research into multimedia authoring pedagogy for middle years students entails disciplinary issues within ICT education, film and media education and multiliteracies education (including, from an English teaching perspective, narrative composition). The issues which emerge are necessarily dealt with in an integrative rather than an articulated fashion, hence the importance of cross disciplinary boundaries in approaches to research. What is then achieved is a transdisciplinary perspective for the

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¹° This diagram does not take form of a Nassi-Schneiderman Diagram.
¹⁰ For instance: no more than 5 scenes; total duration of no more than 1 min; must use a close-up; and must use lighting effects.
research design. An example of this is where semiotic systems are influenced by software affordances (as in the analytic framework, challenge 4) – a person with an ICT background needs to invest in an understanding of the semiotic systems, and vice versa. That reciprocal investment is essential to be able to address the challenge of the analytical framework. Each of the challenges bring to the fore the need for a transdisciplinary perspective to the work.

As research proceeds in emerging fields, the issues raised by Wagner (1993) – of not being confined to a ‘disciplinary grid’ – can be exended to enable the research to reflect the transdisciplinary nature of the work.

References


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