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## TEACHER EDUCATION & DEVELOPMENT | RESEARCH ARTICLE

# To what extent are teachers well prepared to teach multimodal authoring?

Paul D. Chandler<sup>1\*</sup>

**Abstract:** This study reports on the responses to a survey of 55 upper primary school teachers, conducted prior to their classes engaging in a substantial unit of work in multimodal composition. The survey was designed to ascertain the extent to which the teachers were already familiar with, and had already embedded in their teaching, a metalanguage of multimodal composition. The project from which the data was drawn and its underlying theoretical perspective are described. While the teachers' overall attention to a relevant metalanguage is identified as quite low, it is the differential attention that is paid to the more general elements of text construction practices, together with the prior professional learning associated with this material, which raises concerns about preparedness for multimodal authoring teaching more generally. Schools, school systems and teachers themselves are advised to take urgent and systemic action to ensure the satisfactory implementation of multimodal authoring as literacy practice. Recommendations for further research are presented.

**Subjects:** Teaching & Learning; Arts; Technology in Education; English & Literacy/Language Arts

**Keywords:** new media literacy; pedagogy; elementary education; teacher knowledge

### 1. Introduction

The reconceptualization of literacy in the context of our increasingly digital, multimodal information and communication world is now becoming more widely and prominently recognized in the

#### ABOUT THE AUTHOR

Paul Chandler is a senior lecturer in Education at the Australian Catholic University in Melbourne, Australia. His research reflects a long-standing fascination with the relationship between teacher knowledge and pedagogy and the creation of professional learning opportunities which transform pedagogy and improve the learning of student. Paul works across the fields of digital technologies, science education and new media literacies.

#### PUBLIC INTEREST STATEMENT

Across the world, the notion of "literacy" is being re-thought so as to incorporate the wide variety of forms of communication that are present in society as a whole, and part of the daily life of school-age children. In this study students created desktop video animations in their school work. The study found that teachers were not used to using the language of how the text "works" to communicate meaning, and tend emphasize general aspects of the production process. Those teachers tend to be self-taught and therefore not thoroughly inducted into the patterns of practice of how to effectively create animations. The capacity for these teachers to facilitate their students producing rich, meaningful texts is thus diminished. We therefore claim that teachers are not well prepared for teaching non-traditional types of texts, and recommend urgent attention to their professional learning, with certain elements of language particularly targeted.

curriculum requirements of education authorities across the world. This reconceptualization is viewed as an integral and important component of studies of language (Australian Curriculum Assessment and Reporting Authority, 2016; Education Scotland, 2009–2016; Finnish National Board of Studies, 2016; Scottish Screen, 2009; Singapore Ministry of Education, 2010; Stotsky, 2013). The K-12 New Horizon Report (Johnson, 2006; Johnson, Adams Becker, Cummins et al., 2013; Johnson, Adams Becker, Estrada, & Freeman, 2015; Johnson, Smith, Willis, Levine, & Haywood, 2011) has consistently identified the growth of digital media literacy as a challenge for schools over the medium term, and other authors have considered that visual literacy is the “missing piece” in technology integration (Metros, 2008; Sosa, 2009). To explore the important question of teacher preparedness for teaching multimodal authoring, this paper draws on data gathered from 55 Australian upper primary teachers and considers the professional learning opportunities that they have embraced, their familiarity with relevant software, and the extent to which they bring the terminology of the field (more formally, incorporate the metalanguage) into their teaching. The findings have practical significance for teachers, schools and curriculum developers, and highlight the need to improve teachers’ professional learning in relation to multimodal authoring.

### **1.1. The teaching of new literacies**

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). As to how well that might actually be operationalized in the classroom, there has been a long-standing concern about the level of teachers’ specific knowledge in relation to written texts (Myhill, Jones, Lines, & Watson, 2012). As to multimodal texts, some studies have raised a general concern (Cloonan, 2011; Edwards-Groves, 2011; Ryan, Scott, & Walsh, 2010), with the implication that a general deficiency is widely recognized and problematic, without offering an analysis of the particulars. Kitson (2010) found that although teachers espoused the need to reconceptualize literacy, their level of knowledge of the detail of multimodal communication significantly limited the extent of this reconfiguration. By drawing on empirical pre-test data of teachers readying themselves to teach students to produce segments of video using desktop technologies, this paper contributes specific findings to this general sense of mal-content about teacher content knowledge.

Crucial to the operationalizing of new literacy forms in the classroom is metalanguage, which is the language to talk about language and how texts work. A familiarity with the metalanguage of multimodal texts has been shown to be a key feature of effective literacy instruction (Geoghegan, O’Neill, & Petersen, 2013; O’Neill, 2012; Walsh, Asha, & Spranger, 2007). In lessons using metalanguage extensively, “teachers or students frequently take the opportunity to draw attention to particular aspects of texts ... such discussion will often focus on pointing out how differing sentences, types of texts, discourses and other symbolic representations actually work” (Department of Education and Training NSW, 2003). In addition to their role in effective instruction, extent of knowledge of metalanguage can be an indication of the teacher’s knowledge of the field. Therefore, we explore the extent to which teachers are using the metalanguage of multimodal authoring in their teaching as it is a key consideration for the effective teaching of multimodal authoring in its own right, and sheds light on the background knowledge of the teachers more generally.

This paper argues for an urgent attention to teachers’ knowledge of multimodal metalanguage, with particular areas for targeted attention identified. The discussion proceeds by describing the study context (including the conceptual and pedagogical orientation), followed by the study itself, the particular findings, and then implications and recommendations.

### **1.2. Study context**

Several Australian Education Departments (Australian Labor Party Australian Capital Territory Branch [ALP/ACT], 2004; Office of the Minister for Education and Training, 2004) committed to providing the multimedia authoring software *Kahootz 3* (Maggs, 2008) to all primary and secondary schools in their jurisdiction. This created an ideal opportunity for research and development into

student construction of multimodal texts in the form of the *Teaching effective 3D authoring in the middle school years: multimedia grammatical design and multimedia authoring pedagogy* (or 3DMAP) project (Chandler, O'Brien, & Unsworth, 2009, 2010). There is a small but growing body of work drawing on projects of a similar type (Burn, 2013; e.g. Burn & Leach, 2004; Burn & Parker, 2003; Callow, 2003; Mills, 2008; Pantaleo, 2013; Shanahan, 2013a, 2013b; Vincent, 2006; Walsh, 2011). Whilst still of modest scope, with over 50 teachers and 1100 students participating, the 3DMAP project has afforded more opportunities for quantitative analyses compared with the case study work which are the mainstay of research into the pedagogy of multimodal authoring to date.

The software that facilitated this work, *Kahootz 3*, has been described by its principal designer as a “3D construction toolkit” (Maggs, 2008), and it is important to describe of how it facilitates the creation of multimodal texts. When using *Kahootz 3*, the user is firstly presented with a series of initially blank scenes in the same way as many movie creation software packages show a sequence of frames to the user. Each scene is a virtual 3D space that the user populates with various objects from an extensive library. In that sense, it is not unlike the construction of a “world” in environments such as *Second Life* (<http://secondlife.com>), *The Sims* (<http://www.thesims.com>) or *Minecraft* (<http://minecraft.net>). As in these products, the user of *Kahootz 3* can move around a virtual space, interacting with other objects. Unlike those other software environments, *Kahootz 3* is a single-user environment, so there are no interactive participants in the space, and the user is not represented as an avatar. *Kahootz 3* also provides some limited programmatic capabilities (not unlike computer programming in 3D environments such as *Alice* [<http://alice.org>]) that can be used to develop game-play-styles of interaction; the user can then, for instance, click on certain objects and move to another scene, or cause an effect such as another object bursting into flames. As these functions of *Kahootz 3* can be used to produce a movie, it also has strong similarities to other student-accessible desktop animation programs, such as *movizu* (<http://www.movizu.com>) and *moviestorm* (<http://www.moviestorm.co.uk>). To construct a multimodal text, the author/creator uses *Kahootz 3* to do the things that would otherwise be done using live-action film making. That is, authors/creators are able to “construct” and “film” in a virtual space that involves considerations of length, breadth, depth and the passage of time, and use the 3D space effectively to convey meaning. To do so, authors/creators must take on various roles such as director, cinematographer and location scout; they must select objects and locate them in a virtual 3D space and have ways of specifying their activity.

The 3DMAP project engaged upper primary school classes (i.e. 10–12-year-old students) in four Australian states. Recruitment to the project occurred through advertising in teacher networks, with teachers making application to join the project. This process was aimed at attracting committed and enthusiastic teachers, and indeed only in a small number of cases did participants not continue beyond application, and then only because of organizational or technical difficulties at the school. The participants, therefore, were generalist classroom teachers (not specialist literacy, computing or media teachers) who were seeking an opportunity to increase the multimodal literacy component of the classroom programme. These teachers’ classes engaged in a programme of two units of work (Chandler, 2014), each requiring approximately 20 hours of engagement, and with teaching resources provided by the 3DMAP project team. The first unit introduced key concepts of multimodal authoring and relevant design elements (discussed below). In the second, students applied their understanding of these ideas to construct their own text that required them to apply the knowledge from the first unit of work to orchestrate the full range of semiotic modes that contribute to the moving image. In both cases, the text students produced was, in structure and social purpose, a narrative (Unsworth, 2001).

Anecdotal conversations with teachers prior to their commencement in the 3DMAP project consistently suggested that they believed that their knowledge of multimodal authoring was quite low. This study is a snapshot of their knowledge prior to engaging in the teaching of two units of work to gain insight into areas of weakness and strength. Indeed, it shows that immediate recognition of, and familiarity with using, the relevant metalanguage is generally low. Presented here is the

**Table 1. Design elements and conventions in still images combine to make meaning (Anstey & Bull, 2006, p. 108)**

The design elements of are combined through the conventions of to make meaning	
<ul style="list-style-type: none"> <li>• Colour</li> <li>• Texture</li> <li>• Shape</li> <li>• Form</li> </ul>	<ul style="list-style-type: none"> <li>• Balance among design elements</li> <li>• Layout (how attention is attracted and focused)</li> <li>• Vectorality (how the eye is led through the image)</li> </ul>

conceptual orientation used to develop the survey, which is also the basis through which concern around the particularly low rating of certain items (as described later) is founded.

### 1.3. Conceptual orientation

The conceptual approach of the 3DMAP project arose out of the functional grammar of Halliday (Halliday, 1985; Halliday & Matthiessen, 2004). The Hallidayan system has been extended from the written word to the other modes such as the visual (Kress & van Leeuwen, 1996), the moving image (van Leeuwen, 1996) and the auditory (van Leeuwen, 1999). In *Reading images: the grammar of visual design*, Kress and van Leeuwen (1996) observe that “just as grammars of language describe how words combine into clauses, sentences and texts, so our visual ‘grammar’ will describe the way in which depicted people, places and things combine in visual ‘statements’ of greater or lesser complexity and extension” (p. 1). How design elements (also referred to as “codes”) can be combined with the conventions to make meaning can be presented is described in Table 1.

In the case of multimodal texts, the author needs to understand how linguistic, visual, spatial, gestural and audio resources can be ordered and structured to make meaning. The design elements that may be employed by an inexperienced student user of *Kahootz 3* have been identified through a generative process involving an insider’s (i.e. the author’s) perspective of both the theoretical framework (Kress & van Leeuwen, 1996; van Leeuwen, 1996) and the software product. Consistent with the two units of work for the 3DMAP project, the elements that an inexperienced student was expected to develop an understanding of are summarized in Table 2. The questionnaire used in this study was derived from these 18 design elements. It would be reasonable to explore teachers’ prior knowledge of these same elements.

### 1.4. Pedagogical orientation

The 3DMAP project emphasized that there is a principled basis for making design choices (as per Table 2), which can be explicitly taught, alongside a metalanguage which facilitates communication about the composition (that is, using terms such as “genre”, “social purpose”, “design elements”, “conventions”, “line”, “balance”, “vectorality” and so on). The role of explicit teaching such as this in literacies has been emphasized since the mid-1990s (Anstey, 1998; Mills, 2011). Though not uncontested (Myhill, 2016), this is consistent with Hallidayan approaches (e.g. Macken-Horarik, 2012; Schleppegrell, 2004), multiliteracies approaches (Anstey & Bull, 2010; Cope & Kalantzis, 2009; New London Group, 1996) and has been valued in the teaching of multimodal texts (e.g. Pantaleo, 2013; Shanahan, 2013a, 2013b). Indeed, a number of studies have demonstrated that literacy development has benefited through explicit teaching (Myhill et al., 2012; Schleppegrell, 2004; Torr & Harman, 1997; Williams, 2000). Myhill (2016) has argued that in contexts where the experience with the composition of texts is almost certainly limited, explicit teaching is necessary for students to fulfil the demands of the task. In studies of students’ use of animation and digital video, Burn and Durran (2006) showed that when grammatical design was taught, students made very sophisticated commentaries on their reformulated movie texts. Furthermore, explicit use of metalanguage has been shown to be a key feature of effective literacy instruction with both written texts (Geoghegan et al., 2013; Quinn, 2004) and multimodal texts (Anstey & Bull, 2010; Mills, 2006; Walsh et al., 2007).

**Table 2. Design elements easily accessible to inexperienced Kahootz 3 users**

Software function	Design element	Type of meaning
Selection of worlds, colouring/texturing worlds and objects	Setting and location	Symbolic meaning (including locality, time of day, season, era)
Colour/texturing worlds, lighting effects, fog effects	Atmosphere and mood	Symbolic meaning (including locality, time of day, season, era)
Selection of objects, colouring/texturing of objects	Characters	Symbolic meaning (including locality, time of day, season, era)
Availability of an in-world camera	Sizes of camera shots	Social distance (between in-world characters, and between character and viewer)
	Camera distances	Social distance between viewer and character
	Vertical camera angles	Power relations between viewer and character
	Horizontal camera angles	Degree of involvement of viewer with character
	Point-of-view	The relationship between the viewer and the character, which may change throughout the text
	Camera movement	Dynamicize changes in relationships
Animation of objects	Relocation of characters through animation	Portray a narrative process or dynamically describe a change in social interaction
	Gesture—the “on the spot” animation of characters	Convey emotion, narrative process or interpersonal relationship
	Animation and positioning of the head and eyes to direct gaze	Convey interaction or emotion between characters
Availability of recorded audio	Voice performance	Narrative continuity Symbolic meaning Interactions
Sound effects library, availability of voice performance	Sound effects	Symbolic meaning
Sequencing of scenes and shots	Continuity	Narrative continuity
	Sequence	
Explosions, fades and animations	Special visual effects	Symbolic meaning
Availability of on-screen text, visual elements and audio elements	A balance between sound, image and print	Compositional meaning

Whilst located in this tradition of language/composition teaching that values explicit teaching and a metalanguage, it is important to acknowledge other perspectives. The adoption of this approach is not intended to deny the large body of knowledge of both teachers and students related to multimodal texts that may be tacitly held. However, such knowledge needs to “activated” such that it can be taught explicitly. One purpose of the survey that is reported in this study, alongside providing a snapshot of the extent of knowledge of relevant metalanguage, was to sensitize the participating teachers to some of the metalanguage which would be expected of them whilst delivering the units of work. The metalanguage explored in this investigation (second column of Table 2) is not especially “heavy duty” or unfamiliar. These are intended to be a common-sense base-line, giving voice to concepts (third column of Table 3) that may be tacitly held, and which are not unrealistic for generalist teachers to know in order to commence fashioning an understanding of multimodal authoring with their classes.

Secondly, explicit teaching does not deny a dialogic pedagogy where students and teachers are learning together, co-constructing meaning and developing familiarity with metalanguage through their creative work together. It values the shared metalanguage as being anchored in the language

of the discipline, and that the teacher as the “lead learner” needs to have a sound basis to start with. Thirdly, there is the issue of whether it is reasonable for upper primary school (generalist) teachers to have knowledge of, or teach, multimodal authoring to the level of detail implied by Table 2. In the Australian Curriculum, amongst others (as noted above), multimodal composition approaches the same “value” as written texts. The pedagogical perspective taken, and the findings of this study, are intended to speak specifically to those situations where specialist knowledge is required by generalist teachers, and where a kind of open-ended dialogic approach is not a substitute for adequate levels of subject-specific knowledge.

We proceed to consider the extent to which teachers/participants in the 3DMAP project were knowledgeable about, and claimed to have already embedded within their pedagogy, those design elements to which their students would be introduced.

### **1.5. Foci for investigation**

In the context of a pedagogical approach that values explicit teaching of design elements, the lead question “to what extent are teachers well prepared to teach multimodal authoring?” is explored through four sub-questions:

- (1) To what extent are teachers familiar with the metalanguage of multimodal design elements?
- (2) To what extent do teachers emphasize the teaching of particular design elements in both the reading/viewing of texts and the writing/creating of texts?
- (3) To what extent are teachers familiar with associated concepts, such as narrative structure and systematic review and improvement of multimedia products?
- (4) Are there any identifiable trends, such as age or experience in relation to points 1, 2 or 3?

The instrument, participants and data investigation techniques are now presented.

## **2. Method**

### **2.1. Questionnaire**

An online questionnaire was developed, and presented to respondents through Google Docs. Data concerning the awareness of multimodal design elements (refer to Table 2) were gathered using a Likert-type items, as presented in Appendix 1. Two general items related to knowledge of text genres were also presented (items 1 and 2), as were two further items thought to be interesting in relation to the process of creating of multimodal texts (items 21 and 22). Alongside the design element items, some general information was also collected, which included demographic information about the respondent (school, gender and age) along with an estimate of the number of years of teaching experience, the number of years’ experience with multimodal authoring and the multimodal software with which they were familiar. Respondents were also asked in what fora they had learned about the software that they nominated (e.g. short course or self-study).

The 18 design element items were presented to respondents in three ways, as shown in Appendix 2. Firstly, a question to discern a basic level of knowledge about the design element was asked—“I have an understanding of what this means” as a “yes” or “no” choice. As a knowledge of design elements could be applied to the separate literacy tasks of reading and writing (or their multimodal counterparts “viewing” and “creating”), for each design element, separate items enquired about the teaching of reading/viewing and writing/creating on a five-point scale.

## 2.2. Participants

The participants in the 3DMAP project were generalist classroom teachers. Some were enthusiasts, individually committed to expanding the multimodal authoring component of the curriculum; others would not have sought out the project but joined in willingly because other members of the year-level teaching-team at the school initiated the contact. No particular level of computing expertise was required or anticipated, nor was it assumed that the teacher had used *Kahootz 3* previously.

The data were collected over two years. Fifty-five teachers completed the questionnaire at the outset of their engagement with the 3DMAP project, prior to receiving any teaching materials from the 3DMAP team, engaging in any professional learning or commencing any project work with their classes. They had received and completed the relevant paperwork on research ethics, approved by the university and school sector, prior to completing the questionnaire. The results, therefore, provide a snapshot of the general experience and knowledge of the generalist upper primary teachers in relation to multimodal semiotics—teachers who have no *prima facie* special attributes or experience. Teachers also completed the questionnaire at the end of the teaching year, when they had completed the project work with their classes, but those data are not reported here, and are the subject of a separate work-in-progress

The majority of the respondents were Victorian (18 schools, 48 classes), with smaller numbers from Tasmania (2 schools, 4 teachers), New South Wales (2 schools, 2 teachers) and Queensland (1 school, 1 teacher). The distribution of age and experience of participants is shown in Figure 1. There is a high representation of female teachers in the 40–50-year-old age group, and the male teachers in the sample tend to be older, but not necessarily more experienced. The greater proportion of female teachers is consistent with the Australian teaching workforce overall, but with an average age of around 40 and average years of service of just over 15, it is a slightly younger and less experienced group than Australian teachers in general (McKenzie, 2012). Subsequent investigation showed that there was no significant difference in the response to items based on differences in gender, age or years of experience, and so the whole cohort was treated as single group in the investigations reported as follows.

## 2.3. Data analysis

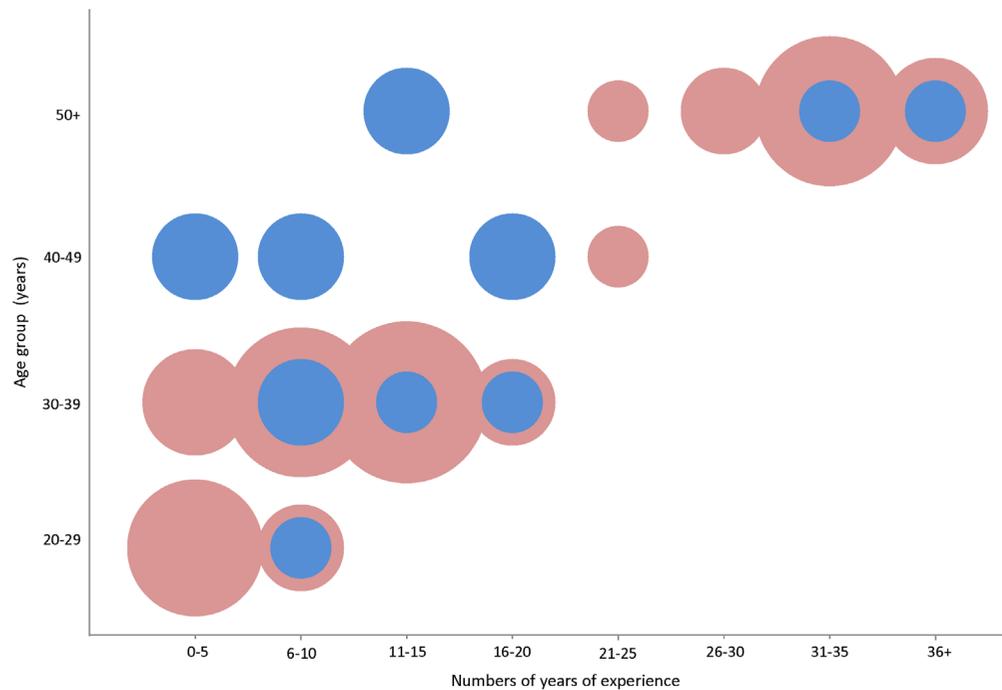
Demographic data presented here, including the teaching experience and experience with multimodal authoring of the respondents, uses descriptive statistics (see Figure 1, Table 3, and the discussion below). The response to each item was treated as a six-point scale (zero to five) with negative responses to “I have an understanding of what this means” rating as zero. Calculations were carried out in the statistical software, *R* (R Development Core Team, 2012).

In order to provide insight into research questions (1), (2) and (3), concerning the familiarity with the metalanguage and the extent of use of that metalanguage in teaching, an item-to-item comparison was undertaken. The mean score for each item was computed (see Figure 3) and Tukey’s HSD test was used to compare means, using a randomized complete blocked design to correct for familywise error, within-subject effects and between-subject effects. The strength of this approach is that it is a realistic treatment of the data rather than assuming responses to the items are independent events, but the weakness is that the data are not normally distributed. However, the size of the data set is such that the central limit theorem is assumed to apply and the shape of the distributions is not a concern. The similarity between means is presented graphically using the method suggested by McDonald (2009, pp. 132–136). A further investigation of each item was to consider the results for the item component “do you have an understanding of what this means” to identify any statistically significant majority response using the sign test (Owen, 1962, pp. 362–363).

A further investigation related to research questions (1), (2) and (3) was to make a teacher-to-teacher comparison. This was achieved by computing a “Design Element Average” (DEA), for each teacher (see Figure 3), and comparing the means across the range of teachers was provided by the

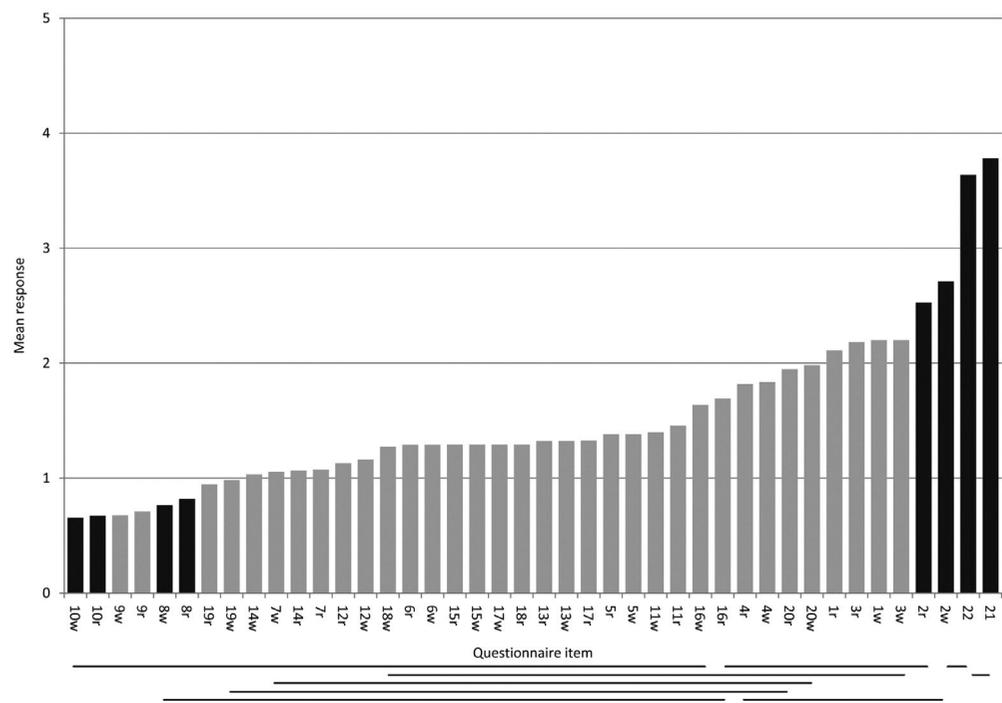
**Figure 1. Distribution of age and experience of participants.**

Notes: Relative numbers of participants are indicated by the size of each circle; male participants shown in blue, and female participants shown in pink.



**Figure 2. Means of teacher ratings for each design element.**

Notes: Pairs of means grouped by a horizontal line are not significantly different from each other (Tukey–Kramer method,  $p < 0.05$ ). Means shown in black indicate a majority response to “I have an understanding of what this means” (sign test,  $p < 0.05$ ).



Gabriel comparison interval approach (Gabriel, 1978). Separate averages were computed for the reading/viewing and writing/creating items.

In order to explore research question (4), a series of investigations considered possible identifiable trends such as age or experience. Using the independent samples  $t$ -test, the means of teacher scores (both DEA and that of each item, in turn) was compared using groupings of age, experience,

school and prior familiarity with certain software types. There was one coherent set of significant results from this series of investigations. This is reported below.

### 3. Findings

#### 3.1. Breadth of knowledge about software

Respondents were asked about software that they believed to be similar to Kahootz 3 in three ways. Firstly, they were asked to consider 3D animation software. Nineteen respondents did not identify any 3D animation software, and three products were identified by at most three teachers each. Secondly, movie-making software, with which respondents were a little more familiar: *iMovie* ( $n = 16$ ), *Moviemaker* ( $n = 28$ ), and *Photostory* ( $n = 26$ ) were the highest, but 13 respondents did not name any movie-making software. This corresponds with analysis of data on students from the 3DMAP project in which *iMovie*, *Moviemaker* and *Photostory* were identified as being taught in schools (Chandler, 2013). In the third category, 3D game creation/3D world software, the only three systems were mentioned, by a maximum of five teachers each. In general, the breadth of knowledge of relevant multimodal authoring software is quite limited. Based on age alone, one might be tempted to describe the younger teachers (and their students) as “digital natives” (Prensky, 2001), and think that they would be relatively familiar with relevant software. For the participants in the 3DMAP projects, this seems not to be true for either the teachers or, as a previous study showed, the students (Chandler, 2013).

#### 3.2. Fora where software is learned

Results for the fora where respondents first learnt multimodal authoring software are presented in Table 3. Strong trends are shown: a high number indicate little prior learning, with over 50% have some level of being self-taught. Initial teacher training has had some impact for the more recently graduated teachers, and in-service education has been an important form of learning by those with more experience. Content knowledge is also known to be a contributor to teacher confidence, attitudes and capacity for planning (Chandler, 2001; Hew & Brush, 2006), and it is therefore important to increase the access to professional learning.

Whilst a larger data sample would be needed to be certain, there is a tantalizing feature of mid-career teachers: they are the group that seems least likely to be self-taught or seek tuition from colleagues, and also the most likely to claim no background in multimodal authoring. Therefore, these data also suggest there are particular professional learning needs of mid-career teachers.

**Table 3. Percentage of respondents who have learned multimodal authoring software in particular settings**

	Experience of teachers (year range)								Overall (N = 52)
	0–5 (N = 10)	6–10 (N = 13)	11–15 (N = 8)	16–20 (N = 7)	21–25 (N = 4)	26–30 (N = 2)	31–35 (N = 3)	36+ (N = 5)	
<i>Learning environment</i>									
Self-taught (%)	100	38	50	29	25	50	57	75	52
In-service (%)	10	31	50	43	50	0	57	50	33
I barely have any background (%)	50	31	13	57	50	50	14	10	33
Tuition from a colleague (%)	20	23	25	14	25	50	29	25	22
Pre-service teacher education (%)	50	15	13	0	0	0	0	0	15
Short course (%)	20	15	0	14	25	0	14	0	12

Note: N = 52; data not received from 3 participants.



between modes to construct meaning—is far from strong. However, except for those items at the extreme ends of the chart, the study is not able to discriminate between the relative emphasis given to the majority of design elements in teaching. In response to the second research question, there is no discernible difference in the relative emphasis that teachers give to each design element (i.e. items 7–18) in their teaching; all receive relatively low levels of attention. Items concerning camera work have particularly low levels of familiarity or emphasis.

The anecdotal conversations with teachers prior to their commencement in the 3DMAP project in which they referred to their low levels of knowledge about multimodal authoring might have led to the hypothesis that their knowledge of design elements would be low; perhaps their knowledge will be activated by completing the questionnaire. The surprise in the data, and broader concern for their preparedness to teach multimodal authoring, is found in a consideration of the items at both ends of the scale, which are statistically different to most of the others. At the high end, the majority position is high familiarity with emphasis on narrative structure (item 2), encouraging revision and improvement of multimodal texts (item 21), and expecting students to be innovative in their storytelling (item 22). Indeed, in response to research question 3, the data support the idea of teachers being quite familiar with concepts such as narrative structure and systematic review and improvement of multimedia products. Edwards-Groves (2011) observes that there has been a strong emphasis on written composition as “process” in recent decades, and items 21 and 22 are consistent with this. Moreover, in recent years, considerable attention has been given to narrative and genre in national high-stakes test for this age group of students in Australia (Cumming, Kimber, & Wyatt-Smith, 2012; Hipwell & Klenowski, 2011). One might therefore expect that teachers would be well used to emphasizing genre (item 1) and narrative structure (item 2), and yet 27% of respondents claimed not to be familiar with narrative structure (i.e. a zero response) and 36% of respondents claimed not to be familiar with genre. What seems to be emphasized in their classrooms are the most general ideas about texts of any type—specific ideas of how they work and how to fashion their creation do not receive attention. It may well be that the respondents did not have immediate recognition of the language of the design elements as presented to them, but the concern centres around the emphasis of generality and why even that is not emphasized to a greater degree.

At the other end of the scale, three items stand out as being least known and emphasized than the others: points of view (item 10) and camera angles (items 8 and 9). In terms of Hallidayan linguistics these have a particular place in creation of texts, but nevertheless could be regarded as examples of a general lack of recognition of the wording if it were not for differences between teachers with particular backgrounds and experiences, which is discussed below. In Hallidayan terms, the significance of camera work is as follows. In this approach, meaning is constructed through three so-called metafunctions: the ideational (what is going on and where), the interpersonal (who are taking part and the relationships among them, and with the viewer) and the textual (how the message is structured). No single design element “belongs” exclusively to any one metafunction (the construction of meaning is the interplay between the designs that are used), yet certain design elements will have stronger role to play in the creation of certain types of meaning, such as “setting and location” in ideational meaning and use of the camera in interpersonal meaning. The concern, therefore, is that teachers’ knowledge and current practice is emphasizing ideational meaning and de-emphasizing interpersonal. We might also wonder whether high levels of attention to the most general of text-creation practices, low levels of attention to the realization of ideational meaning and lowest levels of attention to the realization of interpersonal meaning might indicate a lack of awareness of theoretical frameworks associated with how texts “work” and inform their construction.

In the context of the 3DMAP project, this has a particular significance, as the prescribed genre for student texts was a narrative. The usual structure of a narrative (Unsworth, 2001) is “orientation”, “complication”, “evaluation” and “resolution”. Orientations are accounts that give the setting or context of a narrative, complications are specific events that actually take place, and resolutions are reports as to what finally happened. Construction of ideational meaning is important in these phases. Evaluations are accounts that tell the viewer/reader what to think about a person, thing, place,

event, or the entire experience, and in this phase, construction of interpersonal meaning is emphasized. In other words, even though they claimed at least a modest understanding of narrative structure (item 2), the participating teachers were actually significantly unprepared for teaching multimodal *narratives* because of their unfamiliarity with the design elements through which evaluation is constructed.

In summary, teachers are attending to general ideas of literacy, but not specific meaning-making constructs, and this is equally true for writing/creating as reading/viewing. Considering the emphasis on some of these ideas in national testing regimes in recent years, the lack of emphasis on those components strongly related to that venture is surprising. Attention to the construction of interpersonal meaning is also a clearly identifiable limitation. We now turn to what can be learned by comparing the responses in terms of school, age, teaching experience and experience with software.

### **3.4. Variation amongst teachers' knowledge of design elements**

Figure 3 shows the teachers' self-reporting of their extent to which they use the terminology of design elements in their teaching. For simplicity, only the DEA related to "writing/creating" are presented. This is because responses to "reading/viewing" and "writing/creating" variants of the questionnaire items were nearly identical (see Figure 2), so the act of teaching reading/viewing does not seem to elicit any differentiated attention to design elements compared with teaching creating/writing.

Comparing DEA across the sample shows considerable variation in teachers' professed use of the metalanguage. There are two teachers whose rating places them as more knowledgeable than the majority. Further, with two three exceptions, DEA is not statistically different among teachers from the same school. The exceptions are school 3 where the two teachers rate themselves significantly differently, school 4 where two teachers rate themselves much lower than the other two teachers and school 10 where the top-rated teacher is rated significantly differently to the lowest-rated teacher. This suggests that there is professional learning that at least three teachers have undertaken which has not been available to their colleagues at the same school. Figure 3 also shows that the rating of the teachers at school 2 is significantly higher than many of the other teachers in the sample, which suggests that there has been some professional learning occurring in that school and the development of a "culture" where the explicit use of metalanguage is valued. Anecdotal evidence from having worked closely with and spoken to these teachers over the course of the 3DMAP project confirms this assertion. With this exception, familiarity with multimodal authoring seems to be a feature of individual teachers' experience, and not mainly a function of the professional learning afforded to them by virtue of teaching at a particular school. This suggests that there are opportunities for school-based professional learning in this field, and an opportunity to maximize the impact of "digital champions".

This identification of trends within and across schools, potential reasons for it and implications of it, is an important response to research question 4. Other trends such as age or experience were also explored with only one set of statistically significant results, which is now described.

### **3.5. Movie-making software and familiarity with camera terminology**

With more than a handful of respondents familiar with certain software (namely iMovie, Moviemaker or Photostory) statistical investigations were undertaken to identify any similarity amongst groups based on use or non-use of those using the independent samples *t*-test. The only statistically significant results involve iMovie. The group of teachers who have familiarity with iMovie ( $n = 16$ ) have a statistically significantly higher ( $p < 0.01$ ) DEA mean compared with those who do not ( $n = 39$ ). An explanation for this is that iMovie is movie-making software, and it would seem that users have become more familiar with certain practices or terminology through engagement with it. The exploration was extended to test the difference in means on an item-by-item basis. A significant difference was found for six items: iMovie users have a statistically higher mean ( $p < 0.01$ ) for items 5 (size of camera shots), 6 (camera distances), 7 (camera movement), 8 (vertical camera angles), 9 (horizontal camera angles) and 15 (voice performance). These are the group of items (see above) for which the

average teacher rates him/herself so low as to represent nearly negligible prior knowledge. An explanation for this is not readily apparent, but it is possible that iMovie users have worked with live-action film-making—managing physical cameras, distances, angles and shot size, along with challenges of recording voice—and used the software for post-production. It is possible, therefore, that some attention to live-action filming, rather than the desktop-equivalent alone, would be a valuable component of both student learning and teacher professional development.

In response to research question 4, the data do not support the idea of any trends related to age or teaching experience; there seems to be some differing experiences of software which seem to be important, and the variation between and within schools points to the benefits of, and strategies for, professional learning.

#### **4. Limitations of the study**

It is important to address issues of reliability, validity and generalizability of the study. Reliability (whether it can produce similar results in similar circumstances) has not been explored and is an avenue for future work. In relation to validity (whether it examines what it claims to examine), there are three particular challenges.

Firstly, the study has used a questionnaire to gather a snapshot insight into teachers' familiarity with design elements. It does not purport to be a thorough exploration of those teachers' multimodal knowledge and practice, nor their understanding of theoretical frameworks about texts. Further detailed explorations of this, including qualitative techniques, post-tests, pre-tests and a research design that allows for the tracking of growth over time are required. As part of a broader endeavour, it would certainly be interesting to reflect the results of a "snapshot" study back to the respondents as a way of probing more deeply their understandings of what it might take to be an effective teacher of multimodal literacies.

Secondly, the expression of each questionnaire item is acknowledged to be an investigation of familiarity with particular words rather than the concept itself. There is the possibility that participants have an understanding of the relevant multimodal concepts but lack the metalanguage to express them. There would be merit in a more direct exploration of teachers' knowledge using examples and interview methods, together with a research design that could identify growth over time.

The third challenge is the fact of the instrument being a self-report. The advantage of a self-report approach is that it gives the respondents' own views directly—their perceptions of themselves and their world that are unobtainable in any other way. Key criticisms of self-report are that answers may be exaggerated or lean towards "socially desirable" responses. The scores overall are sufficiently low that presenting a socially desirable response does not seem to be a feature of the data and that the teachers have responded honestly and individually to the items.

With the small sample size, it is not valid to generalize the specifics to Australian upper primary school teachers more broadly, although we note (above) that the group of participants bears similarity with the Australian teacher workforce. However, despite the limitations (particularly the one-off "snapshot" design and small dataset) this study makes important contributions to the question of whether teachers are well prepared to teach multimodal authoring.

#### **5. Conclusion**

Empirical data from 55 teachers who engaged with a multimodal authoring project have been used to explore the question "to what extent are teachers well prepared to teach multimodal authoring?" A snapshot of teachers' knowledge prior to engagement with a 3D authoring tool has revealed:

- Participants have low levels of prior experience with relevant software.
- Participants have low levels of familiarity with the metalanguage of multimodal authoring, as expressed through the statements of design elements; a lack of awareness of theoretical frameworks associated with text design and construction has been conjectured.
- There is considerable variation in the extent to which participants attend to design elements in their teaching, but age, gender, experience or school are not identified as predictors. A larger sample would be necessary to identify any such trends.
- There is negligible difference in teacher's professed emphasis on reading/viewing compared with writing/creating.
- The participants express a higher level of knowledge about more general literacy concepts (commitment to creativity in story writing, knowledge of text genres and knowledge of narrative structure) and a general commitment to encouraging their students to engage in systematic review and improvement in their work. They seem not to be used to paying detailed attention to considerations of how texts work and can be constructed. Moreover, the teachers do not seem to be as knowledgeable about these as would be expected, given the current national testing agendas.
- The metalanguage associated with camera work and the construction of inter-personal meaning tends not typically included in the participants' teaching repertoire. This is a particular concern for the effective teaching of narrative texts.
- "Digital champions" within schools can usually be identified, but familiarity with multimodal authoring software and concepts seems more related to individual experience and interest than it does with a deliberate strategy at school-level.
- The extent to which participants claim use of design elements tends to be similar among teachers at the same school; the development of a "local school culture" of metalanguage use may be an important feature of assisting students to produce high-quality multimodal texts.
- If the participants claim to have any relevant background at all, they tend to be self-taught or perhaps having attended a brief in-service program. Mid-career teachers seem to be the least engaged in any structured learning.

In short, the respondents are not well prepared to teach multimodal authoring, although those with some experience with software products associated with live-action film making seem a little better prepared than others.

New literacy approaches (Cope & Kalantzis, 2009) identify the need for students to be engaged with specialized, disciplinary and deep knowledge typical of expert communities of practice. For all the reasons identified above, it seems most unlikely that the group of teachers profiled in this study would be well positioned to help students achieve these outcomes. The age, gender and experience profile of the participants is such that this claim may well reflect the Australian teaching population in general. The move towards "new media literacies", particularly where multimodal information and communication is included as an integral component of language studies within mandated curricula, may assume a level of capability of teachers that is simply not justified. The paramount role of the teacher was identified in earlier work that found that "left to their own devices, upper primary students do not gain a breadth of knowledge of new media" (Chandler, 2013, p. 264). Urgent and systemic action by schools, school systems and teachers themselves is required to address this, and to effectively move literacy pedagogy into that central place which is envisioned for it in current curriculum frameworks.

## **6. Responses, recommendations and future opportunities**

The opportunities for providers of professional learning are considerable. There is some evidence from this study that pre-service teacher education programs are increasing their attention to multimodal authoring. The major effort, however, needs to be at the in-service level. Simplistic assumptions that teachers are highly familiar with literacy concepts and/or are increasingly computer-familiar are not

supported by this study. System-wide efforts are required to make sufficient progress. Certain projects can be noted (Cloonan, 2011; Love, Macken-Horarik, & Unsworth, 2011; Myhill et al., 2012), but these are insufficiently multimodal and also small scale compared with the scope of the problem. “Digital champions” can be identified, and there is the challenge to schools individually and the sector more generally about how to harness their expertise and enthusiasm to build capacity more generally.

The findings of Myhill et al. (2012) call attention to possible particular learning needs amongst mid-career teachers, which finds some support in this study. In short, there are rich opportunities to explore different modes of professional learning, and certainly to trial possibilities such as whether engagement in live-action film making is an important contributor to developing a richer understanding of multimodal authoring.

As a study into teachers’ preparedness for teaching multimodal authoring, this study is a valuable but nevertheless small first step. In-depth qualitative work—including interviewing teachers and observing their practice—is clearly needed to provide richer descriptions of the issues and possibilities.

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### Appendix 1

Twenty-two questionnaire items were constructed as follows. Firstly, two general items related to knowledge of text genres were created, with the stem “To what extent do you teach your students about ...”

- (1) The different genres of multimodal texts.
- (2) How a narrative structure is made up of different parts (e.g. orientation, complication, evaluation and resolution)?

Eighteen items concerning design element (refer Table 2) were created. As a knowledge of design elements could be applied to the separate literacy tasks of reading and writing (or their multimodal counterparts “viewing” and “creating”), in respect of each design element, two questions were asked. Firstly, “the extent to which I emphasize this in my teaching of reading/viewing ...” and secondly “the extent to which I emphasize this in my teaching of writing/creating ...”

- (3) The ways multimodal authors use location and setting to help tell a story?
- (4) The ways multimodal authors use atmosphere and mood to help tell a story?
- (5) The ways multimodal authors use different sizes of camera shots (e.g. close-ups, mid shots, wide shots) to help tell a story?
- (6) The ways multimodal authors use different camera distances (e.g. close-up, mid shot, wide shot) when showing characters to help tell a story?
- (7) The ways multimodal authors use of different camera movements (e.g. zoom, pan, track) to help tell a story?
- (8) The ways multimodal authors use different vertical camera angles (e.g. high angle, low angle, eye level) to help tell a story?
- (9) The ways multimodal authors use different horizontal camera angles (e.g. frontal angle, oblique angle, back view) to help tell a story?
- (10) The ways multimodal authors choose different points-of-view for camera shots to help tell a story?
- (11) The ways multimodal authors use visual elements (e.g. colour, shape, size) to convey information about characters?
- (12) The ways multimodal authors use movement of characters and objects to tell a story?
- (13) The ways multimodal authors use gesture (e.g. a smile, a shove, a turn of the head) to help tell a story?
- (14) The ways multimodal authors use the direction of gaze (i.e. where a character is looking) to help tell a story?

- (15) The ways multimodal authors use voice performance (including dialogue and voice over) to help tell a story?
- (16) The ways multimodal authors use sound effects to help tell a story?
- (17) The ways multimodal authors use special visual effects to help tell a story?
- (18) The ways multimodal authors have to work out a balance between sound, image and print to tell a story?
- (19) The importance of continuity in multimodal texts?
- (20) The importance of the sequencing of story in multimodal texts?

Two further items were also included to investigate some associated concepts:

- (21) To what extent do you teach your students about the need to revise and improve multimedia work before it is considered “finished”?
- (22) To what extent do you expect, and support, your students to be innovative in their storytelling?

**Appendix 2**

The items in Appendix 1 were presented to respondents in two ways. Firstly, a question to discern a basic level of knowledge about the design element was asked—“I have an understanding of what this means” as a “yes” or “no” choice. Secondly, two items that enquired about the application of such knowledge to the teaching of reading/viewing and writing/creating, requiring a response on a five-point scale. The presentation of the set of questions for each design element is shown in Figure A1.

**Figure A1. Sample questionnaire item as presented to respondents.**

To what extent do you teach your students about the different genres of multimodal texts, such as narrative, recounts, biography, documentary, etc?

I have an understanding of what this means  
 Yes  
 No

The extent to which I emphasize this in my teaching of reading/viewing is:

	1	2	3	4	5	
I place insignificant emphasis on it						I emphasize this to a significant extent

The extent to which I emphasize this in my teaching of writing/creating is:

	1	2	3	4	5	
I place insignificant emphasis on it						I emphasize this to a significant extent



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