**Title: Multimodal analysis for critical thinking**

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**Multimodal analysis for critical thinking**

**Abstract:**

This paper proposes a pedagogical approach for teaching and learning critical thinking through multimodal analysis; that is, 'multimodal analysis for critical thinking' (MACT). The approach builds on the conviction that students require competencies that move beyond traditional notions of literacy to meet the changing demands posed by media and technology in the 21st century. The approach takes a social semiotic view towards critical multimodal literacy, which aims to provide students with an analytical metalanguage for the systematic analysis of multimodal texts and videos. The pedagogical approach is facilitated through the use of purpose-built software applications with comprehensive analytical frameworks designed to support the systematic teaching and learning of multimodal analysis, with a view to developing the critical literacy skills needed for life in the digital age. The potential efficacies of the approach are illustrated via the exposition of software functionalities and the sample analyses of a printed text with image components, and a short advocacy video.

**Keywords:** multimodal analysis; multiliteracies; media literacy; new literacies; critical literacy; critical thinking

**Introduction**

The ability to critically analyze and interpret multimodal texts (e.g. online news, social media postings, websites, videos etc.) has become an important, if not indispensable, skill in the 21st century, where sites of information, knowledge construction and social interaction are increasingly governed by interactive digital media technology. Educators and scholars (e.g., Jewitt 2002, 2006, 2008; Jewitt and Kress 2003; Kress 2010; Unsworth 2001, 2006, 2007, 2008; Walsh 2009, 2010) have long argued for the need to incorporate multimodal literacy in their school curricula to empower students to meet the challenges and affordances offered by technology in a digital age which has given rise to new media where language combines with image and sound resources in complex and changing ways.

In this paper, we propose a pedagogical approach for teaching and learning multimodal literacy, specifically, the application of multimodal analysis for critical thinking (MACT), facilitated through the use of purpose-built software applications. The approach takes a systemic, social semiotic view to the analysis of multimodal texts and videos, with an emphasis on the teaching and learning of an analytical vocabulary (or metalanguage) for multimodal meaning making (e.g., Hodge and Kress 1988; Jewitt 2002, 2006, 2008; Jewitt and Kress 2003; Kress 2003; O'Halloran and Lim-Fei 2011; Unsworth, 2001, 2006, 2007, 2008). The aim of the pedagogical approach for teaching and learning multimodal analysis is to develop students' analytical and critical thinking skills to enable them to become informed, confident, responsible and active contributors to the consumption, creation, and dissemination of knowledge and information in present day society. In this article, we report on the theoretical underpinnings and potential efficacies of the pedagogical approach, which arose from preliminary studies which trialed the usefulness of a systemic learning approach supported by prototype multimodal analysis software (Lim-Fei, O'Halloran, Tan, and E 2015), and explored students' use of multimodal analysis software in combination with other

social media platforms in the accomplishment of a collaborative learning task involving the annotation and analysis of multimodal texts and videos (O'Halloran, Tan, and E 2014).

In what follows, we situate our approach in relation to the vast body of research that stresses the importance of equipping students with critical literacy competencies to prepare them for life in the digital age. We then elucidate the underlying concepts of critical multimodal literacy from a social semiotic perspective, and propose how teachers and students can use the pedagogical approach to critically analyze the meanings made in multimodal texts and videos with the aid of interactive software by way of two sample analyses. We conclude by offering a view to future directions and developments in this field.

**Critical (multi)media literacy skills and practices for life in the digital age**

The conviction that students require critical competencies that move beyond traditional literacy practices to prepare them for life in the digital age is not a recent development. Educators and scholars from different traditions and disciplines have long documented the requirement for new literacy skills and pedagogic practices to accommodate the changing landscapes of media and technology in the 21st century (e.g., Lankshear and Knobel 2006, 2007, 2011; Jewitt 2008; Jewitt and Kress 2003; Kellner 1998, 2000, 2006; Kress 2003; Mills 2010a, 2010b; Thoman and Jolls 2004). As Kress (2003) aptly observes, in the new millennium '[i]t is no longer possible to think about literacy in isolation from a vast array of social, technological and economic factors' (Kress 2003, 1).

There is a general consensus amongst the followers of the New Literacy movement (e.g., Anstey and Bull 2006; Lankshear and Knobel 2006, 2007, 2011; Freebody and Luke 1990; Luke and Freebody 1999; Jewitt 2008; Kress 2003; Unsworth 2001, 2006, 2007) that the competencies needed to participate in emergent forms of new media require 'multiliteracies'; that is, a set of multiple literacies which extend beyond language. The

concept of multiliteracies can be attributed to a group of international educational researchers and theorists, known as The New London Group (1996, 61), who proposed a new pedagogy that moves beyond traditional understandings of literacy to include a 'multiplicity of discourses', or multiliteracies. The aim of a multiliteracies pedagogy was to cater to 'the increasing multiplicity and integration of significant modes of meaning-making, where the textual is also related to the visual, the audio, the spatial, the behavioral, and so on' (The New London Group 1996, 64). As Jewitt (2008) observes, one of the central concerns of the multiliteracies approach proposed by The New London Group is 'the promotion of a pluralized notion of literacy and forms of representation and communication to help students negotiate a broader range of text types and modes of persuasion' (Jewitt 2008, 255). Specifically, The New London Group (1996, 65) advocates a four-pronged pedagogic approach, involving (1) 'Situated Practice' based on students' meaning-making experiences with texts from real-life situations and contexts; (2) 'Overt Instruction' of a metalanguage of design, 'that is, the systematic and explicit teaching of an analytical vocabulary for understanding the design processes and decisions entailed in systems and structures of meaning' (Jewitt 2008, 248-249); (3) 'Critical Framing' for interpreting the social context and purpose of designs of meanings; and (4) 'Transformed Practice' which sees students applying their newly acquired skills by becoming purposeful meaning makers and designers of multimodal texts themselves.

Approaches to multiliteracies pedagogies have since been adapted and expanded to include the dimension of critical (media) literacy. Unsworth (2001), for instance, proposes a pedagogical approach that distinguishes three different dimensions of literate practice, categorized respectively as 'recognition literacy', 'reproduction literacy' and 'reflection literacy', also referred to as critical literacy (Unsworth 2001, 14). Unsworth's (2001) categorizations build upon and are comparable to Freebody and Luke's (1990) definitions of

'Code Breaker', 'Text User', and 'Text Analyst' (Anstey and Bull 2006, 44-49). That is, Luke and Freebody's (1999) definition of critical literacy involves the ability to decode the meaning of texts, participate in understanding and composing meaningful texts, use texts functionally, and – ultimately – analyze texts critically. As Anstey and Bull (2006) elaborate, the practice of code breaking in Luke and Freebody's terms involves 'working out how the different semiotic systems in the text work on their own and in combination with others', whilst being a text user entails being able to 'understand that although the text might have the same purpose in different contexts and on different platforms, the structure or layout might vary' in each instance (Anstey and Bull 2006, 44-47). From Unsworth's (2001) perspective, the text analyst role requires the ability to critically interrogate 'the visual and verbal codes to make explicit how the choices of language and image privilege certain viewpoints and how other choices of visual and verbal resources could construct alternative views' (Unsworth 2001, 15). It is precisely the text analyst role that draws on reflection, or critical literacy practice.

According to Anstey and Bull (2006), a general concern about the need to regard texts 'critically' has made critical literacy a central tenet of multiliteracies pedagogies (Anstey and Bull 2006, 37). The ability to view and analyze (multi)media texts critically is also a central concern of proponents of the media literacy movement.

Andrist et al. (2014), for example, propose a pedagogy that advocates the use of film for attaining specific learning goals, which include, amongst others, 'thinking theoretically; understanding research methodology and data analysis; […] knowledge of culture and social structure; and critical thinking' (Andrist et al. 2014, 197), while Burnett (2010) highlights the arguments made by the Media Literacy Task Force (2004) that educators should provide students with ample 'opportunities to explore digital environments, and develop their critical evaluation of digital texts and critical participation in digital worlds' (Burnett 2010, 249).

Hobbs (2004), in her review of school-based initiatives in media literacy education, similarly reports that the aim of such initiatives is primarily 'to provide learning experiences where students strengthen critical-thinking skills to reach their own understandings about how to fully participate as citizens and consumers in a media-saturated society' (Hobbs 2004, 44). She observes that many of the schools surveyed place a strong emphasis on critical thinking and the 'complex processes involved in the communication of meaning through symbolic forms' (Hobbs 2004, 50). She notes that '[e]ducational technologists seem finally to have recognized that any vision of 21st century learning must de-emphasize the "tool focus" that has been prevalent in much scholarship about technology in education throughout the 1990s' (Hobbs 2004, 54); — that is, moving away from using technology such as photography, video cameras, microphones, and graphic design software for the creation of multimedia texts and products, towards using technology as a tool for analysis, with an emphasis on the development of students' critical thinking. Indeed, the introduction of media literacy programs that value critical thinking has been shown to have some of the desired effects. As Hobbs (2004) notes, a survey of elementary students revealed that they were 'more critical viewers, more cautious about advertising, and more skeptical of Internet content. Students also were more skillful in recognizing a media message's purpose, the message genre, and point of view' (Hobbs 2004, 48).

Similar observations are made by Kellner (1998, 2006), who argues that media literacy requires 'not just technical knowledge and skills, but refined reading, writing, and communicating abilities that involve heightened capacities for critically analyzing, interpreting, and processing print, image, sound, and multimedia material' (Kellner 1998, 114). According to Kellner (2006), a media literate person needs to be 'skillful in analyzing media codes and conventions, able to criticize stereotypes, values, and ideologies, and competent to interpret the multiple meanings and messages generated by media texts'

(Kellner 2006, 249-250). The attainment of such competencies, he argues, 'requires developing abilities for critical thinking, reflection, and the capacity to engage in discourse' for different motives and social purposes (Kellner 2006, 258).

Koltay (2011), in turn, notes that most definitions of media literacy, information literacy and digital literacy today tend to focus on critical approaches towards the interpretation and engagement with media messages (Koltay 2011, 211), while Scheibe (2004) asserts that media literacy is a logical extension of traditional definitions of literacy. From Scheibe's (2004) point of view, media literacy involves 'learning to 'read' visual and audiovisual messages as well as text-based ones, recognizing the basic 'language' used in each media form, being able to judge the credibility and accuracy of information presented in different formats, evaluating the author's intent and meaning, appreciating the techniques used to persuade and convey emotion, and being able to communicate effectively through different media forms' (Scheibe 2004, 61). According to Scheibe (2004), 'media literacy builds critical-thinking, communication, and technology skills and is an effective way to address different learning styles and an appreciation for multiple perspectives' (Scheibe 2004, 61).

Thoman and Jolls (2004) likewise highlight the benefits of a critical approach to media literacy by quoting Faith Rogow (2003), president of the Alliance for a Media Literate America, according to whom media literacy is seen 'as the best way to help students master the skills of critical thinking' (Thoman and Jolls 2004, 23).

There are many other studies that advocate the inculcation of critical media literacy skills in today's classrooms in order to develop students' critical thinking competencies (e.g., Singer and Singer 1998; Thisdell 2008; Vande Berg, Wenner, and Gronbeck 2004; Wade 2014). As Abrami et al. (2008) concede, most educators today 'would agree that learning to think critically is among the most desirable goals of formal schooling' (Abrami et al. 2008,

1102). However, there is far less agreement amongst researchers and practitioners about how these competencies are to be taught and operationalized. As Abrami et al. (2008) acknowledge, 'part of the problem facing practitioners and researchers alike is that it is a complex and controversial notion that is difficult to define and, consequently, to study. Furthermore, the tools of implementation (instructional interventions) are difficult to operationalize' (Abrami et al. 2008, 1103). For this reason, the focus of the current paper is the development of a pedagogical approach for teaching and learning critical thinking through multimodal analysis; that is, 'multimodal analysis for critical thinking' (MACT).

One of the most widely recognized definitions of critical thinking can be attributed to the American Philosophical Association's Delphi Committee (1990), which identified six core skills and 16 subskills (e.g., see Facione et al. 1995), which are summarized in Table 1.

**Table 1. Core critical thinking skills and subskills (Source: Facione et al., 1995, 9)**

| Core skill | Definition | Subskill |
|---|---|---|
| Interpretation | To comprehend and express the meaning or significance of a wide variety of experiences, situations, data, events, judgments, conventions, beliefs, rules, procedures, or criteria. | Categorize<br>Decode significance<br>Clarify meaning |
| Analysis | To identify the intended and actual inferential relationships among statements, questions, concepts, descriptions, or other forms of representation intended to express belief, judgment, experiences, reasons, information, or opinions. | Examining ideas<br>Identify arguments<br>Identify reasons and claims |
| Inference | To identify and secure elements needed to draw reasonable conclusions; to form conjectures and hypotheses; to consider relevant information and to educe the consequences flowing from data statements, principles, evidence, judgments, beliefs, opinions, concepts, descriptions, questions, or other forms of representation. | Query evidence<br>Conjecture alternatives<br>Draw conclusions using inductive or deductive reasoning |
| Evaluation | To assess the credibility of statements or other representations which are accounts or descriptions of a person's perception, | Assess creditability of claims<br>Assess quality of |

| | | |
|---|---|---|
| | experience, situation, judgment, belief, or opinion; and to assess the logical strength of the actual or intended inferential relationships among statements, descriptions, questions or other forms of representation. | arguments that were made using inductive or deductive reasoning |
| Explanation | To state and justify that reasoning in terms of evidential, conceptual, methodological, criteriological, and contextual considerations upon which one's results were based; and to present one's reasoning in the form of cogent arguments. | State results<br>Justify procedures<br>Present arguments |
| Self-regulation | To self-consciously monitor one's cognitive activities, the elements used in those activities, and the results educed, particularly by applying skills in analysis, and evaluation to one's own inferential judgments with a view toward questioning, confirming, validating, or correcting either one's reasoning or one's results. | Self-monitor<br>Self-correct |

In the following sections, we introduce a pedagogical approach for the analysis of multimodal texts and videos, incorporating the core critical thinking skills of interpretation, analysis, inference, evaluation, explanation and self regulation listed in Table 1, with the objective of promoting analytical and critical thinking and equipping students with the requisite literacy skills for life in the digital age. The approach is facilitated through the use of purpose-built software applications with comprehensive analytical frameworks designed to provide students with the necessary technical vocabulary (or metalanguage) required for the systematic analysis of multimodal texts and videos. The approach is illustrated via the description of software functionalities and the sample analyses of a printed text with image components, and a short video.

**Teaching and learning multimodal analysis for critical thinking (MACT): A social semiotic approach**

Advancements in technology in the digital age demand literacy skills that expand beyond the mere ability to read, view, and (re)produce multimedia texts and videos. In a knowledge-

based economy that is increasingly driven by the use of multimodal media, students need to develop a critical understanding of the ways knowledge and information can be presented to transmit ideologies, privilege certain points of view, or elicit desired actions and reactions from the reader (e.g., Kellner 1998, 2000, 2006; Unsworth 2001). As Kellner (2006) observes, 'emergent multimedia environments necessitate a diversity of types of multisemiotic and multimodal interaction, involving interfacing with words and print material and often images, graphics, and audio and video material' (Kellner 2006, 255).

From a multimodal perspective, texts and videos fulfill their respective communicative aims and functions through various combinations of semiotic choices in their organizational structure, functional stages and properties; that is, through the ways in which authors organize, present and orientate the information to their readers. In order to participate effectively in a multimedia environment, students need to be able to understand how these meanings are created. The approach proposed in this paper takes a social semiotic view towards multiliteracies (e.g., Jewitt 2002, 2006, 2008; Jewitt and Kress 2003; Kress 2003, 2010; O'Halloran and Lim-Fei 2011; Towndrow, Nelson, and Yusuf 2013; Unsworth 2001, 2006, 2007, 2008; Walsh 2009, 2010). A social semiotic perspective – although principally informed by Halliday's (1978) social semiotic theory – also draws upon other theoretical approaches such as anthropology, sociology, critical and pragmatic discourse theory (e.g., Barthes 1993; Fairclough 1992; Foucault 1980; Goffman 1979; Malinowski 2006). It also integrates concepts and frameworks from visual design, film theory, and musicology, etc. (e.g., Kress and van Leeuwen 2001, 2006 [1996]; Machin 2007; O'Toole 2011 [1994]; van Leeuwen 1999, 2005).

A social semiotic approach principally sees discourse as involving the interaction of multiple semiotic resources, such as language, image, music and so forth, which are co-deployed to create meaning in a text or video. These semiotic resources are viewed as sets of

inter-related semiotic systems where meaning arises from combinations of inter-related meaning-making systems, or networks of system choices, which are used to construe social practices. From a social semiotic viewpoint, the choices that are made in a text are not seen as the result of conscious design decisions 'but a set of possible alternatives' (Halliday 1994, xiv-xxvi). Whilst these choices may 'result from a convention followed unthinkingly, a habit acquired unreflectively, or an unconscious impulse' (van Leeuwen 1999, 29), they are, however, always likely to be motivated according to the interests of the text's author (e.g. Kress 2010; O'Halloran and Lim-Fei 2014). A social semiotic approach builds upon the assumption that a text's communication function is the result of specific choices selected from a network of systems, which realize three 'metafunctions' simultaneously: experiential meaning for construing our experience of the world; interpersonal meaning for enacting social relations and expressing attitudes; and textual or compositional meaning for organizing meanings into coherent messages relevant to their context (e.g., Halliday 1978; Halliday and Matthiessen 2014).

The pedagogical approach to multimodal analysis for critical thinking (MACT) involves familiarizing students with the different semiotic choices that are available to authors in the creation of multimodal texts and videos. As Jewitt (2008) aptly observes, this requires the

> 'overt teaching of metalanguages to reproduce the links between available designs (e.g., genres) and their cultural and ideological relations and functions. As parts of the social system of communication, all modes work to realize culture and power. Image is as ideological and as power laden as word. This raises important issues about how image, word, and design of other modes are understood as available resources for meaning making in the classroom' (Jewitt 2008, 252; see also Unsworth 2001).

The MACT approach expands beyond traditional dimensions of literacy practices (e.g., Unsworth 2001) by taking into account how verbal, visual, and other semiotic choices combine and interact to fulfill the specific communicative purposes of a text or video, and how these choices contribute to the organization, development and presentation of information and ideas, by providing comprehensive catalogs of systems and system choices for the analysis of different text types and genres. The aim is to provide teachers and students across various levels and abilities with the resources to systematically approach new media texts with the objective of attaining the ability not only to effectively engage with multimedia texts and videos, but also to critically analyze a range of informational and functional text-types and genres from print and digital sources.

As Unsworth (2001) reports, descriptions of differentiated curriculum literacies around the world have identified certain 'genres (types of texts like explanations, reports, procedures, narratives etc.) that are prominent in the reading materials and writing demands of different subject areas, specifying the organizational structures of such text types' (Unsworth 2001, 11). For example, the MACT approach introduces students to a variety of informational text-types and genres, which typically present factual information about people, animals, things, places, events, or natural phenomena in a direct and forthright manner. Informational genres, however, also include expositions, which are persuasive texts that present an argument or make a claim for or against a certain point of view, with the aim to convince the audience to adopt or share the projected point of view. In such situations, it is important that students learn to recognize what is made salient in the text, what is foregrounded or backgrounded, and how a preferable reading path is constructed for the reader.

Specifically, the MACT approach encourages guided as well as self-directed group and individual learning, with the aim to

- develop an understanding of the different text types/genres that students may encounter in everyday contexts;
- systematically identify the main features, structures, and ideas in functional texts from print and non-print sources;
- plan, organize, summarize and synthesize pertinent information;
- develop a critical understanding and appreciation of how visual, verbal and aural elements work together to create an impact and achieve their respective communicative purposes.

The MACT approach arose through the design, development and use of interactive software for multimodal analysis in the Multimodal Analysis Lab at the Interactive and Digital Media Institute, National University of Singapore[1]. The software, *Multimodal Analysis Image*[2] and *Multimodal Analysis Video*[3] for the analysis of texts and videos respectively, contain predefined semiotic concepts and frameworks for analyzing how different semiotic resources interact to create meaning in a variety of informational and persuasive text-types and genres that students may encounter in everyday contexts, such as advertisements, movie posters, information reports, news reports, and videos etc. *Multimodal Analysis Image* can be used independently or together with a resource book (Tan, E, & O'Halloran, 2012) that includes sample lesson materials with exercises and worksheets, sample analyses of texts from real life contexts, with suggested answers and solutions for teachers and students.

In the following section, we describe the functionalities of the software applications, and how they can be deployed as tools for learning how to critically analyze and interpret multimodal patterns in multimodal texts and videos, by way of two short sample analyses.

**Using software as an analytical tool: An illustration of the MACT approach**

The software applications are designed to act as tools to facilitate the systematic teaching and learning of multimodal analysis, with functionalities building on the findings from an exploratory study carried out at two Singapore schools in February 2012 that tested the usefulness of prototype multimodal analysis software to support a systemic learning approach (Lim-Fei et al. 2015). In the current versions of the software, the graphical user interfaces (GUIs) are organized into different platforms for importing and organizing media files (i.e. 'Media'); creating and editing catalogs, systems and system choices for language, image, and video annotation (i.e. 'Library'); storing and consolidating projects of analyses (i.e. 'Project'); annotating and analyzing media files (i.e. 'Analysis'); and visualizing combinations of multimodal choices in the annotation (i.e. 'Visualization'), and exporting data from the analyses to Excel spreadsheets for comparison and synthesization.

The catalogs of systems and system choices in the Library GUI for *Multimodal Analysis Image* are displayed in Figure 1. They provide the metalanguage for the analysis of different text types and genres by offering a specialized vocabulary that will allow teachers and students to talk confidently about 'the multimodal relations between the different meaning-making processes that are now so critical in media texts and the texts of electronic multimedia' (The New London Group 1996, 77). The Library GUI in *Multimodal Analysis Video* is based on the same design principles, but includes catalogs of systems and system choices that are geared specifically towards the analysis of videos. Teachers and students can use, edit and delete existing systems, create and add new systems, and manage their appearance. The design of the Library GUI is underpinned by the philosophies of The New London Group (1996), according to which a metalanguage 'needs to be quite flexible and open ended. It should be seen as a tool kit for working on semiotic activities, not a formalism to be applied to them. We should be comfortable with fuzzy-edged, overlapping concepts.

Teachers and learners should be able to pick and choose from the tools offered. They should also feel free to fashion their own tools' (The New London Group 1996, 77).

While the software includes sample analyses of selected multimodal texts, e.g. advertisements, movie posters, information reports, news reports, news features, news editorials, and infographics in the case of *Multimodal Analysis Image* (see Project GUI in Figure 2), and catalogs of systems and system choices specifically tailored for these text types and genres (see Figure 1), the software is completely customizable and scalable across various levels and abilities, so that new media texts may be imported, and news systems developed, according to the individual requirements of the teacher, class and school, and the nature and scope of the intended learning task.

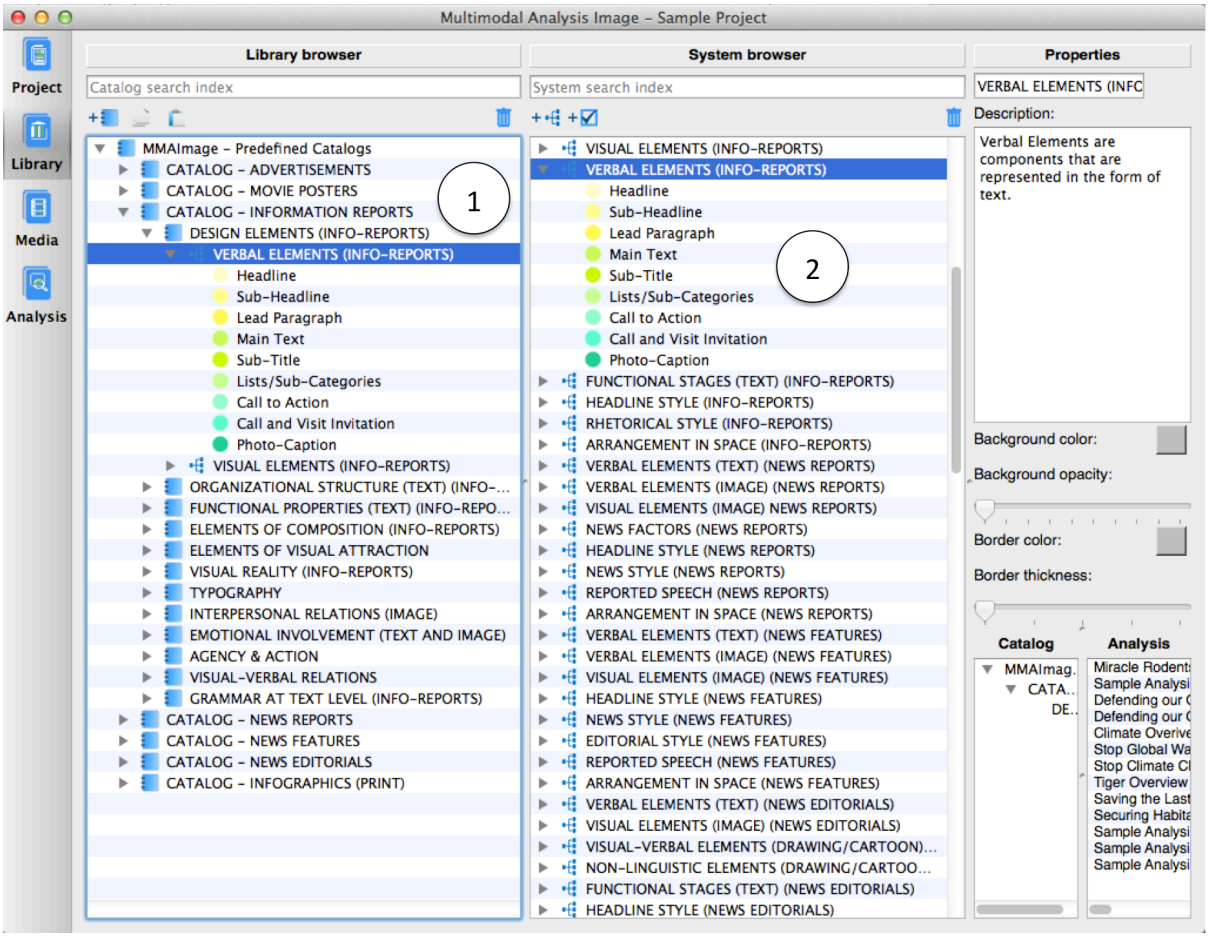


**Figure 1. Screenshot of Catalogs of Systems [1] and System Choices [2] (Information Reports) in *Multimodal Analysis Image***

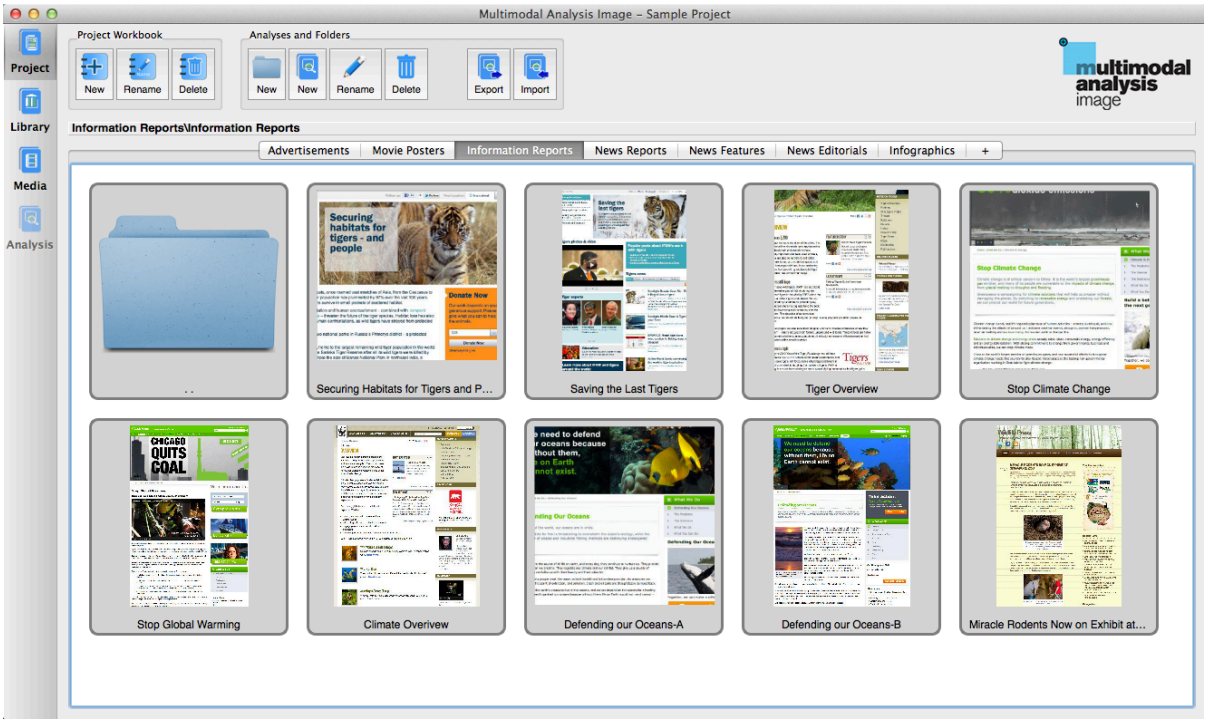


**Figure 2. Screenshot of Project Folder (Information Reports) in *Multimodal Analysis Image***

*Multimodal Analysis Video* similarly has facilities to organize videos into different text types and genres. As teachers and students are likely to create multiple analyses of the same or related media using the same or similar annotation systems, the software is organized in such a way to allow media files and annotation systems to be reused in different analyses. The software also allows for analyses to be shared and compared via the import/export function. This is to enable students to discuss their analyses with others and broaden their perspectives by acknowledging other points of view, and (re)evaluate their own judgments. As Towndrow, Nelson, and Yusuf (2013, 347) observe,

> '[w]hen students, for their part, begin to see and understand their own work (and that of their peers) in critical semiotic terms, they become better able to recognize the meaning-making affordances of diverse resources with respect

to their expressive needs, to anticipate others' interpretations of their design choices, and to verbalize their design intentions'.

The Analysis GUI for annotating and analyzing the media files is displayed in Figure 3. In *Multimodal Analysis Image*, annotations are made via a range of overlay tools, as displayed in [1] in Figure 3. The overlays [2], which are inserted directly onto the multimodal document, are correlated with annotation nodes [3] in system strips categorized according to customized analytical frameworks. These analytical frameworks are made up of the categorical systems and system choices stored in the Library GUI. Once an overlay has been made, students select a system choice [4] from a list of available system choices [5] and assign it to the overlay. Students practice their analytical skills by annotating the overlays by selecting the appropriate system choices from the systems in the catalog (in this case for information reports), based on the descriptions [6] provided by the software, their teachers, or the students themselves, in accordance with their experience with similar texts from real life contexts. Students can enter additional free-text annotations on an overlay to justify their choices (as shown in [7] in Figure 3). This serves to enhance students' critical argumentation skills, as they need to explain the choices made in the text and present a justification for their interpretation.

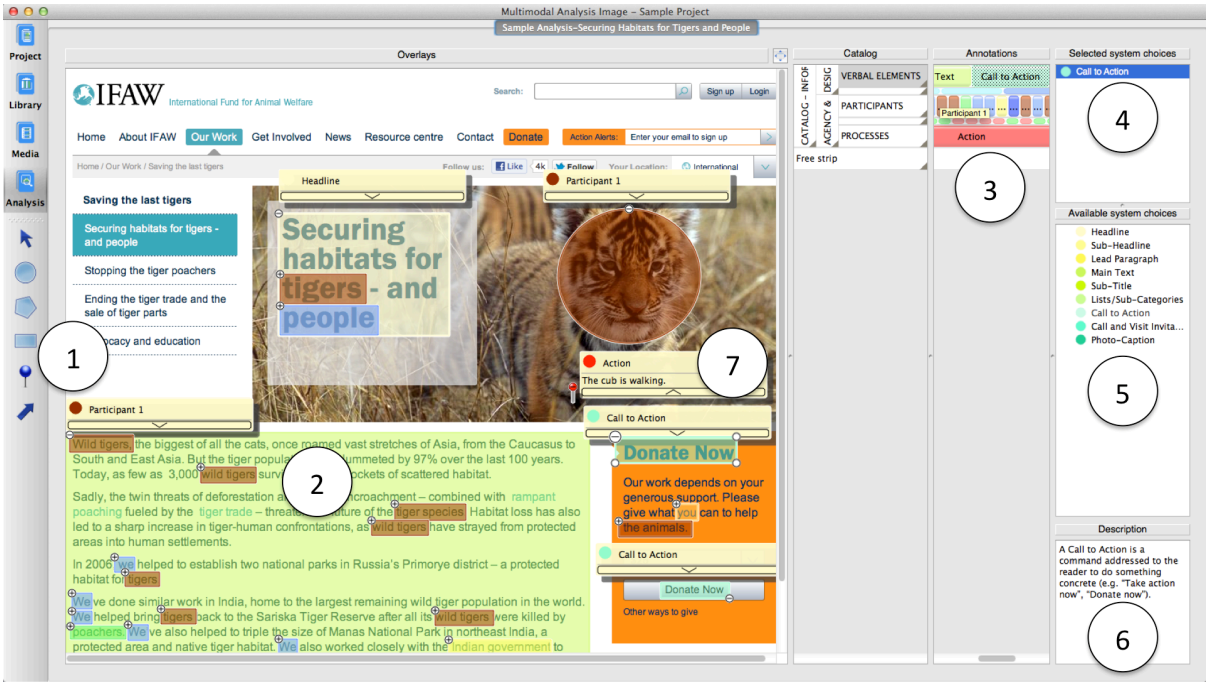


**Figure 3. Screenshot of sample analysis (Information Report) in *Multimodal Analysis Image*: Overlay tools [1], overlays [2], annotation nodes [3] selected system choice [4], list of available system choices [5], system choice descriptions [6], free-text annotation [7]**

Constraints of space and focus mean that it is possible to present only a snapshot of the sample analyses to illustrate the potentials of the software-based approach. It is clear that not all semiotic modes and resources utilised in a text or video will contribute to meaning making in equal measure. Also, different perspectives on the text (and context) will require different systems to be focused on in the analysis. In this particular analysis of an informational report that educates readers about the International Fund for Animal Welfare's (IFAW)[4] activities to secure habitats for tigers and people (Figure 3), students are asked to identify the choices that have been made across a range of systems for language and image, and map them to the meanings and associated ideologies espoused in the text. In the sample analysis shown in Figure 3 the functions of verbal design elements (e.g. Headline, Sub-Headline, Call to Action) have been identified, as well as the major participants that are

named in the text. The analysis permits students to deduce that the text is carefully structured and participants are introduced strategically (visually and verbally) so as to first attract readers to the plight of tigers in the wild (indicated by brown overlays in the annotation), backgrounding the actions taken by IFAW to remedy the situation (realized through the first person plural pronoun 'we'; indicated by blue overlays), and ending with a call to action addressed to the reader ('you can help the animals', 'Donate Now'; indicated by green overlays). The resultant analysis allows students to assess the strength and quality of the arguments made in the text, and to justify their reasoning by providing an explanation how the verbal and visual elements work together to elicit the desired actions or reactions from the reader.

Although some may argue that static media, such as the printed texts in Figure 3, could also be analyzed using pen and paper, the affordances of the software and the workflow built into its design encourage students to approach the analysis in a systematic and structured manner, which a pen and paper method cannot afford. In addition, annotations can be easily modified, and analyses reduplicated and shared, which may make students more amenable to self-correcting their analyses, and exploring different perspectives or points of view.

When dealing with the composite meaning potentials afforded by dynamic media, such as videos, which additionally involve the interpretation of sound and movement in space and time, students are required to engage in a rather more complex process of sense making (e.g., Jewitt 2008; Walsh 2010). As Kellner (1998) observes 'media culture is so polymorphous, multivalent, and polysemic that it requires sensitivity to different readings, interpretations, and perceptions of the media's complex images, scenes, narratives, meanings, and messages' (Kellner 1998, 114; see also Kellner 2000, 2006). Accordingly, the

complexity of the analytical task can be immensely daunting without the suitable tools and techniques to capture and interpret the multiple meanings made.

*Multimodal Analysis Video* provides the necessary tools for investigating the use of semiotic resources and the ways in which semiotic choices interact to fulfill particular objectives in a multimodal video; namely to engage and orientate readers to particular views of the world which are understood in relation to the situation and the context of the respective communicative act. To facilitate this, the software includes a comprehensive conceptual social semiotic framework for analyzing experiential content (e.g., configurations of participants, processes, and circumstances), the social relations which are established between participants (e.g., power, social distance), the orientation to the ideas which are presented (modality and truth values), and the ways in which the choices are organized to achieve specific purposes (e.g.; cinematographic and editing conventions).

The Analysis GUI for annotating and analyzing the media files in *Multimodal Analysis Video*, as displayed in [1] in Figure 4, allows students to view the video in the player window, and insert time-stamped annotation nodes [2] in system strips [3]. All annotation nodes are synchronized with the video, the film strip [4], the sound strip [5], and the verbal transcription [6]. To make an annotation, students select a system choice [7] from a list of available system choices [8] based on predefined descriptions [9], and assign it to the annotation node in the systems strip. As in *Multimodal Analysis Image*, students can enter free-text descriptions on an annotation node in the system strips to further justify their choices (as shown in [10] in Figure 4).

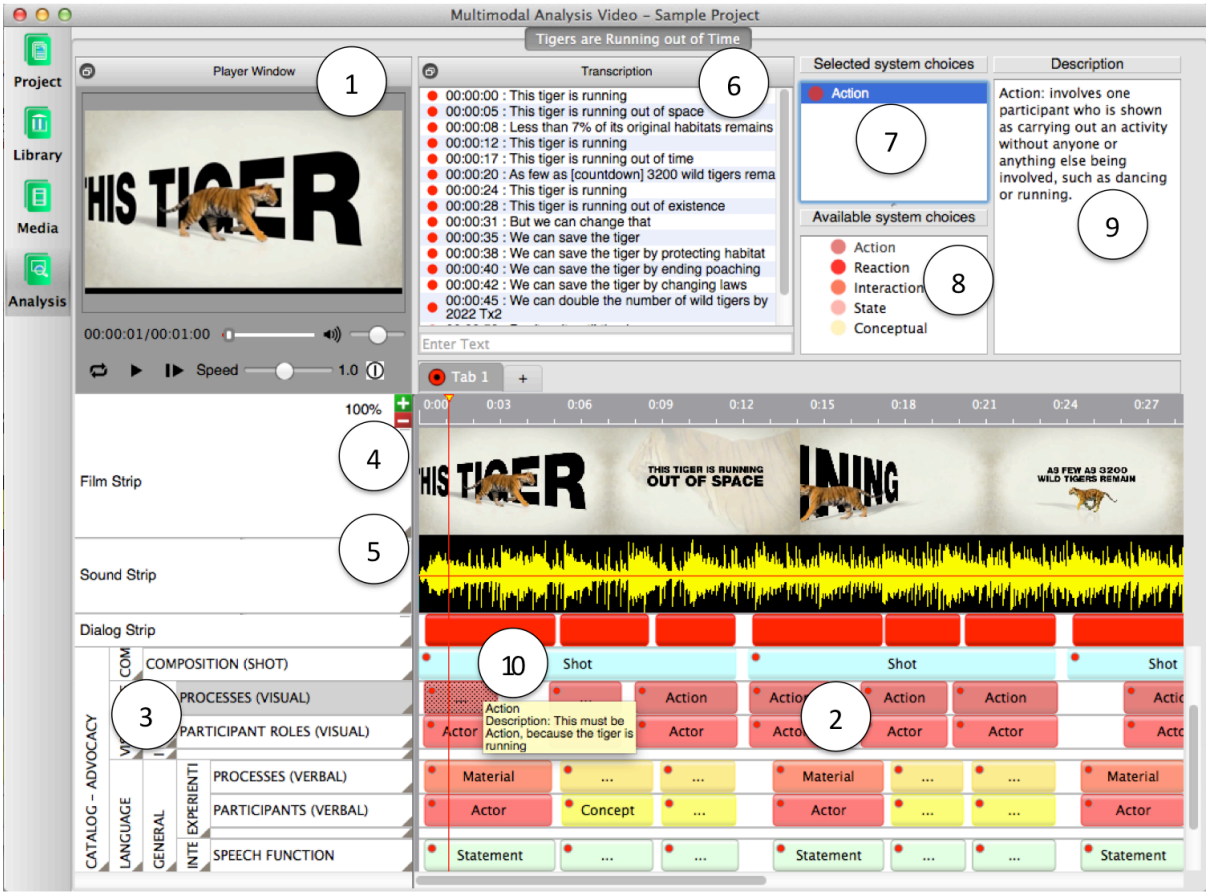


**Figure 4. Screenshot of sample analysis in *Multimodal Analysis Video*: Player window [1], time-stamped annotations [2], system strips [3], film strip [4], sound strip [5], transcription of verbal text [6], selected system choice [7], list of available system choices [8], system choice definition [9], free-text annotation [10]**

The advocacy advertisement 'Tigers are Running out of Time' by the World Wildlife Fund[5] (WWF) is designed to present a compelling argument about the urgent need to protect tigers. A critical approach requires students to arrive at an informed judgment about how this communicative purpose is achieved. With this in mind, the sample analysis of the video shown in Figure 4 was annotated for Processes (e.g. material processes that describe actions, and relational process that describe the qualities and characteristics of persons, animals, and things), Participants (e.g., actors, concepts), for both visual and verbal modes, and the Speech Functions (e.g., statements, questions) that were used in presenting information to the reader

or viewer. Color-coded system-choices assigned to annotation nodes allow students to observe emerging patterns in the analysis, and correlate it with the temporal and spatial occurrence in the original video data. This will permit students to practice their inferential skills by deducing that in this particular video certain choices regularly co-occur, which may in some way contribute to the text's effectiveness.

Given the complexity of multimodal video data, novice analysts may still have difficulties in making sense of the multiple relationships that can exist between different modes and resources. *Multimodal Analysis Video* offers students the option to further visualize the annotations made in the system strips in the form of state diagrams, using the facilities provided in the State Machine (as displayed in [1] in Figure 5) in the Visualization GUI. In this case, a 'state' [2] reflects the combination of system choices that have been utilized for a particular system or a combination of systems in the analysis [3] in terms of total video time/duration [4]. The state diagram also displays the transitions between individual states [5], which can be viewed dynamically as the video unfolds in time and space in the player window [6].

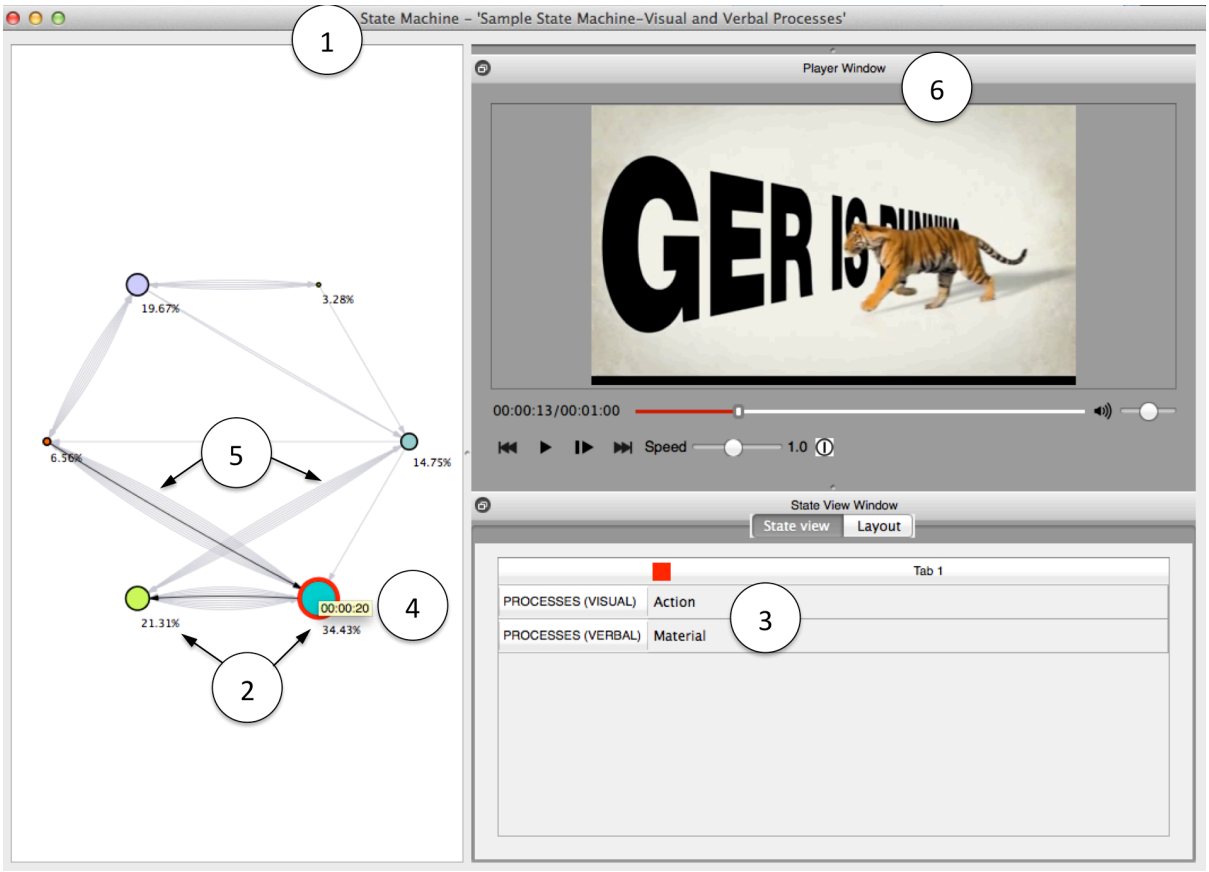


**Figure 5. Screenshot of State Machine in Multimodal Analysis Video: Visualization window [1], state(s) [2], selected systems in the analysis [3], percentage/time in terms of total video duration [4], transitions [5], player window [6]**

The state diagram of the sample analysis shown in Figure 5 reveals, for instance, that there is considerable overlap (34.4% or 20 seconds in terms of total movie time) between material and action processes in both the visual and verbal displays. In other words, rather than making intuitive assumptions about how the video achieves its communicative purposes, students can now draw on computational evidence to demonstrate that in this particular video the meanings which are constructed verbally complement the meanings made in the video's visual display. The visualizations also reveal that language (rather than image) resources are used to construct the conceptual argument that tigers are endangered (i.e. 'tigers are running out of space', 'tigers are running out of time') through relational processes (19.6% or 11

seconds in terms of total video duration, as indicated by the top-left circle in the state diagram in Figure 5). In this way, the software also affords students with an opportunity to observe how the various choices and modes combine in real time to contribute to the video's symmetry, consistency and innovation in terms of its communicative functions, and, hence, its perceived effectiveness.

The ability to view combinations of semiotic choices as they unfold over time permits students to explore how *semiotic interactions* achieve certain effects: for example, linguistic and visual choices may repeatedly co-contextualize each other to reinforce particular meanings, as found in the 'Tigers are Running out of Time' video. However, semiotic choices can also function to achieve a purposeful contrast. For example, O'Halloran, Tan, and E (2013) analyze the television advertisement 'Dreams' by the Republic of Singapore Air Force (RSAF)[6]. The video is a "a pseudo-job advertisement", which also functions to promote and brand "the RSAF as a technologically advanced fighting force that plays a prominent role in Singapore society" (O'Halloran et al. 2013, 116). As O'Halloran et al. (2013) explain, the advertisement is based on the premise that all children (and parents) have dreams which the RSAF can fulfil, as depicted in the video where childhood scenes are contrasted with air-force activities. The multimodal analysis of the advertisement (visualized in the form of a state transition diagram in Figure 2, O'Halloran and Lim 2014, 149) reveals that the organizational logic of the advertisement unfolds in three distinct phases. The first, and longest, phase, establishes the context for the advertisement through real-life imagery of RSAF planes and personnel engaged in military activity, which is interwoven with imagery related to the aspirational dreams of children (and their parents). This is followed by two short phases, where choices in voice-over narration, visual imagery and music function together to culminate in a climax which connects childhood dreams related to the concept of 'flying' and the RSAF with values of homeland security in modern-day Singapore. As

O'Halloran and Lim (2014, 147) explain, the final two short phases form repeated and contrasting patterns to the first (much longer) phase, so that "the connotative ideas (i.e. ambition, flying and homeland security) reinforce established ideologies in Singapore in juxtaposition with symbols of Singapore's success …". In this way, attention is drawn to various meanings which become salient through contrast and difference in the 'Dreams' advertisement, as opposed to the similarity or repetition found in the 'Tigers are Running out of Time' video. As such, the visualization of temporal semiotic patterns offers valuable insights into the various meaning-making strategies which operate in videos.

Through systematic multimodal analysis using the facilities offered by the software – in particular, the ability to develop multimodal frameworks, create temporal annotations using these frameworks and visualize the results – students can gain a better understanding of the ways how different semiotic resources work together to create meaning in a multimodal text or video, and the resources that are deployed, individually or in combination, through which particular points of view are constructed and communicated. The MACT approach thus allows students to move from observation and description to empirically grounded insights based on theoretically informed concepts and frameworks.

**Conclusions and future directions**

Other studies (e.g. Lim-Fei et al. 2015; O'Halloran, Tan, and E 2014) suggest that the approach proposed in this paper has significant implications for the teaching and learning of critical multiliteracy skills. First, multimodal analysis is a rapidly emerging field in educational contexts on an international scale (Jewitt, 2006, 2014; Kress, 2003; O'Halloran, 2011; Unsworth, 2001), and multimedia literacy is increasingly being incorporated into school curricula. In an age that is marked by rapid advances in media technology, students need to be taught the requisite skills to fully benefit from them. As proponents of the media

literacy movement have long recognized (e.g. Andrist et al. 2014; Burnett 2010; Hobbs 2004; Kellner 2006; Koltay 2011; Scheibe 2004; Thoman and Jolls 2004), students need to be able to read, view, understand and think critically about the multiple meanings and messages generated by (multi)media texts in order to function in this fast-changing and complex world. Such skills require multimodal literacy – the ability to critically interpret linguistic, visual and audio resources as they combine in traditional and new media. Whilst educators are fully aware of this need, most pedagogical approaches available to them do not provide resources such as purpose-built software that can handle such complexities. Existing media technologies may permit media files to be shared and commented upon, but they do not include conceptual frameworks and techniques for the systematic analysis and interpretation of texts with images and video components, as facilitated by the MACT approach.

Second, preliminary studies involving the use of prototype software for the critical analysis of multimodal texts and videos carried out in Singapore schools in 2012 and 2013 have shown encouraging results. For example, findings from an exploratory study carried out at two Singapore schools in February 2012 with the Ministry of Education (MOE) to test the efficacies of a systemic approach to learning multimodal literacy indicate that there is indeed value in a pedagogical approach that uses software as an analytical tool (Lim-Fei et al. 2015). Preliminary results show that students at both pre-university and secondary school levels not only found the metalanguage provided by the software and the lesson materials helpful in their analyses of a multimodal text (in this case, a print advertisement/movie poster) but could even apply the appropriate metalanguage to talk about their experience with multimodal text analysis after only two lessons.

The benefits of incorporating a systematic pedagogical approach to scaffold students' learning in a media-rich environment have also been documented in a study involving the use of multimodal analysis software in combination with social media platforms, such as

Hangout in Google+, with a view to developing a web-based software application for annotating, analyzing and interpreting text, images and videos for collaborative learning and problem-solving in project work (O'Halloran, Tan, and E 2014). The pilot study, carried out over several months in early 2013 in the Multimodal Analysis Lab at the National University of Singapore, involved students of various levels and abilities, ranging from the ages of nine to eighteen from three government schools in Singapore. The results show that students of all levels are adept at effectively deploying the affordances of the analytical tool, producing annotations that reflect both their individual and collective understanding of the text under study. An analysis of students' chat entries during group work in a simulated online environment has shown that students actively negotiate the applicability and relevance of their own and others' annotations, reflect on their own and challenge other students' inferences, and correct their own reasoning and understanding, if necessary. Such behaviour accords with the core critical thinking skills and subskills (i.e. analysis, interpretation, inference, evaluation, explanation and self regulation) displayed in Table 1, suggesting that the design of the pedagogical approach, coupled with the use of software as a tool for analysis and meaning making, permits students to develop the critical competencies needed to participate effectively in a digital environment.

Directions for the future may focus on the development of online and mobile applications for the critical analysis of multimodal texts and videos, and other dynamic media, such as websites, with an aim to develop students' collaborative learning and relationship management skills. As they work together in an interactive online environment, students will learn to assert and negotiate control as they collaborate on the analysis of a multimodal text or video in project work. The enactment and negotiation of social relations afforded by a web-based application promotes self awareness, social awareness, self management and relationship management, as students discuss and defend their positions in

relation to the content and ideas which are being analyzed. In addition, students can develop problem-solving strategies in order to resolve conflicts if differences of opinion arise.

Online or mobile platforms for multimodal analysis could also be used to foster a critical awareness of global issues and sensitivity to cross-cultural differences. Such platforms could provide students with an opportunity to analyze and interpret multimodal texts and videos that present opposing views about a global issue (e.g. climate change, economic crisis, environmental issues). Through the joint analysis of such texts, students will learn to develop a critical awareness and concern about issues affecting the world today, while at the same time, developing an understanding and appreciation of different cultural perspectives.

The applications of a web- or cloud-based platform for analyzing and interpreting multimodal data are immense, and extend beyond uses in the classroom. The affordances of such applications could potentially lead to the first database of user-generated content with information about how students understand and interpret multimodal information. This could be useful for educational and behavioral research, teacher training, and the evaluation of digital learning materials. Indeed, large, datasets of multimodal analyses provides a strong empirical basis for deriving insights into how students understand, analyze, interpret, infer, evaluate, explain and self regulate in the digital age. Such an approach holds much promise for understanding and improving students' critical facilities; a facility which itself is critical in the dynamic, fluid and rapidly changing digital world of the 21st century. The next step is to make educational policy makers and curriculum developers aware of the potentials of the MACT approach, and to introduce the analytical tool to teachers and students, on a national and international level.

**Websites**

1. http://multimodal-analysis-lab.org/

2. http://multimodal-analysis.com/products/multimodal-analysis-image/

3. http://multimodal-analysis.com/products/multimodal-analysis-video/

4. http://www.ifaw.org/

5. http://www.worldwildlife.org/

6. https://www.youtube.com/watch?v=AytoCPeAVl8

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