Assessment is for learning: Supporting feedback

e-scape scotland: **supporting formative assessment for creative performance**

Abstract

This paper describes an action research, school situated project conducted with partnership funding from Learning and Teaching Scotland (LTS) Scottish Qualifications Authority (SQA) and Becta, the UK government's agency for communications technology in education.

Based on *e-scape* (e-solutions for creative assessment in portfolio environments), developed by Goldsmiths, University of London, the Scottish project focussed on integrating innovative methods of capturing evidence of creative performance with providing formative feedback to learners.

Classroom trials were conducted with Primary 7 through to Secondary 3 learners (10-15 year olds) in 2 different local education authorities. Learner and teacher thoughts were recorded through blogs, e-forums and interviews; the authored design challenges were shared through the web-based *e-scape* authoring system and e-folios reviewed by participant teachers and researchers.

This paper provides a summary of the reactions and responses from teacher practitioner, learner and researcher perspectives based on their experiences and the results of the classroom trials. It discusses the potential contribution in terms of supporting learning, teaching and assessment within the framework of Scotland's *Curriculum for Excellence* (2004) *Technologies* (2009) learning area. It is hoped that *e-scape scotland* supports pedagogies which enable the capture of creative thinking in real time for authentic and formative assessment and addresses some of the issues for classroom practice and practioners.

Key words

Design thinking; assessing creativity; formative assessment; peer, self and teacher feedback; inclusion; modes of evidence capture; digital portfolios; curriculum for excellence; Assessment is for Learning

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Background Context

To set the project in context, a brief summary of the climate in which the project developed is necessary. First, a summary of the key influences underpinning current developments in Scottish Education is presented. Second, issues of assessment related to the various purposes are discussed. This is followed by an account of the ongoing innovative research which offers potential opportunities to support change in learning, teaching and assessment.

Following a national debate on education (Scottish Executive, 2003), the education system in Scotland (3-18years old) is undergoing significant change in terms of re-examining the values and purposes of education, the principles of curriculum design, curriculum architecture, and assessment (Scottish Executive, 2004). The national aspiration of *Curriculum for Excellence* (CfE) is to improve attainment, recognise wider achievement, and create greater coherence between various initiatives, sectors

and agencies. The aim is to develop the capacities of children and young people to be 'effective contributors, responsible citizens, confident individuals and successful learners' (Scottish Government, 2008). CfE also promotes greater exploitation of the potential of ICT. Learning areas have been reconfigured (Scottish Government, 2009a). Now each learning area has a framework of *'principles and practice'* (rationale), and *'experiences and outcomes'* (guidance) for teachers to interpret into classroom practice.

The assessment of creativity, iterative design thinking, and process-led reflective learning activity have proved troublesome for some years. For example, teachers and certificate awarding bodies have been unsure what evidence to refer to, what criteria to adopt. This has generally resulted in assessment approaches and systems that do not authentically model designerly thinking to any extent. Instead they seem to promote an artificial retrospective record of what a learner thinks that a teacher and assessor may want to see. The learner is often slowed down and de-motivated by the need to record their thinking at every stage, in a paper based portfolio, and make their 'working out' look neat. These are common issues and concerns, and shared across the international community of Technology Education (McLaren, 2007). In Scotland, as a result of the difficulties faced with assessment, there has been little or no meaningful assessment of aspects in Technology Education that relates to creativity and decision making in primary and lower secondary school (5-14 year olds). Technology Education in secondary schools has tended to follow a traditional instructional workshop approach, regardless of National Guidelines promoting the value of a design and creative problem solving process-led pedagogy (cf, Scottish Qualifications Authority, 1989; SOED,1993; LTS, 2000). The result of this has been that assessment has been primarily summative. The *physica*l product or system the learner has modelled is used as the evidence of learning and this is supported by the *physical* outcome of the thinking as it is represented in the individual learner's portfolio.

Black and Wiliam (1998) reported on research that indicated a sigificant change in philosophy of assessment was required. Scotland began to address this through a national initiative entitled *Assessment is for Learning* (AifL: see for example, LTS, 2002; Scottish Government, 2005; LTS, 2005). Analysis of data gathered through previous research by McLaren, Stables and Bain (2006), provides evidence that peer and self evaluation strategies, and meta-cognitive prompts as integrated and structured aspects of a design based activity can help inform progression in capability and creativity (McLaren & Stables, 2007; Stables, McLaren & Bain, 2006). The central tenet of the research and subsequent developments of assessment *for* learning (formative), assessment *as* learning (metacognive)*,* and assessment *of* learning (summative) provides the foundation for this discussion of the *e-scape scotland* project.

Over the past 10 years there has been growing interest and discussion around the disconnection between digital cultures in and out of school, the potential of the digital technologies (particularly 'handhelds' and mobile devices), and the opportunities for more authentic e-assessment practices. Case studies and innovative projects, good practice guides and literature reviews on e-assessment are being shared across the education community (cf. *'assessment tomorrow'* and *'handheld learning'* conferences; Consolarium, LTS; Faux *et al*, 2006; Becta, 2007). Curriculum for Excellence (CfE) offers opportunities to look afresh at all aspects of content, pedagogy and assessment associated with Scottish education for 3-18 years olds. The Scottish Government and Scottish Qualifications Authority (SQA) are currently considering ways of assessing pupil performance, specifically related to *Assessment is for Learning* in the context of the new curriculum.

Given this context, *e-scape scotland* project offered a timely contribution to the changing educational landscape of Curriculum for Excellence. The key difference between the initial *e-scape,* orginated by TERU at Goldsmiths*,* and the *e-scape scotland* project is the nature of the purposes of the assessment evidence and approach. *E-scape* was initially devised for the purposes of summative assessment through a time dependent, standardised and scripted approach, as would be required for assessment *of* learning by national examinations and awarding bodies. In contrast, the main thrust of *e-scape scotland* is to explore the potential of the *e-scape* methodology in school classrooms (with primary/10-11year old learners and secondary/11-15year old learners) where creative performance and assessment for learning are the primary concerns. The philosophy of assessment within the curriculum, states 'Assessment activity should not dominate the learning process' (Scottish Government, 2010). The emphasis is on breadth, challenge and application. A range of approaches to assessment is necessary and active learner engagement is crucial.

Aims and objectives of *e-scape scotland*

Within this context, the aims of *e-scape scotland* were established:
> To capture learner performance, thinking and creativity, as they work on design challenges, to facilitate formative assessment strategies.

Objectives
- To trial and appraise the opportunities that an *e-scape* approach offers for supporting Assessment *for*, *as* and *of* Learning .

- To capture creative learner performance in real time scenarios as a means for recognising achievement

- To provide a range of evidence useful for assessment, through various modes of expression, providing learner flexibility and choice.

- To provide 'proof of concept' of the *e-scape* approach in the learning and assessing process and how it may affect the iterative approaches to creative, critical thinking and communication.

- To contribute to modes of formative (and summative) assessment within the principles and purposes of Curriculum for Excellence.

- To collect evidence that will provide data to inform and support learners and teachers in terms of progression and transition.

e-scape scotland approach

Following an appraisal of available digital devices, in consultation with the TAG technical team, it was decided to progress the *e-scape scotland* project with small robust, netbooks, specifically manufactured for school use. They offered a range of features required for multi-modal capture of data arising from the types of learning activities and challenges, including camera, touch screen/ drawing tablet, and microphone (figure 1).

Figure 1. The portable devices used to capture thinking in real time through *e-scape* system

To create the interactive *e-scape* system in a classroom / workshop a number of steps were necessary.

First, *e-scape* activities were authored on–line using the web-based bespoke *e-scape* authoring system. The teacher then selected the class/group members who would be involved in the activity. The activity was then uploaded to the *e-scape* management system laptop (EMS) connected to a router. This, in turn, sent the activity to the learner's netbooks. Using the EMS, the teacher controlled the activity, checked progress of individuals on an overview screen, and provided feedback for individual learners. The netbooks synchronized with the EMS, built up a personalized portfolio for each active participant that represented their journey through the activity in the various evidence modes as prompted or chosen (see figure 2). The modes available to the learner to capture their designerly thinking included tools such as mind maps, photos, audio files, video, sketching/ drawing, text. These individual portfolio records were uploaded and stored on the web-based *e-scape* system as class set files for access by teachers and, learners.
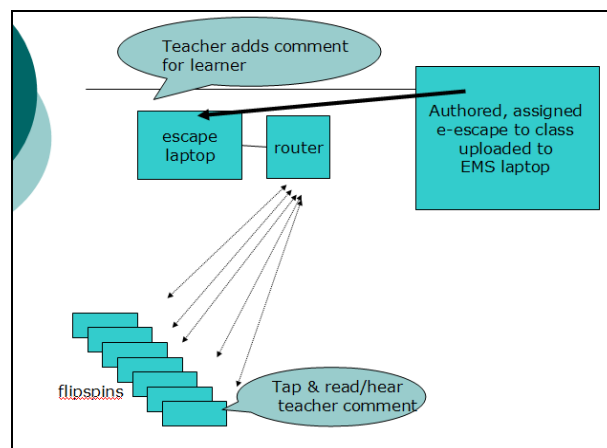
Figure 2. Schematic of *e-scape scotland* system set up for classroom use.

E-scape scotland takes place in the context of sequential classroom learning and teaching sessions, where intervention, ongoing teaching and formative feedback is provided throughout the projects. Teachers and learners can view and interact with the e-portfolios at any chosen time. A folio in progress comprises 'boxes' of prompts for activity of some sort and provide links which activate the options for the various recording media as authored by the teacher at the planning stage (Fig3). The learners can navigate through an authored task at their own pace.

Figure 3. Screens as seen by learners to prompt recording at significant points.

Figure 4. Overview of e-folio with comment to be read from teacher indicated by a green flag.

Teachers can provide feedback, prompts, encourage reflection and set targets for the learner in text or audio format (Figure 4). The learner can access the feedback from the e-portfolio on the device at any time.

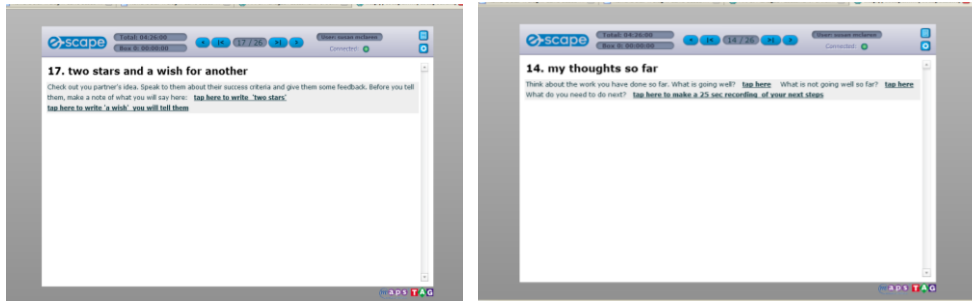From the outset of the project, some of the participant teachers authored their design activities to suit the learning intentions, as identified by their school programme of work. All activities include peer and self evaluations, reflection, review and target setting. They also all incorporate some common aspects of design and technology teaching and learning such as exploring a scenario or situation, sketching, making models, exploring ideas, devising design specifications, considering clients and/ or user groups, testing, and collecting research data.

Research Method

An action research approach was selected as the most approriate method (Baumfield, et al 2008). School situated projects were devised, with volunteer teachers, in order to trial innovative formative assessment methods of learner performance in creative design and technology challenges, using the *e-scape* approach. The development of the activities was also particular to the needs of the class groups, learners and schools. Therefore each school had a different scenario, time-frame, and sample groups. This methodology resulted in many variables in the project.

A case study narrative method was adopted for reporting. There were 140 secondary school learners and 165 primary 7 learners involved over a 12 month duration (phase 1 and phase 2 , April 2009 – 2010). The two participant secondary school teachers and three primary school teachers involved in the study were from two different local education authorities;

- Local Authority A (West Scotland): denominational comprehensive secondary school and associate primary school. Schools are served by a closed computer network (i.e. local authority external management of the school computer server and network, dictating what browser, software, access etc. is permitted)
- Local Authority B (East Scotland): non-denominational comprehensive secondary school and associate primary school. These schools had 'bypassed' the local authority contract specification and management.

Although the case study schools are considered as high attaining (LTS, 2009) generally the range of learner ability, the need for differentiation, and the teaching and learning issues that are encountered by the majority of teachers in these schools are similar to those over Scotland as a whole.

E-scape Scotland Activity design

Seven design and technology related activites were authored in this project, using the on-line *e-scape* system. These were designed in 'flexible mode', which means the activities can be readily stopped, started and modified as the learners progress. For example, the initial time allocated for tasks can be extended or shortened in real time by the teacher while the *e-scape* activity is in progress. Learners can also navigate independently between sub-tasks in the overall activity. The seven activities varied in duration between four and twelve sessions of approximately 1 hour each.

The e-portfolio system captured the design centred activity as framed by the learning and teaching plan. This allowed the recording of the learner's analysis skills, decision making and related justification. Within *e-scape*, the learner's imagination/ innovation, ability to communicate ideas (mind maps, verbal commentary, notes, diagrams, 3D modelling/ rapid sketch prototyping) and development of ideas through synthesis and iteration can be represented in a range of ways as selected by the learner and

prompted by the teacher. The teacher can review and note whether the learner is able to retain a focus on the task and define requirements at any point during the activity. The system also provides facility for the teacher to hear / see the way learners provide meaningful and focussed peer support. The learner's response and critical thinking in response to prompting can be recorded. Overall literacy, in terms of comprehension, clarity, oral, written, interpersonal was embedded into the planning of the activity for each learner to display in the most natural way. Each activity required learners to set personal learning targets (short, interim, long term). This was to encourage them to engage with self evaluation and reflection on learning and performance outcome, self assessment and review. In addition to ongoing ipsative assessment, the teachers referred to their identified formative and summative criteria to provide ongoing feedback and facilitate the learner's next steps, prior to each teaching session. A 'greenflag' icon appeared on the learner's digital folio to indicate that there is a teacher comment for the learner to view. This was accessed by the learner through the portfolio view facility on the netbook (Figure 4).

Most activities utilised the full palette of tools on offer, that is the mindmap tool, text, uploaded resources such as worksheets ('read only' and 'write on'), photo, video, audio, sketch and collaboration for feedback. All activities incorporated some aspect of learning in 'collaborative mode'. This mode allows each learner to see the work of another learner on their own netbook screen at a particular point in the activity, and to comment, sketch and annotate their peer's work. The combined image/ feedback is then available for the orginator to view.

As a familiarisation activity for the learners, all teachers adopted the same pre-authored short and 'strict mode' (i.e. fixed-time, tightly structured) task which introduced the learners to the different tools/modes for capturing their thinking through use of text, drawing, camera, and voice.

Forms of feedback

Assessment *for* learning and assessment *as* learning strategies were integrated throughout the different *e-scape scotland* project activities. The most common types of tasks were those involving the learner in peer feedback on design ideas. The learners were also required to evaluate their own designs: their progress, strengths and weaknesses. They were asked to consider comments from peers and decide whether to act on the comments. Their next steps/ intentions for action were recorded.

It is important in this project to recognise that two quite different forms of feedback to learners were explored. First, peers could add ideas and thoughts to the originator's ones. These new thoughts and ideas can be in any mode (eg drawings / text etc). So the learner can benefit from additional ideas offered by peers and choose how (or whether) to adopt these new ideas into their own. This is normal collaborative / group work as it might be recognised in any classroom. The *e-scape* system allows this to be easily captured and shared digitally.

Additionally, another mode of feedback was made possible because of the priority that formative feedback had within this project. *Curriculum for Excellence* explicitly highlights the role of teachers interacting with learners within the learning framework, and it was suggested that the portfolio system should facilitate this. Through a series of discussions between the teachers, the researchers, and TAG Developments, a new model of feedback was developed into the software. This enabled the teacher, at any point, to look at the evolving portfolio of a particular learner and to add

comments / suggestions / ideas / in exactly the way one would if talking directly to learners in the classroom. Initially these teacher comments and suggestions were in written/note form, left in the portfolio so that the learner could see them when s/he next opened the portfolio. Subsequently, these feedback comments were possible as direct voice files, so that as the e-portfolio was opened by the learner, the teacher's voice gave feedback to him/her directly. It was felt that this mode of feedback would be particularly helpful for teachers who could review the portfolios after school (perhaps at home) and leave their feedback in a mode suited to the individual learner. *E-scape scotland* was the instigator of this innovation within the *e-scape* system, and provided the first classroom trials for teachers to experiment with it.

Data collection for the case studies

The case studies draw on data collected from the specific situation of the schools and the responses of the teachers and the learners who engaged in the project. Methods adopted included researcher observations of the classroom implementation, teacher blogs and e-mail correspondence, review of evidence captured, review of authored *e-scape* activities, survey responses from each participant learner, semi-structured interviews (taped and transcribed) with each participant teacher and a round-table teacher, researcher and sponsor discussion. Data were analysed and reviewed in terms of learner response and teacher reponse, general learning, teaching and assessing. Analysis also included matters of housekeeping and management, software and technical aspects, but these are not reported in this paper. A summary of the responses from learners and teachers is given in the following section.

i) Learner response
The flip-spin/ netbook proved popular with the majority of the learners and they seemed confident with the sketching and drawing, although many had not used a stylo on a touch-screen before. (The learners called the netbooks 'flipspin' or 'fizzbooks' due to the screen which could be rotated and become a graphics tablet.) Voice files proved amusing for learners and many did not enjoy hearing their own voice. Positive learner comments commonly included the ease of use, the fun in using the various tools of the device especially the touch-screen, video and camera and the facility to provide comments on other learner's ideas. For example,

> '*I like the camera, voice recorder and that you can take videos the best because you don't have to type anything which makes it easier and you can show your model in a picture or video so people can see what it looks like.*'

> '*It was made easy by the fizzbooks that you wouldn't have to take pictures from a camera and send it to a laptop then look at it- it was just there*'

> '*The thing I liked best was taking the pictures of different stages in my design instead of having to draw all my ideas out or write about them. It saved a lot of time.*'

However, not all learners agreed with these sentiments.

> '*I didn't like taking the photos all the time and doing the folio on the fizzbooks as I would prefer to draw them on paper and write about them on paper. I think that it would of been easier to do our folio on paper as it would of saved a lot of time and we wouldn't need to stop all the time to take photos and record our voices saying what we think as it wasn't really important.*'

The majority appeared to be impressed when the ideas of their peers appeared on their screen for them to draw on, annotate, offer new ideas and provide evaluation comment. They were also positive about the benefits of being involved in the interchange of feedback. Learners were asked what they thought about the facility to receive comment and feedback from their peers. Typical of such responses are:

> *'The best bit about using the fizz-book spins was that you could see other people's idea and put comments. It was helpful to see what people thought of our idea.'*

> *'One thing I enjoyed best was reviewing. I enjoyed typing up what I thought of my idea and seeing what my class mates thought of my idea.'*

> *'I liked the bit where we got feedback from our classmates as it gave us a 3rd degree apart from the teacher.'*

On the whole, learners were positive towards receiving comment and feedback from teacher through the e-folio, albeit technical issues often hindered this aspect.

> *'I liked being able to have the fizzbooks to record our voices and what our opinions were so the teacher could go on our folios and write what she thought about our design and what we should do next.'*

Responses regarding the opportunity to look back at the e-folio, view and listen to the work captured, conduct further review as *ongoing* reflection and set the 'next steps' received more mixed comment. Again, the selected quotes, given below, in the words/spellings of the learners, are representative of common responses, starting with the more positive.

> *'I liked taking pictures and recording your voice because it helped you change your design along the way and also you could and if you forgot what you wanted to change you could go back and see what you said.'*

> *'You could have a quick timeline view of all the things you had done in this project. also this also meant that it was much harder to lose anything.'*

> *'Useful ? Not really because you already know what you think.'*

> *'I thought it was a waste of time because we already new that our stuff was all correct.'*

Additional negative learner comments commonly included poor sound quality, wait time related to logging on, synchronising with the server / EMS laptop, uploading to view the portfolio, and general technical glitches.

ii)Teacher response
The teachers remained highly positive throughout the project. At times, technical issues of software, hardware, general housekeeping and management aspects of the various digital devices tested their perseverence and organisation skills.

Authoring activities

The teachers reported that they found the authoring of the activities relatively straightforward. As with all presentation of information or instruction to learners, care is needed to create a suitable and accessible interface. For the most part the authoring interface seemed intuitive, but the teachers did not feel the basic graphic interface as it appeared on the learners screen was at all appealing.

They gained confidence in selection of evidence capture modes to match the desired outcome. The data analysis highlighted the need to build in some learner choice of evidence capture tool, while at the same time recognising the importance of not always allowing a learner to utilise their preferred mode, e.g. spoken word rather than written word. It was considered important to develop the weaker aspects of a learner rather than allow them to always work to their existing strengths. It seemed that an open choice was not as successful an approach as initially supposed. The learner became overwhelmed and attempted to utilise every tool rather than select what they considered appropriate. Thus, the tools selected for the learner to use for particular aspects need to be authored in to the overall activity with care.

The teachers noted that authoring *e-scape* activities required a shift in their pedagogical practice and understanding of some theories related to capture of designerly thinking. Some of the teachers were entrenched in a paper-based linear folio approach, such as exploration of ideas undertaken prior to modelling in 3-dimensions. They also had become formulaic in their approach to a design task and insisted that 'research' is undertaken prior to any exploration of ideas. Although the *e-scape* authoring tool was set up in as a linear graphic which implied a sequential procedure, yet when undertaken the *e-scape scotland* activity did not need to be experienced in that way. The teachers were also unaccustomed to encouraging learners to show, share and 'hitch-hike' ideas as a method of growing initial thoughts. Design work tended to be the work of solo learners. Therefore, the teachers were required to determine when and what would be designed in to the activity using the collaboration tool.

Collaboration and feedback mechanisms

The teachers agreed there was an added richness to the design activity from the real-time evidence available for making judgments on formative assessment and next steps, for individuals and groups. The examples of reflections by the learners, captured as written or audio files, on their personal strengths, weaknesses and future targets, provided some useful insights which they may otherwise not have realized. For example, the collaborative support comments to develop the work of their peers provided valuable evidence of language and level of critique. These helped the teachers differentiate student performance in terms of their skill and understanding and as such were particularly useful for formative assessment. The ability to consider the design task in focus (function and user, aesthetic and technical aspects) tends to reflect on the performance ability of the one providing the feedback to their peer. To illustrate this, some direct quotes from e-folios are given below (projects were 'celebratory trophy design' and 'portable lighting device design'):

> *'i think sarahs trophey model s very good. i like how it has an a+ to show someone has passed an exam. I also like how she has made it nice and bright and colourful but i like the plack to with the person's name on it. My wish is that sarah sould make sure that the plus doesnt fall off becasue it might get loose, and wobble about it. but apart from that its really good.'*

> *'it is aesthatically pleasing...it iis light to hold up when u win it….(needs to be) bigger so that it stood out more'*

> *'We like this design because no-one else has made lights for a wheelchair!!!*
> *They are bright and funky and we really like them!!!!!*
> *They will make a wheelchair bright and different than other wheelchairs!!*
> *It is also nice that they thought about the people in wheelchairs!!!'*

> *'your idea was fabby, and you could definitly wear it outside. it could of had a bit more colour just because it only had green. the switch was easy to get at aswell.'*

Not all teachers considered the facility for inputting comment / formative feedback to the learners as entirely positive. It was interesting to see the different approaches teachers took to provide formative feedback. Some used questions to prompt deeper thinking, or probe for more information. Typical samples (as written by teacher) are given below:

'Great idea! Will the light shine forwards, backwards, or all the way round the walking stick? Cars may be approaching the person from different directions so think about how you could have the light shining in as many directions as possible.' Teacher Primary School B (Thu 4th Feb 2010, 15:00:36)

'This adaptation increases the width of the handle. Looking at it make me think of handles on a variety of things in my kitchen. Are there any from your own kitchen that might inspire you?' Teacher Secondary School A (Wed 11th Nov 2009, 22:29:02)

'Have a look at where the blade and handle come together. Could this area be changed to make it easier to clean and make the design stronger? Will the smile affect the strength of the blade? Try bending the model at that point to find out.' Teacher Secondary School A (*Wed 11th Nov 2009, 22:05:37*)

Others tended to instruct and provide explicit directions for next steps. The samples below illustrate the range used:

'Well done on trying out the audio recording - remember that it was filing the metal not chiseling as you say in your recording, but good work all the same. Your next step is to drill the sides of the clock. I have fixed them for you and you can drill at each cross on the side of your clock. After that it is onto the mortice machine. Ask Khurram to help you get set up with the mortice machine to cut out the back square of your clock.' Teacher Secondary School B (*Tue 1st Dec 2009, 18:56:10*)

'Euan, decent work on your clock so far ……You have a new piece of pine which hasn't yet been cut to length. Your next steps with your clock is to mark out a template of the side profile of the car and mark this onto the wood. You will need pencil, card and scissors to do this. Use a tenon saw to cut the sides to length. Then use a coping saw to cut out each side.' Teacher Secondary School B (*Tue 1st Dec 2009, 18:00:24*)

The teachers viewed the feedback tool with caution. There was consensus that it is no substitute for one-to-one dialogue, direct intervention and questioning in real time. There was also a distinct difference in thoughts on the advantages of the feedback systems between the primary school and secondary school teachers. The primary teachers agreed that tangible evidence of formative feedback in the e-folio was useful. However, Teacher, Primary school B, suggested

"There is a worry that there was pressure to give feedback to every single child before each session… Child thinking they've not had feedback if it isn't written, on the system. The children have it in their head that unless it is on their portfolio- you haven't looked at and it isn't in a green bubble. So you haven't given me feedback--…… Is recorded feedback valued more that the feedback, questions and reassurances given in class while engaged in task?"

Generally, Primary teachers were much more comfortable with their own judgment and recall. Teacher 1, Primary school A, wondered, *'why evidence everything? why get bogged down in that- you lose the teaching- why do we need to prove all that..'* It was acknowledged that providing feedback for every learner during a highly interactive and practical design and make classroom activity was difficult. The quiet reflection time, reviewing the e-folios and hearing, seeing and reading the performance and thoughts as recorded by the learners permitted access in an alternative and intimate

way. The teachers became aware that it was far more important to *provide* the direct feedback than to *capture* it as evidence. As a secondary teacher participant, noted:

'*Some* (learners) *went, "OK. I'll work on that feedback you've given me, or that target you've given me" and then others would just read it and then ask you anyway and they needed that verbal link.'* Teacher, Secondary school B.

The timing of providing formative feedback was considered. With the cautions and limitations noted previously, generally the secondary teachers felt that the provision of '*feedback and prompts ready for them to view at the beginning of a new session… important in the creative stage to prompt and help them 'hit the next 50 mins session running…'* Teacher, Secondary school A.

The teachers began to identify some significant 'boxes', or sections of authored activity, which provided useful timely formative feedback. For example, there was a consensus that they way in which learners responded to the sections which asked them to create a 'specification', or list design criteria, proved particularly pertinent. The teacher could ascertain the level of understanding by reviewing what the learner had noted, especially in relation to the user(s) and key features of the functional, aesthetic, and technical requirements. This allowed them to note the learner's level of appreciation and analysis of the design activity scenario. Subsequently, the thinking processes could be tracked through the e-folio in self-, and peer-evaluation sections and next steps, with these the aspects as benchmarks.

This evidence indicated the learner performance in terms of '*proving (criticality)*' and '*growing (synthesis)*' (Kimbell, et al 2004). Research by McLaren et al (2006) and Christiaans, & Venselaar (2005) noted there is a tendency to lose sight of the design goal when making interim appraisals, particularly with novice designers. A useful discriminator of performance in design thinking is the capability to evaluate and communicate meaningful and developmental critique. This project provided an insight into the quality of feedback to peers and to self, written, spoken and in graphics. For example, some learners were able to provide comment to their peers that clearly focussed on the user, the technical and/or the aesthetic aspects of the design activity. Teachers were able to examine the feedback a learner offered their peers as well as their self-evaluation. The primary and secondary teacher acknowledged that this illustrated how a learner was progressing with their literacy, critical thinking skills and design capability and enabled judgments to be made and useful feedback to be given.

In addition, a participant secondary teacher felt that subtasks that required the learner to
'*Explain in your own words- very useful – also the work at home and feedback from the users* (of the design). *Kids were qualifying their thoughts and decisions with examples like, mum didn't feel it would fit in the dishwasher… when   qualified like this-   indicated understanding… especially when they moved onto make changes of the design..'* Teacher, Secondary School A

All teachers agreed that it was useful to have evidence of a learner acknowledging the peer and teacher feedback and making informed choices regarding changes and development of their idea.   This was highlighted in the e-folio when the learners were instructed to make their next steps explicit: 'what are you going to do now in light of the feed back and comments?' This evidenced the quality of thought in terms of reflection and autonomy related to the changes the learner made by taking on the feedback of others or justifying their actions. The *e-scape scotland* project has indicated that at all stages of learning there is a need for more teacher support in

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terms of the vocabulary and strategies for ongoing evaluation in order for the learners to be able to give constructive feedback. The teachers became aware of a possible weakness in their previous teaching and felt that they needed to do more to develop the learner's skills in giving and taking feedback.

Differentation and Inclusion through Tools for Evidence Capture

In general, the degree of inclusion for all learner abilities was well received, particularly, through the individualisation and choice that was possible within the framework of the design activity and the tools/modes of capturing evidence. It was thought by all teachers that the range of methods of capturing learner thoughts was successful. For example, there was a notable incidence of a learner responding very well to choice of the evidence capture tools. This learner (11years old, Primary school B) was severely dyslexic and very articulate. He was clearly liberated by the audio tool and was able to communicate his ideas and thoughts well in a media he preferred.

In addition to raising awareness of the usefulness of encouraging a wider range of approaches to capture creative thinking, (e.g. spoken words, video, peer critique) the teachers became more aware of the role these modes offered in terms of differentiation in learning and teaching. The specialist secondary Technology teachers particularly felt that *e-scape* approach had drawn their attention more closely to the considerations required of them with regards to their responsibility for literacy. CfE emphasises that literacy is the responsibility of all teachers, across curriculum and as a consequence all teachers should 'promote the development of critical and creative thinking as well as competence in listening and talking, reading, writing and the personal, interpersonal and team-working skills which are so important in life and in the world of work'(Scottish Government, 2009c, p1).

The younger learners tended to engage with the audio and video evidence tools enthusiastically and immediately. The older learners seemed more concerned with what they sounded like on recording and looked like on video. This resulted in them being self conscious and limited in their input or adopting silly voices and performing in inappropriate ways. The secondary teachers agreed that there was value in overcoming the reticence of some learners and developing audio as a more common approach. Perhaps, of all the modes of evidence capture, the teachers showed greatest interest in audio capture. They particularly liked that the system located the audiofile in the realtime e-folio, as part of the process. The audio facility tool was used for various aspects of the design activities. For example to
- record a range of thinking and reflections, including definitions of researched new words, reasons for selecting ideas for designs;
- make comparisons between a range of ideas aginst the specification;
- record progress reviews on what has gone well/ not so well so far; next steps/ targets for the session;
- interview peers regarding their work to date;
- self evaluate finished work; and
- note who learners have helped and how.

Audio, as a method of assessing learning, has not been exploited in general teaching and learning. It was agreed that it allowed the teachers access to evidence that may otherwise have not been available. The advantages were recognised:

'…. Again coming back to the audio, often, as you know, it's a sea of hands when you ask a question when you're trying to gauge understanding but you don't know what everyone's been

thinking but when you can hear somebody explain what they've understood by doing that that's helpful.' **Teacher, Secondary school A.**

There was a willingness to promote audio as a method of assessing and learning about the learning. The participant teachers were keen to exploit recording of learner justifications, statements, explanations and interviewing for differentiated learning and assessment purposes, and create digital audio files particularly for inclusion and differentiation, personalisation and choice.

Planning for teaching

The teachers commented on the influence the *e-scape* approach had on planning more generally. They recognised that when planning a learning experience the production of the end product should not dominate. The *e-scape scotland* activities helped emphasise, to teachers and learners alike, the process of designing. The teachers noted that the process had influenced the way the learners went about producing their designs and their models. Some learners changed their initial idea completely by the end of the activity, and most displayed a progression of incremental changes, benefiting from the feedback/feedforward as the project went along. The process had also encouraged them to use a more varied range of evidence of their thinking, reflection and progression, which was all valuable for making assessment of performance judgements to inform the their next steps.

Analysis of the teacher response data indicated that the most advantageous and positive aspect of *e-scape scotland* was the potential it offered for learners of all abilities to access the curriculum and a wide variety of needs to be met. Differentiation was possible in a variety of meaningful ways and had been demonstrated in the project. The teachers were convinced of the benefits of a more mixed approach to exploration of design ideas and recording of thoughts throughout the process. They were more willing to approach design activities in a non-prescriptive way, which allowed learners to make personal preferences to the methods adopted and journeys taken in their individual thinking.

Teachers felt that the *e-scape* approach encouraged them to be more flexible, yet it still provided a structure within which learners could respond creatively. Indeed, some of the teachers had chosen to take a familiar project and adapt it for *e-scape* rather than create a new learning experience, and this had proved successful. The planning framework also demanded the learners take more responsibility for their own learning, progress and performance. In terms of outline planning for design activity, following the trials, the teachers were keen to embed ongoing peer and self assessment of the designing activity, rather than leave evaluation to a task at the closure of a project. It was suggested that the connections between assessment for learning strategies, learning through designerly thinking, and performance and higher order thinking skills had been understood more deeply.

The advantages of the *e-scape* approach to storing, sharing and revisiting e-folios through web assisted facilities, was recognised. The facility allowed immediate digital access to evidence of creative performance and achievement, learner reflection, self assessment and target setting. This had the potential to contribute towards record of progression, personal learning and individual planning profiles.

Generally, it was agreed that *e-scape* created a richer experience for the learners than traditional teacher led activities and offered a deeper insight for assessment of achievement and performance. It was agreed by all involved that a bank of *e-scape* activities for other teachers to view, edit and use would be a very useful facility.

Discussion

It is evident that the *e-scape* approach can make a significant contribution in terms of supporting learning, teaching and assessment within the framework of principles of curriculum design, and the underpinning philosophy of Scotland's Curriculum for Excellence (Scottish Executive, 2004; Scottish Government, 2010) and CfE Technologies learning area (Scottish Government, 2009b). The strategies which were built into the authored *e-scape scotland* activities and the modes of providing feedback (teacher prompts and questions, peer critique, self evaluation and target setting) served to broaden awareness of assessment *for*, *as* and *of* learning. The quality of the captured e-portfolios provided useful evidence for diagnostic and formative assessment on a number of levels. However, there is admission that further professional development is needed.

Assessment *for* learning

Several studies and reviews (cf. Black and Wiliam, 1998; Lindsay and Clarke, 2001; Nicol and MacFarlane-Dick, 2006) note the benefits of providing a framework for peer assessment; teachers gain valuable insights as a result of seeing one learner's feedback to another; the learners become more self-critical, transfer deeper understanding to their own ideas and proactive in setting targets for themselves as a result. Nicol and MacFarlane-Dick (2006) also suggest that learners sometimes find it easier for learners to accept critque from peers rather than teachers and learn the strategies of sustainable assessment (Boud, 2000). The findings of the *e-scape scotland* project support this. As found by earlier by research reported by McLaren and Stables (2007), the learners did not ask the teachers anything about the predicted or final grade, percentage marks, pass or fail. The comment or prompt questions only approach to feedback, as advocated by Black and Wiliam (1998) served to place responsibility back to learner and removed emotional reaction, competition and ego. As the data reported illutrates, the *e-scape* teachers each had individual approaches to framing their feedback to individuals and although, as noted in previous research (Black and Harrison, 2001) the process took considerably longer it was noted that the platform allowed for differentiated and personalised responses. It was useful to have a record of any feedback offered and evidence of any actions taken as a reslt of receiving it. This project also highlighted the need for more explicit teaching strategies related to how to judge the success of a design idea. For example, focussed scaffolding to help the learners evaluate their own designs, and those of others, in relation to the user, the function, the context and design criteria as stated and, as in AifL, to the 'success criteria' (Clarke, 2001). Leakey (2001) emphasises the need for the feedback to be constructed in such a way as to move the learning forward and, in agreement with the findings of the *e-scape scotland* project, acknowledges that written or audio feedback does not superceed the need for dialogue and face to face interaction with the learner.

Assessment *as* Learning

The tools within *e-scape* encourage learners to externalise their design thinking and scaffold their metacognitive and creative evaluative thinking skills and there was consensus that, as a result, the learners enaged readily with review and reflection tasks. Harlen (2004) and Evans (2001) recognise the importance of speech for reflection and expressing connections between old and new ideas on the journey to more holistic ideas and understanding. Evans suggests that there should be greater

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use of the oral response mode in particular. Kimbell and Stables (2008) highlight the importance of supporting learners beyond being aware of their own thinking to allowing them to take greater responsibility for it, through their own target setting to enable them to manage their 'progressive pathway towards procedural autonomy' (Kimbell and Stables, 2008:224). The *e-scape* teachers recognised the importance of developing the vocabulary and language of reflection to enable the learners to review their own learning, identify progress and establish 'next steps' as personal learning targets.

Assessment *of* Learning

Assessment *of* Learning was not the core focus of this research. Talking, listening, reading and writing, in a wide range of genres, and for a variety of audiences and purposes will form the basis of a summative judgment on literacy achievement for each learner (Scottish Government, 2009c). The multi-modal evidence collected through *e-scape* is useful and positive in determining summative achievement and attainment in CfE Technologies. However, the teachers noted that they were unsure as to the standards and quality of literacy, and technological capability, to be expected, at this early stage of introduction of the new curriculum.

Conclusion

The early trials of *e-scape scotland* have helped to identify strategies to progress approaches and pedagogy associated with the key messages of evidence capture, Curriculum for Excellence and assessment. It is hoped that the contribution offered by *e-scape scotland* helps to develop pedagogies which enable the capture of creative thinking in real time for authentic and formative assessment. It may address some of the assessment issues for classroom practice and practiconers as identified by McLaren (2007). It is anticipated that illustrated *e-scape scotland* digital case studies and dissemination will share the teaching and learning activities with a wider audience to map the examples of collaboration, self and peer evaluation to the *Assessment is for Learning* strategies. Teachers are to be encouraged to engage with and discuss the advantages and issues of incorporating a range of digital tools to capture various types of thinking through the sharing of practice. The case studies will serve to highlight creativity, flexibility and learner choice in the planning and implementation of design challenges, and demonstrate a range of approaches in using ICT to enhance learning. The data from the *e-scape scotland* trial provides a starting point to develop critical analysis of assessment by teachers. The 'trace of the thinking left behind' (Kimbell and Stables, 2008:222) strategies of *e-scape* enable teachers to engage learners in reflection, self evaluation, and peer assessment. *E-scape* offers a feasible approach to developing a broader repertoire of methods to develop successful learners (Scottish Executive, 2004) and place literacy in action through a range of genres in Technologies.

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