RESEARCH BRIEF

Multimodal Meaning-making in the New Media Age: The Case of a Language-based Design Research Intervention

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MUSE **(MUSEUM-BASED MULTIMODAL LEARNING INITIATIVE)** aimed to show the viability of designing an innovative technologically enhanced learning environment to enhance students' multimodal meaning-making in the English Language curriculum. The study involved secondary school students in designing and constructing a virtual museum using virtual and augmented reality to represent their personal and cultural identity. Findings indicated signs of students' emergent multimodal awareness with a growing sensitivity to semiotic affordances and constraints in addition to collaborative learning skills and language learning motivational gains. The investigation identified adaptive measures in overcoming challenges from contextual constraints as well as pedagogical implications for new literacies in digitally mediated contexts.

INTRODUCTION

MUSE, a Museum-based Multimodal Learning Initiative, involved the design, implementation and evaluation of a technologically enhanced, museum-based, design research intervention within the context of an English Language (EL) curriculum, to enhance students' multimodal awareness and stimulate their imagination and creativity as designers of meaning in "student-centred, student-directed, collaborative" (Karagiorgi & Symeou, 2005, p. 19) constructivist learning contexts. The study (Ho, Nelson, & Mueller-Wittig, 2011) aimed at fostering deep student learning with technology-enabled pedagogical practices for cultivating 21st century knowledge and skills. Aligned with New Literacies principles (Gee, 1996; Lankshear & Knobel, 2003; Street, 2005), the interest was in digital-age literacies grounded in participatory forms of critical discourse, identity construction and social practice, to help students engage in

KEY IMPLICATIONS

- Curriculum design needs to be aligned with classroom pedagogy and assessment that is supportive of a collaborative, participatory "design" culture, grounded in social semiotic theory and multiliteracies pedagogy for 21st century interactive digital culture.

- Practitioners need to see themselves as active designers of multimodal meaning-making, empowered with specific "grammars" of semiotic modes and a shared metalanguage to engage with new literacies pedagogies.

- Technologically enhanced research intervention can be designed by scaling up or customizing the MUSE system, taking into account ongoing operative, systemic support against contextual constraints.

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meaning-making practices that foster the development of personal identity and empower the individual.

MUSE reinforced the philosophy underlying the Ministry of Education's (MOE) EL syllabus of building "a strong foundation and rich language for all" (2010, p. 8) and "enriching the EL curriculum through infusion of authentic, rich texts at all levels" (2008, p. 9), to enhance students' "creative and expressive capacities, as well as shape their personal, cultural and social identity" (p. 8) through "a variety of print and non-print sources to convey meaning" (p. 58). Students' use of semiotic resources for specific purposes was explored through the attention to three key processes: *Engagement*, *Expression* and *Embodiment*. Engagement was viewed as the extent of involvement and interaction in the virtual site. Expression involved the interpretation and production of concrete means for communicating ideas and perspectives, manifested in the participant-generated artefacts (e.g., 3D models, photographs, descriptive captions) and in the design of the museum gallery. Embodiment referred to the productive awareness of how meaning-making processes are informed by all human senses, in isolation and in combination.

In this study, learning was positioned as a process of design focused on the learner, emphasizing "the meaning-making practices and interpretive work of students" (Jewitt, 2008, p. 258). Students in groups conceptualized, designed and constructed their museum galleries and artefacts. Their individual and group interests, values and beliefs were projected through multimodal constructions using various semiotic resources and virtual reality (VR) and augmented reality (AR) technology. Students tested their ideas through negotiation, adaptation and transformation, which built up skills in sourcing, responding to, manipulating, connecting and re-contextualizing information in the multimodal environment (Kress, 2003; A. Luke, 1996). The challenge was to work towards a meaningful synthesis as they moved "from collection to connection" (C. Luke, 2003, p. 400), to establish coherent flows across the configurations of text, music, images, video clips and 3D artefacts, which offered concrete manifestations of students' "sign making" (Jewitt, 2008, p. 253).

The research questions addressed in this study were:

1. How do students explore and acquire adaptive Language Arts knowledge, skills, and new literacies through multimodal interaction and expression in a virtual museum?
2. What are the learning interactions between virtual engagement, expression and embodiment in a pedagogical context?
3. In which ways, if at all, does creative semiotic engagement in shared virtual spaces shape students' senses of individual and cultural identity and foster the articulation of these identity constructs in multimodal textual form?
4. What roles do semiotic mode, medium and technology play in affording or constraining the expression of an authentic authorial voice?
5. What possible insights and implications can be derived from an investigation of this kind of creative communicative practice, toward a clearer and more useful understanding of Language Arts pedagogy for the 21st century?
6. What are the contextual factors that facilitate or impede the success of a technologically mediated learning intervention for multimodal literacy?

RESEARCH DESIGN

MUSE drew upon the tradition of *design experiment* (Brown, 1992; Collins, 1992) or *design-based research* (Cobb, 2001), involving "close collaboration between designers and practitioners" (Bereiter, 2005, p. 17), which is at the core of multiliteracies pedagogy (New London Group, 1996). The 2-year study involved 158 Secondary 1 students with average EL proficiency. The two-cycle intervention was integrated into the school language curriculum and interleaved use of the technology platform between active construction and negotiation with reflective thinking, consistent with Kolb's (1984) framework for experiential learning.

The initial phase involved scenario and materials development and usability pilot testing. Pre-project, a guided real-world museum visit and a three-session orientation—emphasizing creative play and experimentation—provided students exposure to the nature and workings of a museum and to initial multimodal meaning-making. Data collection comprised several stages: entering, imagining and centring, the main creative construction, encircling and deconstructing the process as students classified, categorized and analysed gallery artefacts. Students' oral presentations of their galleries at the close of the intervention were followed by peer feedback.

Data sources comprised classroom observation, semi-structured interviews, surveys, questionnaires, written reflections, multimodal response tasks, peer gallery critique and evaluation. Interviews at the pre-, mid- and post-intervention stages yielded useful

descriptive data. Open, axial and selective coding (Miles & Huberman, 1994; Strauss, 1987) and inductive thematic analysis were applied to interview data and textual documentation to identify recursively emerging issues, major themes and patterns.

KEY FINDINGS

Students' Use of Semiotic Resources for Multimodal Meaning-making

A key goal was student exposure to a range of semiotic resources, multimodal awareness and sensitivity to semiotic affordances and constraints, aligned with New Literacies emphases (Barton, Appleby, Hodge, Ivanic, & Tusting, 2007; Gee, 2008). Semiotic awareness involves "conscious attention to and understanding (even if partial or intuitive) of the ways individual semiotic modes and modes in combination may be drawn upon in the designing of meaning" (Nelson, 2008, p. 70). Students' choice of multimodal resources was predominantly limited to still images singly with descriptive texts, and some adoption of 3D models. They did not appear ready to experiment heavily with a combination of resources. Audio resources appeared less dominant with selective use of recorded voice-over narration.

The quantity of multimodal resources generated, similar to other studies where initial random resource collection often exceeded the instructor's recommendation (Vavoula, Sharples, Rudman, Meek, & Lonsdale, 2009), raised the issue of the choice of resources. Selective, informed choices in artefact sourcing is critical for effective multimodal meaning-making to establish purposeful interactive links across various resources (Duncum, 2004; C. Luke, 2003). Monitoring of students' artefact repository with adequate time provided for them to meaningfully process and critically examine artefact value would be beneficial. Sustained multimodal exposure would also broaden students' use of multimodal resources, even influencing them to experiment more with integrating a mix of resources.

Semiotic Engagement in a Pedagogical Context

Students' engagement with semiotic resources for meaning-making revealed different degrees of awareness. Base 1 level comprised students' superficial listing of descriptive attributes of multimodal resources, without amplification of specific impacts. At Base 2 level, students were able to expand on the value of semiotic resources in their specific use. At the mid-level, students began to show awareness of the functional use of semiotic resources with the ability to synthesize and compare resource use and purpose. An understanding of the value of the parts as compared to the sum of the whole in the integrated use of semiotic resources was pronounced. Advanced levels of engagement reflected students' interpretative skills to analyse, rationalize and explain the selective and adaptive use of resources for targeted impact in specific contexts. Students also showed an awareness of the limitations of specific semiotic resources. The complexity of interpretation of particular resources through the multiplicity of perspectives by various individuals was also noted.

Comparing semiotic awareness and multimodal representation of more engaged groups with the less engaged, students' differing abilities to explain their own multimodal representations and leverage on specific semiotic resources for intended purposes were displayed. These included the ability to elaborate on the use and description of multimodal resources, and their awareness of semiotic affordances and limitations. Motivation to experiment beyond conventional use of the resources was another consideration, and the ability to infer astute conclusions from the adaptive, strategic use of specific resources.

Students' Individual and Cultural Identity

Identity was viewed as a "process of giving meaning and meaningfulness during which individuals come to know their cultural environment and its place in their lives" (Turniansky, Tuval, Mansur, Barak, & Gidron, 2009, p. 41). It is fluid and transforming, "we are positioned by, and position ourselves within, the narratives of the past" (Vincent, 2003, p. 394). The identity of the learner is shaped by the complex interaction of different social factors, since learning is essentially a social activity; individuals construct their sense of self, through or despite others' constructions of themselves (Tett & Maclachlan, 2007).

Of particular interest was how students articulated, constructed and visually represented their ideological positions via their definition of their intended audience. Participants' conceptions of Self and Community were "textualized" in collaborative gallery construction—spatial arrangements, images, texts, audio and video. As each semiotic mode offered distinct affordances for meaning-making, student-generated multimodal texts showed diversed outlooks on their "identity work" (Holland, Lachinotte, Skinner, & Cain, 1998). Rich representations of identity were evident in individual component modes of museum "texts" and in the ideology-laden inter-semiotic linkages between

elements of different modes. Analysis of gallery artefacts and authorial choices showed students' emergent awareness of what different semiotic modes could accomplish, in isolation and in combination.

Authorial Voice in Multimodal Composing

Voice was interpreted as "the process by which people create, maintain or transform institutional roles and identities through the discursive choices they make" (Lam, 2000, p. 460). The voice projected is a representation of the individual and group selves. Students' voice indicated an awareness of a wider external audience beyond their individual selves. Their choices of artefacts and language used catered to a shared Singaporean culture, but also extended to the larger imagined global community. Design specifics highlighted attention to the requirements of different museum visitors and age groups, even non-English visitors to their galleries.

Teamwork and Collaborative Learning Skills

Teamwork and collaborative learning skills, vital 21st century life skills (NCREL, & Metiri Group, 2003), were evident. Positive benefits of group work were reported by students, and noticeable gains in interpersonal awareness were observed by teachers, with high levels of in-class group talk and focused participation in tasks. The collaborative learning dimension was unpacked from two angles: students learning on their own, and students learning with others in the group (Looi, Chen, & Ng, 2010). Collaborative knowledge co-construction encouraged students to discuss, provide input, explain, ask questions, and challenge each other in order to find solutions to problems (Kuhn, Black, Kesselman, & Kaplan, 20000), and helped them acquire decision-making skills. This broadened their perspectives as they learned to look at things from different angles, which led to critical refining of original ideas.

Practitioners' Professional Development

Practitioners displayed a gradual transformation in their attitudes, mindset and level of confidence as they collaborated with academic researchers. Initial concerns about classroom logistics, lesson execution, preparedness for design research, and competency to use the software were addressed with supportive technical input, logistical adjustments, lesson flow and structure modification to accommodate unanticipated complexities, which reinforced the need for "continuous evaluation and fine-tuning of the new technology with the learning practice" (Vavoula et al., 2009, p. 298). In the course of the intervention, they became

convinced of the gains for students despite earlier concerns over the value of multimodal meaning-making in EL. Student engagement with a heightened audience awareness and strong, motivational aspects of EL learning were highlighted as visible benefits. The potential for interdisciplinary work was also recommended as an area for continued development, particularly in subject disciplines (EL, Visual Arts) with the appropriate intersections in skills set.

IMPLICATIONS

For Policy

Systemic, curricular and pedagogical support integrated to meet practitioners' needs and achieve curricular goals are critical. The challenge is to contextualize appropriate technological requirements, design specifics and structural demands while taking into account the characteristics of particular instructional environments before scaling up the implementation in other educational contexts. There is room for future research in a wider range of contexts, at various levels and in other disciplines in order to build fuller understanding of the potential and impact of student-generated virtual, augmented museum tools and resources on learning in different instructional settings.

MUSE was integrated into the regular EL curriculum with alignment, as far as possible, with curricular goals and departmental requirements. Careful planning, tighter monitoring and contextual support with focused, strategic management and execution of project tasks are required to maximize limited in-class curriculum time and to ensure the effective transfer of language-based skills from the regular curriculum to the contextualized project writing tasks. The challenge is to ensure a balance for curricular objectives on multimodal engagement to be reinforced through the technological mediation.

The MUSE system was developed primarily for novice participants unfamiliar with technologically enhanced learning platforms. Mediating learning through virtual and augmented platforms, while stimulating multisensory learning and bridging the virtual and the real, remained in its infancy. To maximize the potential of augmented learning, future work could emphasize greater dialogic interaction to enhance participant and artefact engagement (Ho, 2011). Further opportunities are available for developing the socio-technical design through building upon the prototype designed to enhance multimodal capacity and raise participant interactivity and engagement. One enhancement would be to develop a facility

for direct, immediate text uploading to accompany digital content in augmenting artefact displays.

For Pedagogy

The call for curriculum design and classroom pedagogy to be responsive to technological developments, the associated changes in new literacies, and to embrace the rich experience and expertise of students is timely. Incorporating visual communication into language teacher education and professional development programmes will instil awareness and understanding of the specific "grammars" of varied semiotic modes and how these function in the co-construction of meaning. The theoretically grounded functional grammars of language and social semiotics together with the evolving meaning-based metalanguage of image/text relations constructed by multimodal texts enable opportunities for negotiating critical comprehension and creative composition that cannot be overlooked. These provide a base for developing teachers' deep knowledge, sound theoretical understanding and appropriate strategies for multiliteracies pedagogy required in this age of interactive digital culture.

Practitioners' subject knowledge in relation to multimodal composing and pedagogical knowledge in developing instructional practices that actively work with multimodality to enhance students' learning are necessary. They need to not be merely executors of language lessons but be designers of meaning toward a more involved, collaborative, participatory "design" culture (Cope & Kalantzis, 2000; New London Group, 1996). Professional development of teachers in design research enculturation (Chen, Looi, & Chen, 2009) will help develop a fuller appreciation of school-based design interventions and the requisite mindset and skills for participation in investigations of this nature.

Developing multimodal pedagogical practice that fosters "intercontextual links" through the use of semiotic resources leading to critical inquiry, where students question ideological forces shaping uses of texts and analyse the contexts shaped by these forces, is critical. Students' sensitivities arising from a social semiotic approach include a critical awareness of how different modes shape and reshape what is represented, with attention to specific shifts across modes and how these mode differences interact with media variations to affect ways of learning. Sustained exposure to multimodal-based work in the language curriculum would also broaden students' repertoire of semiotic resources for multimodal meaning-making, enabling them to project a cogent voice and distinct identity in their knowledge constructions.

For Assessment

Tighter pedagogy–assessment development and alignment of assessment types and practices to foster pedagogies that develop skills and dispositions for the new media age, namely, "broad knowledgeability, flexibility, problem solving ability" (Kalantzis, Cope, & Harvey, 2003, p. 25), would address the disjunct between multimodal pedagogy and traditional assessment modes. Tasks that enhance students' reflexivity and focus attention on the interrelationship across semiotic modes through guided questions about "texts" and the intersections between visual and verbal semiotic resources would be beneficial. Assessment criteria that address the nature of multimodality and assess impact on the audience (Hammett & Burke, 2009; Selfe, 1999) are critical.

Practices that emphasize the relationship between process and reflection, and explore "the learner's engagement in relation to his or her 'representational resources'" (Newfield, Andrew, Stein, & Maungedzo, 2003, p. 79) are invaluable. Criteria for selective semiotic resource use for specific purposes and the generative, integrated use of resources with appropriate connections across modes and genres would be useful. Examining multimodal synthesis in foregrounding specific resources for targeted impact, analysing how multimodal coherence is achieved, and the purposeful juxtaposition and intersection of "texts" created would be worthwhile.

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