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**Title:**

**Professional judgment in the digital age**

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The research findings on the implementation of a digital application that augments and enhances the performance of the assessment process involving professional judgment will be discussed. Previous digital applications in education have tended to focus on student learning, this one, however focuses on the assessment process. The application moves the marking/recording sheet off the desk and onto the desktop by combining features of word processor, spreadsheet and database programs. In the process many performance enhancements are achieved through the reduction of unproductive and administrative work involved in the marking process (e.g. manually adding up of marks, recording, and spell checking of comments). Many views of the recorded information are provided. The improved performance provides the opportunity for more time to be spent on feedback, reflection and moderation. Features are described and discussed from the marker's perspective in the presentation and concludes with additional features and possible uses of the application especially in the moderation process and in making the assessment process educative.

Key words:

Assessment, marking, moderation, rubric, ICT.

## **Introduction**

This paper discusses the features and technologies involved in the digitization of the assessment process, using two examples of digital assessment implemented as part of my post-doctoral study.

Currently, the assessment process moves from a digital media (word-processed exam questions) to analogue (hand-written answers) and back to digital (word-processed marking key). This process takes place many times, as the assessment process moves from the student work or performance, to its marking and administration. The digitization of some of the stages involved in the assessment process, for example, the word-processing of student work, has been beneficial and productive. However, I would argue that many of these beneficial and productive elements provided through digitization are reduced or lost when the next stage moves back to an analogue media. Further, when the whole assessment process is digitized, many innovative and educative possibilities, which are either impossible or highly expensive within the analogue environment, will be achievable.

In this paper, I will describe two innovative examples of digital assessment that are not replications of paper-based assessment processes, and cover the whole assessment process from the digital capture of student authentic work to its digital marking. I will conclude this paper by highlighting the benefits and synergies achieved when both sides of the assessment process are digitized (student work and marking).

## **Background**

The objective of my research has been to investigate how digital technologies could augment the whole assessment process, not only by improving the individual assessment stages, but also by linking them seamlessly so that the student and teacher can focus on the educational activity and improve their performance. This research has included the following areas of investigation: the design, development and digitization of the student performance task; the design, development and digitization of the marking; and the digitization of the management and reporting aspects of the assessment process.

As we rapidly leave the analogue world behind and embrace the digital world, the educational systems are finding it difficult to catch up. The opportunities that digital media and tools offer to education are being embraced: the use of Interactive Whiteboards (IWB) and netbooks on the hardware side; and podcasts, vodcasts and blogs on the digital media side are just some examples. However, assessment has been lagging behind in the uptake of digital technology, and most assessment tasks are still paper-based, as is the marking of those task. The limitations of current assessment procedures often distort what students learn and what is taught. The digitization of the assessment process presents the opportunity to eliminate many of these limitations, thus enhancing student learning.

## Digital forms of assessment

In this presentation, the term ‘assessment’ has been divided into two distinct areas: the assessment task and the task assessment (see Figure 1).

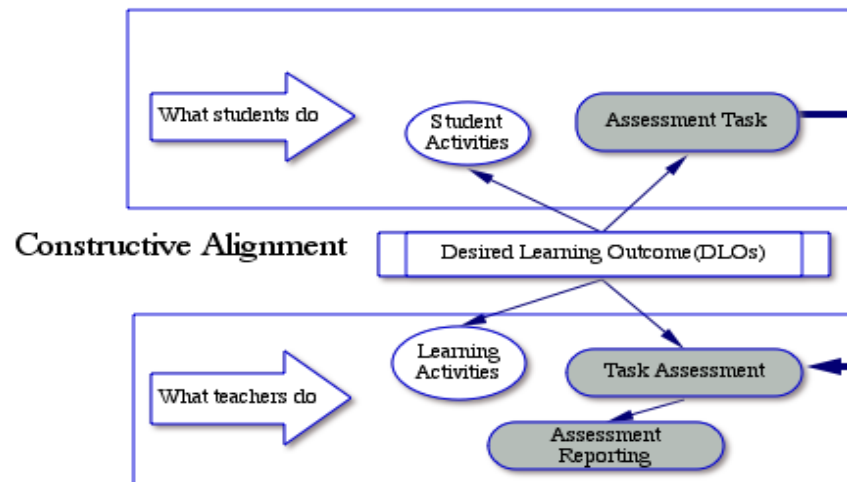


Figure 1: Clarification of the term assessment

The assessment task is what the student does to meet the assessment or exam requirements. The task assessment, on the other hand, is what the marker does to grade or mark the student work or performance, including the administrative work involved. Two examples of the digitization of these two distinct areas of assessment are presented below.

### Digitization of the assessment task

One of the more difficult aspects of assessment is to capture and mark student performance on paper. Performance-based assessment is one of the oldest forms of assessment, and has been marked in many ways, for example, through an observation or simulation, an interview or a portfolio of some kind. These marking methods tend to be costly and difficult to manage for schools.

The Centre for Schooling and Learning Technologies CSaLT, in collaboration with the Curriculum Council of Western Australia and supported by an Australian Research Council grant, is currently conducting a three-year study investigating the potential of digital technologies to represent student output from high-stakes performance-based tasks in four senior secondary courses: Applied Information Technology, Engineering Studies, Italian and Physical Education Studies. I will describe how the student performances were captured in two of these courses, Engineering Studies and Physical Education Studies.

In Engineering Studies, an online digital exam incorporated the capture of text, sketches and their annotation, and a short video-clip over a two-hour period. This process resulted in a digital trace of students’ performance over time, and allowed for the assessment of not just the final product but also the development process.

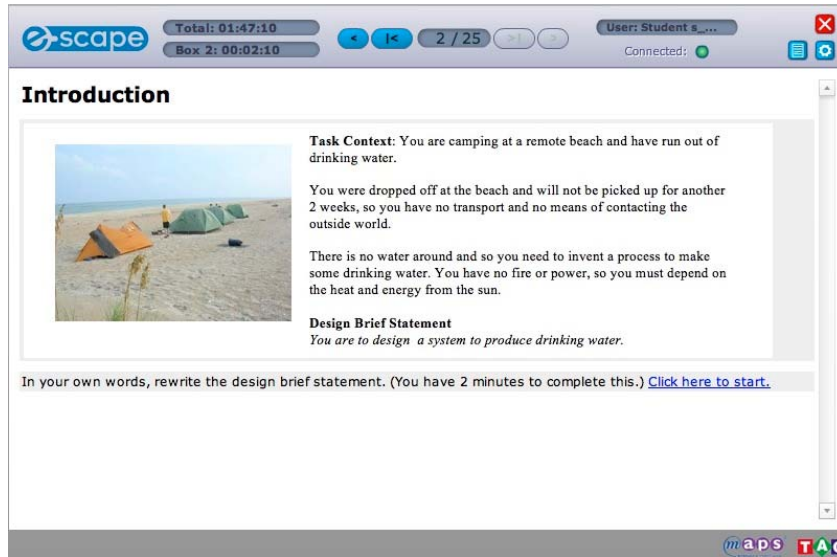


Figure 2: Task scenario presented to the students

Figure 2 shows the way in which the task scenario was presented to the students during the engineering exam, while Figure 3 shows one student using the technologies to capture their work during the exam.



Figure 3: Technology used in the engineering exam

A different approach was used for Physical Education Studies. The assessment task consisted of three components: the first and the last components were digital exams that captured student responses to questions in typed text and via a digital drawing; the second component involved the digital video-recording of students completing four skill drills and two modified games situations in the sports field. The digital recording required the use of three remote-controlled video cameras, the output of which was digitally combined into one video-clip. The final exam presented students with their own performance video-clips, which they were required to reflect on to answer the exam questions. Figure 4 shows an example of one of the final exam screens as presented to students; on the left, the figure shows the exam questions and response boxes, while the screen displaying the video-recording can be seen on the right.

Student ID **dp114** School **dp** **Swimming**

The Challenge Gaining a qualifying time in a 100m Individual Medley race (25m pool)

Click on a Video button to see student dp114 videos  
 Skill Video 1 Skill Video 2 Skill Video 3 Skill Video 4 Game Video 1 Game Video 2

You are watching **Game Video 1**

**Reflection Skills**  
 Type your answers in the RED scrolling boxes below.

**Basic Challenge**  
 Describe the skills/techniques you implemented in the basic challenge of the exam (GAMES videos).

Evaluate the strengths and weaknesses of your implementation of these skills/techniques in (i) drill/practice conditions (SKILLS videos) and (ii) 'live' playing conditions (GAMES videos).

Identify the factors influencing your success or lack of success in implementation of these skills/techniques.

**Adapted Challenge**  
 Describe the key changes in skills/techniques used in the adapted challenge part of the exam (second part of GAMES videos).

Explain why you made the changes that you did in responding to the changing situation/challenge.

Evaluate the strengths and weaknesses of your adaptation of the skills/techniques to suit the changing situation/challenge.

To see a FULL screen of the movie right-click and choose ZOOM.

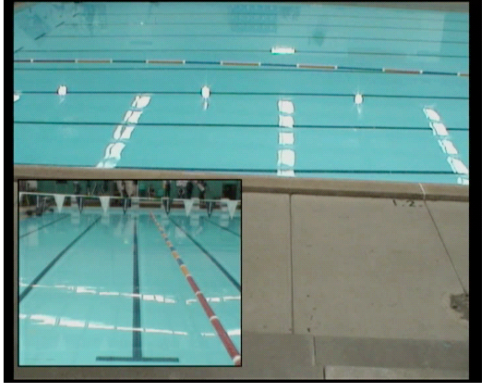


Figure 4: Final exam screen for Physical Education Studies

## Digitization of the task assessment

In Engineering Studies, the marker was able to digitally record marks and view the student work in the same window, and to move between the student's work and the related marking keys seamlessly by clicking on buttons. Figure 5 shows the window the marker used to mark the student performance, with the analytical marking key on the left and the student work on the right.

me101 marker108 108 24

Go Back to Student Results

A. Process 1 B. Process 2 C. Understanding D. Society

**A. Process 1**  
 Comment on Task or Marking system

**IDENTIFYING NEEDS:** Identify and articulate design needs from the given scenario

No evidence of understanding of the design context; few, mostly irrelevant needs identified

Some aspects of the design context have been considered, but not all

Sketches and model clearly matches the design context, comprehensive range of ideas identified

0 1 2 3 4 5 6 7 8 9 10

Clear

Comments on Criteria

What to look for

- \*Relevant appropriate technology ideas
- \* Model represents appropriate technology

**COMMUNICATION:** Clear sketches of ideas and indications of idea development throughout the process

Unclear and confusing, disorganized communications

Confused communication - not consistently clear and concise

communications using appropriate technical terms and conventions

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Clear

Comments on Criteria

What to look for

- \* Sketches clear
- \* Instruction logical
- \* Clear and relevant video explanation

**A. Process 1- Identifying Needs and Communication**


**Solar Heater Principles**

- Hot water rises
- Glass allows most transmission of heat
- Dark colours absorb heat


**Appropriate Technology Principles**

- Technology should be easily understood
- Easily repaired
- Difficult to break
- Low cost

**First Sketch**



**Explanation of Model**



The water tanks are connected via a series of pipes for the water to be heated and then moved to another tank.

The sun heats the pipes via glass that is used to strengthen the light and heat in one location, and is then passed onto the pipes (the heat).

The water for the rainwater tank is siphoned through to it from water collectors, where it is kept as cold water. When the hot water supply runs low, the rainwater is able to go to the other water tank.

Figure 5: The digital marking of student work in Engineering Studies



The Physical Education Studies student performance was marked in a similar way, as shown in Figure 6. In this case, the different student video-clips are accessed by clicking on the buttons on the top right of the screen.

The screenshot displays a digital marking tool for a Physical Education Studies task. The task is titled '5-Reflection' and focuses on 'Setting up a goal scoring opportunity from a corner kick'. It includes a 'Tactical Problem' and 'Alternate Tactics'. The interface features a navigation bar with buttons for 'Skill Video 1' through 'Skill Video 4' and 'Game Video 1' through 'Game Video 2'. A student's reflection is visible, discussing their performance in a 'Basic Challenge' and an 'Adapted Challenge'.

Figure 6: The digital marking of student work in Physical Education Studies

In addition to analytical digital marking, the study also investigated comparative-pair marking, a method of marking where a marker compares the work or performance of two students and then chooses the best one of the two. Comparisons between different pairs are repeated many times until a ranking of students is obtained. Figure 7 shows an example of how this marking method was digitized.

The screenshot illustrates a comparative-pair marking interface. It features two video clips: 'ap103' (a student holding a sign with the number 103) and 'dp115' (a student performing a swimming stroke). A central 'MarkNextPair' interface with arrows 'A' and 'B' allows for comparison. Below the videos are 'Reflection Strategies' for both students, including 'Basic Challenge' and 'Adapted Challenge' sections with student reflections.

Figure 7: Comparative-pairs marking

The current online system generates pairs of student work for each marker to judge, and provides a facility for recording the marker's judgment and related notes. The tool calculates scores and associated reliability coefficients using Rasch modelling while marking occurs, which means that when an acceptable level of reliability was reached marking can stop.

### **Advantages of digital assessment**

Digitization of the assessment process provides a richer environment for students to demonstrate both their knowledge and performance compared with the traditional paper-based assessment methods. As seen in the examples above, in both courses students were able to use different types of digital media to demonstrate their knowledge; in addition, in the Engineering Studies exam, not only the final design, but the development process was captured, while in the Physical Education exam, students were able to link their theoretical knowledge of the sport to their actual performance.

On the markers' side, by using a digital assessment environment, information – both student performance and marking – is entered once, and can then be accessed, displayed, stored and managed in multiple ways. Most of the busy administrative work associated with paper-based assessment, which typically requires a time-consuming and complex integration of spreadsheet and word processor applications, has been eliminated, thus allowing markers to focus on the professional judgment of the student's work.

### **Concluding comments**

The digitization of the assessment process is still in its infancy, however this paper has shown that with current technologies it is possible to complete the whole process digitally, and that a digital environment has a number of advantages for both students and markers. Self-, peer- and group-assessment are now cost effective, as is the student marking of exemplars online. The integration brought about by the digitization of both the assessment task and the task assessment is blurring the boundaries between teaching, learning and assessment. The assessment task can now represent what is taught, and not just what can be reproduced on paper, and students can be active participants in the assessment process and life-long learners.