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Using a Video Annotation Tool for Authentic Learning: A Case Study

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Abstract: In e-learning there is increasing need for active learning designs that highlight reflection. Video sharing is one such option. The Media Annotated Tool (*MAT*), developed at RMIT University, provides the opportunity for students to annotate their own and other students' videos of learning tasks. Teachers provide feedback, coaching and scaffolding using this tool to develop professional skills. This approach provides an authentic learning opportunity, where students engage in 'real world' experiences. This paper uses the results of a pilot study on *MAT* conducted in 2009 and links the design and learning experiences of students to the nine characteristics of authentic learning as outlined by Herrington et al., (2010).

Introduction

There is a need in university e-learning designs to provide for authentic learning opportunities that engage students in active learning and reflection (Herrington, Reeves & Oliver 2010:10-13). The RMIT University media annotation tool (*MAT*) is designed to provide active learner engagement with digital learning resources. Resources presented online in media formats such as video can be marked up and annotated with text entries. Video provides opportunities for artefacts to present as authentic real-life or workplace scenarios that might ordinarily be difficult or expensive to access, and can allow repeat viewing for extended analysis. *MAT* allows students to select sections of video and anchor notes directly to these sections. These notes can be simple, single person annotations in the 'Notes' panels, or may open to a full learning cycle with input from others by using further annotation panels.

MAT offers a learning design that incorporates authentic learning. This approach gives students the chance to engage in 'real world' learning experiences such as collaborative problem solving (Herrington et al 2010) or online role-playing or simulations (Douglas & Johnson 2009). In authentic learning, students cultivate a suspension of disbelief and engage in an active learning task that mirrors their future professional world and thus develop relevant professional knowledge (Herrington, Oliver, & Reeves, 2003). For example, Herrington and Oliver (2000) in a pre-service teaching case study used a simulated online classroom, with a large number of realistic supporting resources presented in various media. In this environment, the students where given an authentic, ill-defined task to solve, which started with a realistic concern from a 'parent' about her child's mathematic assessment tasks.

Authentic learning draws upon situated learning (Herrington et al 2010:14). According to situated learning, understanding is assisted by the realisation that knowledge is not separate from how we learn and how the knowledge will be used. Abstract knowledge and vocabulary will be learnt more quickly in learning activities that are situated in 'real world' contexts. Additionally, these contexts should include the culture of the practice community. As Brown, Collins and Duguid argue, "[a]ctivity, concept, and culture are interdependent…Learning must involve all three" (Brown et al 1989:33).

In this paper, the new online tool of *MAT* is considered against the Herrington and Oliver (2000; Herrington et al., 2010) nine characteristics of situated learning that promote authentic learning experiences. Detail of findings from a 2009 pilot study is provided to demonstrate the learning benefits of this approach. To illustrate how a *MAT* learning environment has been able to address at least part of each of these characteristics, the discussion follows the order of: authentic contexts, authentic activities, authentic assessment, coaching and scaffolding, reflection, articulation, multiple perspectives, access to experts, and collaborative construction. The paper argues that *MAT* provides students with the opportunity to engage in authentic learning. In 2011 there will be further evaluation of *MAT* across a range of teaching disciplines and a summary of the contexts of the cases in this multiple-case study is provided. First a description of the project and the methodology used for the pilot study is now described.

Project Description and Method

The pilot study examined the integration of *MAT* into a higher education setting. It aimed to explore and explain the use and effectiveness of *MAT* in learning; to investigate how this online environment might be used by learners and teachers to support learning. The case offered the opportunity to gather informative, detailed baseline data before wider use of the tool. With "research in the field of educational technology … struggling to keep up with developments in technology" (Muller, 2006), this project provided a start to keeping pace with this new tool. While the *MAT* design was pre-tested by various student focus groups (see Colasante & Fenn, 2009), the first full pilot involved a class of third year undergraduate physical education (PE) teaching students. Their teacher (key academic) wanted *MAT* to facilitate the intended learning outcome to critically reflect on and evaluate PE teaching practice.

The project data was collected under the methodological framework of a single-case study, as pilot research for a proposed multiple-case study. This is an established use for single-case study research (e.g., Yin, 2003). Out of the class of 31 students using *MAT*, 23 volunteered to participate in the study, plus their teacher. Pseudonyms have been used in this paper.

The data collection involved mixed-methods. A two-part survey (pre- and post-questionnaires: n=23) collected information about student learning expectations early in the semester, then feedback on their experiences with *MAT* late in the semester. In between, 'interactive process interviews' were conducted, that is, half-hour audio-recorded individual sessions comprising observation then interview. First the students were directly observed using *MAT* while they 'thought aloud', followed by semi-structured interviews to further discuss their learning with *MAT*, until data saturation was reached (n=7). The teacher also participated in an interactive process interview.

MAT is an interactive tool for analysis and reflection that has been in development at RMIT University since 2005. It provides students with a tool to reflect upon artefacts such as their own and others' performance and allows feedback from their teacher. The students categorise segments of video using defined Markers (analysis categories). Each Marker created automatically generates text-entry annotation panels anchored to its segment of video. These panels are 'Notes', 'Comments' (e.g., peer collaboration), 'Conclusion', 'Teacher Feedback' (e.g., academic or expert feedback), and 'Final Reflections'. To support the PE teaching students in the pilot study, the annotation panels in *MAT* were progressively opened by the teacher to allow complete learning cycles of pre-service teaching analysis over the semester. In the following sections, each of the nine characteristics of authentic learning are described and applied to the pilot study of *MAT*.

Authentic Contexts

According to Herrington et al (2010), a learning environment with an authentic context needs to reflect real-life applicable scenarios. The *MAT* pilot enabled third year PE students to critically reflect on and evaluate their progress in work-readiness, by recording then analysing videos of their teaching practice within *MAT* and receiving peer and teacher feedback within the tool. The context where they applied their teaching practice was real, that is, in primary school class settings. This was by pre-service placement in either local participating schools or with visiting cohorts utilising the university facilities. They recorded both pre- and post-test videos for comparison. In the data collection the pilot cohort's teacher, 'Carl', explained how *MAT* facilitated appropriate supervision levels for these third year students, following their more directly supervised teaching practice in first and second years. He said:

> They actually feel that they are the teacher and they're in charge, and they are given responsibility ... we are meant to see what they're doing, without necessarily watch[ing] over their shoulder the whole time. [And] There rarely seems to be an issue … because they're third year they've gone through a fair bit of scrutiny along the way (Carl).

MAT enabled detailed, repeated and small group collaborative analysis of their PE teaching, with most of the context captured via the visual and audio scope of digital video-recorders. The ability to revisit and analyse the video captured context was valued by the learners. When asked to nominate in the post-survey what it was about *MAT* that was most helpful to their learning, while other responses varied, 16 out of 23 participants wrote 'viewing teaching', whether this was their own teaching, their peers' or both.

Authentic Activities (Tasks)

Herrington and Oliver (2000) argue that authentic activities are those that are complex, messy, single tasks relevant to the real world, and that students can grapple with the task over time (and perhaps over subjects) collaboratively. This style of activity is common in problem-based learning (PBL). PBL sees teaching inverted from more typical presentation of ideas by lecture followed by tasks, to student teams taking on problems to solve and learn as they go (e.g., Dalzeil, 2010). One of the early users of PBL was medical education. For medical graduates to evaluate patients, for example, they needed to build "cognitive skills of clinical reasoning or medical problem solving, as well as interview, physical examination, and interpersonal skills" (Barrows & Tamblyn, 1980:3). Authentic activities promote understanding and allow practice of skills, attitudes in applying solutions that are rarely neat, and ultimately allow transfer into the real world (Herrington et al, 2010).

In the *MAT* pilot, the PE students engaged with activities across the semester to critically reflect on and evaluate their teaching practice. These activities are presented in Figure 1. First this involved (1) each student video recording 20 minutes of their first teaching placement for third year as a 'pre-test' video. They then uploaded the video into *MAT*, and (2) commenced reflection and evaluation activities. From their analysis, they (3) chose an area they'd like to improve in their teaching, and consulted literature for guidance. To further prepare to evaluate their teaching, they each (1) recorded their post-test teaching practice video, and, as for the pre-test video, (2) analysed it in *MAT* and (3) against the literature. Finally, they (4) assessed their improvement and (5) wrote a report on their overall reflection and evaluation, citing both *MAT* collaboration and literature. This approach required the students in the pilot study to link theory with practice and thus master some of the skills relating to PE teaching. Linking theory to practice is a well recognised factor to promote critical reflection in teaching (e.g., Hatton & Smith, 1994, King, 2008, Orland-Barak, 2005, Rodriguez et al., 1998, Whipp, 2003, Yost et al., 2000, in Colasante, in press).

Figure 1: Cycle of learning activities across the semester

The learning cycle that the PE students used within *MAT* (re activity 2 in fig.1) involved accessing their teaching video in *MAT*, and then selecting key areas of the video to analyse and write notes against. After a few weeks, the students viewed their peers' teaching videos and left feedback. The students would later return to their own teaching video to read feedback from peers left in the 'Comments' panels, and, if the feedback stimulated them to, they would write conclusions for their Markers. They reviewed their own learning cycles in *MAT*, plus others' in their group, including teacher feedback where received. At the time of interviewing, the students had or were about to record their post-test teaching videos and anticipated repeating this cycle.

The post-survey data showed that activities in *MAT* were viewed as useful for eventual employment, plus largely allowed for collaborative encouragement. This was indicated by 22 out of the 23 participants agreeing that using *MAT* allowed them to be involved in activities that were relevant to their eventual professional practice, and 18 out of 23 agreeing that using *MAT* allowed them to receive encouraging support.

Authentic Assessment

In work to promote more effective assessment practices, David Boud and Associates (2010) advocate re-focusing attention away from grades and onto the learning required and the activities to achieve this; where the

assessment is designed for learning and made up of substantial learning activities. Essentially, "the assessment should be seamlessly integrated with the activity" (Reeves & Okey, 1996, Young, 1995, in Herrington et al., 2010:39).

In the *MAT* pilot, the PE students' assessments did not take place directly in *MAT*. However, *MAT* provided an environment to facilitate building knowledge through reflective learning cycles. This culminated in a final critically reflective report from the cycles of learning across the semester of study, and required direct reference to learner findings in *MAT*. Thus the assessment was integrated into the authentic activity of reflection on the task of teaching for the students in the pilot study.

Coaching and Scaffolding

In authentic learning a "teacher as coach is a fundamental and integral part of an e-learning course that provides a substantial scaffolding and coaching support for students", involving gradual reduction of teacher support (Herrington et al., 2010:35-36). This can generally be achieved in computer-supported collaborative learning by preparation by the facilitator setting the learning task, and guidance during learning as required (Kienle, 2006).

In the *MAT* case study, the teacher, Carl, described during data collection the learning and teaching structure to support critical reflection and evaluation. This included preparation of the learners on the role of reflection in their learning, and what learning and assessment tasks were required of them:

> having looked at the video, they then had to come up with what area that they wanted to work on … whether that be part of their teaching, or a teaching style, or whatever. Then they had to go off and do a lit search on why that was important. … they had to then come up with strategies of what they could do and design a check list [for inclusion in reflective report] of, having watched the video, a check list of the number of times they did something like that. … [for example,] 'moving while giving feedback' (Carl).

In the pilot, students analysed two videos across the semester (pre-test and post-test videos), reflecting against eight teaching analysis criteria pre-listed in *MAT* by Carl as 'Marker Types'. These included 'Introductory Activity', 'Demonstrations', 'Teacher Position', 'Checking for Understanding', 'Transition', both 'General' and 'Specific Feedback', and 'ALT-PE' (academic learning time in PE). The teacher gave some additional guidance in regards to expectations of how much peer review would be reasonable in the task. He found 'work-arounds' in provision of feedback, such as using the 'Comments' section when there was a delay in accessing the 'Teacher Feedback' annotation panel. *MAT* provides an avenue for coaching and scaffolding by a teacher as it enables the teacher to give direct feedback to students on videoed efforts. Students thus can reflect upon coaching comments to improve performance. This approach allows for the scaffolding of skills relating to teaching PE.

Reflection

Herrington et al., (2010), arrive at several provisions that enable reflection, which (like others) branch out into the other authentic learning characteristics. These, in summary, include a decision making context, non-linear assembly and repeat access to resources, collaborative groups, and opportunities to compare to other learners and experts at various progression points. Lin et al (1999) discuss technology to support reflection from the view that "reflective thinking is an active, intentional, and purposeful process of exploration, discovery, and learning" and "involves social interactions … and feedback on one's own performance and understanding" (p.46).

In the *MAT* pilot, achievement of reflection was a key learning focus. As described in the project description, the intended learning outcome was to critically reflect upon and evaluate (PE) teaching practice. The students reflected on their video-recorded teaching practice within *MAT*, which, as a web based tool avoids some of the limited access options of software dependent tools. Similarly, they could access the recordings of the four or five peers in their group via the web with their student logins.

While not strictly linear, the structure of *MAT* encouraged some uniformity in use, where the students wrote notes against segments of the videos in a structured learning cycle of self-reflection (via Notes, Conclusions, Final Reflections), interspersed by collaboration of peers (via Comments), and teacher (via Teacher Feedback or in Comments). Further, they were required to conduct a literature review on at least one self-selected criterion for

improvement, and then record a further teaching episode to evaluate improvement, culminating in writing a reflective paper for submission.

Both the students and the teacher in the pilot supported the view that *MAT* was effective at enabling reflection. Twenty-two out of 23 students agreed that the use of *MAT* allowed them to both reflect on, and evaluate, their teaching practice. Carl (teacher) said that at the start of the project he spent time with his students on developing their appreciation of reflection in teaching, and that by the end he felt that the visual representation and being able to directly mark the video were significant factors in fostering reflection. He added that the different media offered via *MAT* (visual, audio and text) provided feedback in forms other than verbal, which he particularly felt helped visual learner types.

Articulation

Boud, Cohen and Sampson note the benefits of articulation in peer learning, arguing there are more practice opportunities when students work together without a teacher; "[t]hey are able to articulate their understanding and have it critiqued by peers as well as learn from adopting the reciprocal role" (Boud et al., 1999:415-16). Self-talk or finding own voice has a role in itself, whether verbal such as in critical pairs of pre-service teachers, or in written form, it can be capitalised upon to stimulate extended reflection (Hatton & Smith, 1994). Further to this, public articulation and defence of ideas to other students or experts helps "creat[e]… rich conversational artefacts for discussion and presentation" (Pea, 1991:65, in Herrington et al., 2010:33).

In the pilot study, self-authored text entries were written against markers that students created and anchored to specific components of the video under analysis. Each Marker had annotation panels attached to it, where students could type text into the panels of 'Notes', 'Conclusions' and 'Final Reflections', to be read and contributed to at key points in the cycle by peers and teacher in other panels ('Comments', Teacher Feedback'). Some examples of students use of the 'Notes' text entry field included:

> I just tagged my own teaching and put comments [in Notes] about things that I thought were negative and/or positive (Nicole).

> [I wrote in Notes] about whether it was good or [to] give more definition (Desi).

Multiple Perspectives

For their authentic learning case study, Herrington and Oliver (2000) exposed the students to multiple perspectives by:
- providing varied perspectives of the character roles in the simulated learning environment
- setting a requirement for students to work in pairs
- open access to resources in the simulation, allowing access at different points of learning enquiry.

Role-plays can offer "a breadth of learning opportunities … to participate in authentic activities in a variety of practitioner and client roles" (Douglas & Johnston, 2009:129). Role-plays can thus provide the opportunity to engage in authentic learning that promotes understanding of professional roles. *MAT* provides the opportunity for students to engage in role-plays and then be given feedback from other students. They learn from a variety of perspectives.

In the pre-survey in the pilot, students were mainly positive towards studying with real-life examples (19 out of 23 participants), and subsequently a few less (16 out of 23) in the post-survey appreciated the modelling offered by other students in *MAT*. The students who were observed and interviewed seemed genuinely interested in their peers' perspectives on teaching. Some examples include:

> [Y]ou would kind-of look at other peoples to see what they've done 'cause you're interested in other things that they've put in (Donna).

> I've read all my comments and feedback so I'll click on another group member's to have a read of what they've written themselves about their own teaching video and then what other people have written in the group (April).

[A peer] commented on … [another student's] 'Transition', and I think the drink break has broken down her lesson so we've all commented on how to incorporate drink breaks into the lesson in a more effective way, and she's put in a Conclusion in there as well which we can read. And she's agreed with what we've said (Brittany).

Other PE students perspectives on one's own teaching were valued by the majority. Being able to receive feedback from others was ranked the most valued 'feature' of *MAT* in one of the open-ended post-survey questions by approximately half of the students, while still more students offered it as the second most valued feature.

Access to Experts

Additionally for authentic learning, "[t]eachers and designers … need to focus on how the course environment might provide access to expert or professional knowledge, skills and attitudes in real-world problem solving" (Herrington et al., 2010:23).

In the *MAT* pilot, access to experts involved supervisory in-service teachers and university academics. The students sought feedback from their teacher (key academic) in *MAT* who helped scaffold their understanding. An example from the teacher using *MAT* under observation while thinking aloud is:

I'll go into group 1, I'll go to the first person, … [Student X's] post-test [video]. OK, I've clicked on … [X] to look at all the tags [i.e.: Markers] she's put in. So she's got 'Introductory Activity' [Marker], which I am watching at the moment. So I've written … [feedback—following on from a peer's] comments on the 'Intro' that she took too long—and I'm just reinforcing that's what she should do, and adding that one of the authors suggest that she should do it in about a minute (Carl).

While there was no explicit use of modelling by experts within *MAT* itself, this is an option that will be explored in future uses. Each of the planned cases in the follow-up multiple-case study using *MAT* will have some form of industry representative input, as noted in Table 1 in the 'Next steps' section (see column: 'Expert input').

Collaborative Construction

Herrington et al., (2010) point out the importance of collaboration compared to cooperation (like others before them, e.g., Panitz, 1996). They argue that for authentic learning, collaboration in achieving goals via problem solving is the aim rather than cooperative task division. Peer learning can allow students to construct knowledge via "engage[ment] in reflection and exploration of ideas when the authority of the teacher is not an immediate presence" (Boud, et al., 1999:415).

In the pilot study, while students tended to value collaboration in *MAT* by way of peer feedback, some noted that they valued it more if it was constructive feedback rather than general commentary. Interview example:

Some of the Comments I got … "yes, you're right", or "well done", … a lot of them weren't very constructive, they were just agreeing with what I'd said rather than giving me help (Brittany).

Collaborative efforts were openly appreciated by some of the students. For example, one student looking at a peer's video under observation said aloud:

I've just clicked on 'Checking for Understanding' [criteria] and then one of … [peer's] 'Questioning' markers, and reading the comment that I made on his teaching. He's just reinforcing [in the Conclusion] what I've said, so that was good! Good that he took it on; looked at it (Brett).

Overall, a majority of the survey respondents agreed that activities in *MAT* played a useful role in constructing knowledge. Nineteen out of 23 participants agreed that using *MAT* allowed them to build or construct meaning from their learning experiences, while 18 agreed that using *MAT* helped them to understand key theoretical concepts related to their teaching practice.

Conclusion

Evaluating the authenticity of the *MAT* online learning environment—for student analysis of artefacts in learning and teaching—continues in a multiple-case study. The findings of the preceding pilot study tends to support that *MAT* can meet the Herrington and Oliver (2000) nine characteristics for authentic learning, at least in part. These characteristics are summarised in this paper as: authentic contexts, authentic activities, authentic assessment, coaching and scaffolding, reflection, articulation, multiple perspectives, access to experts, and collaborative construction.

In the pilot *MAT* allowed for presentation of authentic contexts of work-relevant representations of their teaching practice via video, and for students to work with this to critically reflect on practice, and collaboratively construct knowledge with their peers and teacher. *MAT* provided a framework for text entries of learner articulation plus others' perspectives, in a scaffolded format provided by the annotation panels linked to segments of video under learning analysis. However, coaching and scaffolding was reliant on both *MAT* and teacher support. The teacher guided with activities involving *MAT* to build his students towards the work-relevant learning outcome of critical reflection and evaluation of teaching practice. This learning goal was practiced by the students in the activities, building to the final assessment.

While the PE students had access to experts during their learning via supervising teachers in the school, plus university academics including teacher feedback within *MAT*, there are further opportunities to explore the inclusion of experts in other ways. This may include provision of artefacts from industry, or examples of working through problems that model expert behaviour to compare to own, or they may help critique students' analysis within *MAT* using one of the annotation panels to enter their commentary (see Colasante, 2010).

Next steps

A multiple-case study follows the pilot, to evaluate the effectiveness of integrating *MAT* in a range of applications. The contexts for the seven cohorts in the subsequent study are as different as their disciplines and their learning objectives define them. However, all have a work-relevant theme and involve capturing this in video for analysis, plus input from industry experts. This study has recently commenced and the context range is tabled below.

Learning program	Context	Video artefact for analysis	Expert input
Juris Doctor	Examine court advocacy; a key professional skill for lawyers	A legal industry representative scaffolding advocacy skills in a moot court setting; Student example(s)	Legal representative comment on professional behaviour in a student example and providing feedback on collaborative student analysis in *MAT*
Chiropractic	Explore the various aspects of clinical encounters in the chiropractic field	Simulations of patients presenting with various headache scenarios to a chiropractic clinic	Industry representatives provide worked example by analysing the first video as a model for problem solving processes
Property Services (Facilities Management)	Develop business skills required by employees: (1) facilitate meetings (AGMs) (2) customer service and industry networking	(1) Role-plays of students conducting meetings (2) Interviews with industry representatives	Industry representatives: (1) contribute to analysis of running meetings (2) provide perspectives via interviews
Medical Radiations (Medical Imaging)	Develop image evaluation skills; simulating experiences of eventual clinical practice	(1) Medical images represented in various views (2) Expert critiquing a medical image (students compare to own critique)	Medical Radiation practitioner modelling expert image evaluation skills
Audiovisual Technology	Demonstrate workplace skills and underpinning knowledge in an A-V medium	Student performance in audiovisual industry role	Industry input in analysis of performance in *MAT*
Engineering Geology	Interpret geology relevant to engineering: analysis post-field trip & other sites recorded but not currently physically accessible	Geological features of field trips sites for repeat access; bank of other field experiences/sites	Industry partnerships re access to sites; expert interpretations in *MAT* for learning comparison

Primary Education	(1) Explore visual arts teaching, including evaluating own processes and others (2) Observe and identify detailed early literacy practices in children's reading and writing	(1) Education student's artistic processes and final works; gallery art spaces experiences (2) Children reading and writing; education student reading draft text for critique	(1) Expert feedback in *MAT*; modelling of visual arts practice in education settings and gallery art spaces (2) Experienced teacher models various support strategies for literacy development in video

Table 1: Contexts of *MAT* integration in the next (multiple-case) study

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