**Original Project Title:** Developing an integrated online formative assessment framework - providing a scaffold for learning from course to programme based level.

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Aims and scope of the project

Whether we like it or not, assessment is central to the learning experience and can be viewed as ‘... the single biggest influence on how students approach their learning’ (Rust et al., 2005), affecting how and what students decide to learn, as well as how much time and effort they prioritise to different tasks and/or learning resources. Furthermore, each interaction a learner has with the assessment and evaluation process impacts on future learning experiences, further influencing the development of their learning approach (Struyven et al., 2005). Assessment also plays a fundamental role in maintaining and enhancing learner motivation through timely and personalised feedback, allowing the individual to reflect on their learning, clarify any misconceptions and understandings, obtain a sense of the level of competencies attained and gauge how they are progressing academically (Orsmond et al., 2005; Prowse et al., 2007). To progress beyond this individual capability requires intervention from an external source (Vygotsky, 1978).

Providing individualised support is not always possible in today’s educational environment due to a variety of issues including increasing student numbers and pressures on staff time, along with increasing demands for more flexible learning opportunities. Given recent socio-political and pedagogic incentives to integrate information and communication technologies (ICT) usage across the educational sector, one solution to this issue is the effective use of online assessment tools. These tools increase the potential for more frequent and timely assessment of, and feedback on, learner progression, which could be offered 'on demand' to meet individual learning needs. Furthermore, as highlighted in Gipps’ paper on the role of ICT-based assessment in universities (2005), as learning and teaching practices become more reliant on computing technology, it only seems fitting that assessment methods should follow suit to ensure parity of approach throughout the learning experience.

If assessment is to function as an effective mechanism to promote learning progression, it should not only act as a measure of current learning, but also support and encourage future learning (Gibbs & Simpson, 2005), enhancing the quality of learning by providing clear benchmark opportunities for reflection, against which to current abilities, competency achievements and academic progression made can be assessed (Challis, 2005). Furthermore, to ensure effective learning (and teaching) occurs, the methods used must be fully integrated with the assessment practices, with all explicitly linked by clear learning outcomes; i.e., a constructivist approach to learning, teaching and assessment is imperative (Rust et al., 2005). It is therefore paramount that assessment practices are designed and constructed so that all aspects of learning as defined by Brown et al. (1997, quoted in Orsmond et al., 2005), as “…changes in knowledge, understanding, skills and attitudes brought about by experience and reflection upon that experience”, can be tested. By taking an integrated approach, online assessment could be designed to adapt and respond to the needs of an individual learner offering personalised and timely feedback, thereby acting as an interactive learner support system. Such a system will only work however, if learners explicitly recognise how it will contribute to the quality of their personal learning experience.

Helping learners to learn more effectively through scaffolding

Vygotsky (1978) recognised that an individual will only develop as far as their capabilities allows them, and that to extend beyond this requires timely and appropriate external intervention from another source. Vygotsky then defined the difference between what an individual could achieve independently with what could be achieved through assistance, as the ‘zone of proximal development’ (ZPD) - a concept central to much pedagogical research.
In its simplest form, learning can be defined as a social experience that occurs at a personal level, which must be internalised before it can be converted into a useable form of ‘knowledge’ for later application and adaptation. Working from Vygotsky’s principle of social interaction, effective learning will only occur within a supportive and interventionist environment, in which there are opportunities to develop, apply and expand new skills and knowledge, supported at appropriate points and in appropriate ways to meet an individual’s learning needs.

This concept, frequently referred to as ‘scaffolding’, is central to a constructivist approach to learning and teaching. It works in a reactive sense by allowing learners to access support in the form of learning materials, generic resources (e.g. ICT support, library access), and tutor support at a time that addresses their needs. It also works proactively, by flagging potential difficulties, offering links to further learning resources and suggesting appropriate sources of support as and when required, with the latest wave of developments relating to the scaffolding of learning using technology-enhanced learning environments (e.g. Sharma and Hannafin, 2007).

The rapid rise in implementation of ICT throughout education (Dept. of Education and Skills, 2005), is one way in which learning can be scaffolded to help individuals develop beyond their ZPD, however, as Kirkwood and Price (2005) stated: “…although ICT can enable new forms of teaching and learning to take place, they cannot ensure that effective and appropriate learning outcomes are achieved. It is not technologies, but educational purposes and pedagogy that must provide the lead, with students understanding not only how to work with ICT, but why it can be of benefit for them to do so.” Therefore, as the use of e-learning and the integration of VLEs continue to grow across the Higher Education sector, and students and tutors are increasingly presented with a wealth of opportunities to manage, test and support their learning by using online assessment tools, it is paramount that these are carefully designed to ensure the individual’s learning experience is enhanced in accordance with Vygotsky’s principle of assistive learning support. This must be done in an environment that simultaneously matches the conflicting needs of today’s mass education, whilst improving standards and retention rates, and remaining as cost and time effective as possible.

**Study in Context**

This project has been based on the development of an integrated Student Online Formative Assessment (SOFA) for a UK Open University (UKOU) upper level 2 undergraduate open and distance learning (ODL) course in Earth System Science, entitled ‘Our Dynamic Planet’ (S279), presented for the first time in 2007. The academic coverage of this course is similar to two previously existing courses, both of which were perceived as conceptually difficult by students and tutors; as such, an additional source of learner support that could assist with general learning progression as well as proactively deal with individual/specific needs, was sought.

The course (which attracted just under 500 students at the start of its first year) equates to 30 CAT points (~300 hours of study), studied over a 9 month period (from February to October) and is formally assessed by a mixture of continuous assessment and an unseen open-book end of course examination. Throughout the course, students are expected to use and apply a wide range of scientific knowledge and skills from across the disciplines (including areas within Biology, Chemistry, Geology, Physics and Maths), as well as develop a series of higher level cognitive skills that take a more holistic and critically subjective approach to reviewing and analysing current concepts and theories within the realms of Earth System Science.

The SOFAs have been designed to enhance student learning and aid recognition and awareness (of the need) of skills development. It is envisaged that in the near future, the metadata automatically collected by the system will be made available to teaching staff via the VLE, providing a quantitative insight into levels of student engagement and progression, and so enable them to proactively offer generic and specific learning support to meet individual and/or group needs.
The SOFAs

Each SOFA consists of a small bank of ten interactive questions (the majority of which contain exchangeable variables) based within OpenMark, a web-based system developed within the UKOU and which is currently being integrated with Moodle. The system allows students up to three attempts to correctly answer a particular question, each of which have been designed to test knowledge and understanding of a subject as well as demonstrate a range of cognitive, practical and professional skills, whilst simultaneously being offered instantaneous and targeted formative feedback after each attempt to help the individual recognise and correct misunderstandings as they work through the assessment.

Access to each of the SOFAs is obtained via the interactive online study calendar, with students invited to ‘Check your understanding for week …’ as a means of encouraging them to reinforce their learning before moving on to new materials, providing an opportunity to assess personal progress, as well as practice applying newly gained knowledge and understanding before completing the bimonthly summative assessments. The introductory text to each assessment suggests potential ways to work through each set of questions and reminds students that odd numbered questions have been designed to test the expected level of application and understanding within the course, whereas even numbered questions will be more challenging; as such, students are warned not to expect to get all ten questions correct first time (or indeed on their first full attempt at that SOFA).

Students can choose to complete the questions sequentially or in any order they wish using the numbered index on the left of the screen. They can complete all ten questions in one sitting or over a series of attempts (according to personal preference), with the system recording which questions have been completed. Students can end the test at any time (which will trigger personalised summary feedback on the whole assessment) and can repeat any assessment (or particular question) as many times as they wish. As the majority of questions contain random variables, if a student does repeats a question (either within a particular sitting or at a later point), they will automatically be presented with an alternative version of the question.

The OpenMark system also automatically collates quantitative information at the individual student and national cohort level, offering valuable insight into how students are engaging with different aspects of learning. Results are listed subsequently by student thereby allowing individual progression to be gauged, as well as making comparisons across subgroups or the whole student cohort. In addition to each answer being recorded, the system also logs the time spent on each assessment, all of which offers a new source of tangible evidence into how the students are physically engaging with each assessment and with the course content and skills as a whole.

Analysis of this data permits new targeted learning support materials to be developed and/or adaptations made to the current pedagogy to ensure the most effective learning experience for the typical student at the course level. The SOFAs therefore act as a responsive learning support system (similar to a ‘surrogate online tutor’), helping learners to reflect on and challenge their knowledge and understanding, develop and build confidence in their current abilities, and guide them through the learning experience (Chi Ng & Murphy, 2005). Furthermore, once the logistical issue of summarising the wealth of data collected by the system has been resolved, it is envisaged that the SOFA framework will help all stakeholders involved in the learning process (i.e. students, tutors and the course teams) to reactively and proactively evaluate the progress of learning.

Providing instructive formative feedback

The SOFAs offer students feedback advice and guidance at a variety of stages throughout the assessment including; general hints and/or information pages preceding a particular question; stepped and targeted feedback after each attempt at a particular question; summary feedback at
the end of each question; and final summary across all ten questions at the end of each assessment. All feedback is formative, with the feedback provided at the end of each SOFA commenting explicitly on how well each of the learning outcomes tested have been demonstrated, and providing an indication of the overall level of academic competency attained at that point in time (Figure 1).

Within each of the questions, the three stepped levels of feedback targeted at incorrect responses commences with a simple ‘Try again’ comment with some minor targeted feedback regarding minor omissions or errors. The second stage of feedback offers more specific advice and guidance:

- highlighting and commenting on specific (common) errors;
- showing the student by example how to approach a particular aspects of the questions;
- offering tips and suggestions on how to progress; and
- encouraging students to refer back to specific sections of the course text before attempting the question again.

The final feedback provides the student with the expected, completed answer along with a worked example where appropriate, and refers back to the course text to help place this learning into context, before emphasising which skills have been developed and stating why these are of importance at this particular point in time and at future points within the course and their studies in general. In some instances, the final summary will encourage the student to access additional sources of help and support and/or to discuss this issue with their tutor. Each end of question feedback concludes with a list of the learning outcomes tested by this particular question.

**Developing a framework for learning**

In addition to varying the levels of questioning within each SOFA (e.g. odd numbered questions are less taxing that even numbered questions, and with each question slightly more challenging than the next), the assessments have been designed such that each one is progressively more challenging, to maintain the level of difficulty as the student becomes more familiar with the approach and common concepts being developed. This approach offers two levels of complexity within the framework, developing skills and application on a chapter by chapter basis as well as throughout the first half of the course.

The main objectives of the SOFA framework are therefore to:

- develop a ‘safe’, formative learning environment in which students can test their depth of learning and application and thereby enhance their awareness, understanding and recognition of personal strengths, weaknesses and achievements, within learning outcomes framework;
- use a constructivist approach (goal-directed and knowledge-building) to offer appropriate adaptive (i.e. flexible) and timely levels of support to allow students to (holistically) test their academic progress at predetermined and self-selected points throughout the academic year;
- encourage students to develop a more self-directed, integrated and paced approach to learning and to become more confident, motivated and satisfied in their academic progression, thereby aiding retention; and
- develop a mechanism to collate quantitative and qualitative data on student progression and the attainment of the course learning outcomes, thereby providing a better insight into the type of proactive generic support required to meet typical learning needs within the course.
Activities

The Challenge - integrating the SOFAs into the learning experience

In on-going subject-reviews, the Quality Assurance Agency (QAA) have continuously highlighted current assessment practices within the UK Higher Education (HE) sector as one of the weakest component in the educational system (Gibbs & Simpson, 2005; Rust et al., 2005). Particular criticism has been aimed at the limited range of assessment methods commonly used, in turn highlighting the limited range of skills and understanding being tested. While assessing the quality of learning across the HE sector, Nightingale et al. (1996, p.6, quoted in Challis, 2005) recommended three main areas in need of change:

the ability to develop and assess a much broader range of skills;

the ability to support learners more effectively by using a range of summative and formative assessment tools to their full and most appropriate potential; and

the notion that all learners should be intimately involved in the assessment process irrespective of their academic abilities, developing the skills and competencies to assess their own performance.

The pedagogic approach and structure of the SOFA, designed to scaffold, support and promote learning achievement and progression, directly addresses each of these points.

Intrinsic and extrinsic values – encouraging learners to use the SOFA

As an interactive learning support system that can enhance an individual’s ZPD through targeted and timely support (Vygotsky, 1978), it is imperative that learners (and tutors) recognise:

the extrinsic and intrinsic value of the SOFAs in relation to recognising individual (and community) levels of academic progression through the successful demonstration of learning outcomes;

the role that formative assessment can play to enhance the learning experience;

the SOFAs as an integral part of the whole learning package and not as a ‘bolt-on’ or supplementary resource designed to take the role of a (remedial) learning aide rather than a central learning resource; and

that they can interact with it easily, without the fear of technical difficulties or time constraints (e.g. it supplements rather than distracts from the rest of the course).

Each of these points relate to the five principles of learning skills development outlined by Simpson (2002, p135), in which he states there is ‘…no absolute set of learning skills appropriate for all ODL students at every stage’, as learners prefer to use the methods of learning that are most familiar to them, refusing to change unless they can see a direct and immediate personal benefit. This corresponds with the findings of Kirkwood (2003) and Kirkwood and Price (2005) in which studies of learners’ use and perception of different learning media, were carried out. Both studies discovered that when faced with an array of learning media, learners allocated their time according to the resource they perceived most ‘cost effective’ in terms of overall time management and in tackling summative assessments. Kirkwood (2003) also reported that although learners recognised the intrinsic value of different learning resources, the level of integration of a resource with the core teaching materials (e.g. printed textbooks in distance learning; lectures in campus-based courses, etc.) was key to whether it was perceived as sufficiently important to be an effective use of time. Where a medium was perceived as ‘bolted on’ to the core learning resources, learners were unlikely to use it, preferring to allocate study time to more ‘valued’ and ‘central’ resources.

Another factor influencing a learner’s use of particular ODL learning resource related to whether it was sent to the learners or whether they needed retrieved/ access it themselves. The general
consensus on usage was summed up by one learner who stated: “People are too busy... they won’t [access the learning resource] unless they know it’s absolutely essential, and if it’s essential, they should have provided you with [it].” (Kirkwood, 2003).

**Encouraging learners to use feedback to enhance further learning**

One of the main reasons why learners do not engage with feedback is because they either do not know how to use it, or cannot see how it enhances their studies. A recent study has also found that feedback is often provided too late and/or returned some time after the original event, by which time the learner has moved on to new topics, concepts and challenges (Gibbs & Simpson, 2005). In the same study, learners stated that the two main reasons they did not engage with formative assessment were time constraints and a belief that it had no direct bearing on their summative assessment (i.e. academic progress). Therefore, if learners are to use formative feedback it is paramount: i) they are explicitly told how to use it; ii) that it is forward looking (therefore acting as a scaffold for future learning development); and iii) it is timely (Gibbs & Simpson, 2005; Haigh, 2007).

Within the context of the SOFA framework, by directing students to the formative assessments via the online interactive study calendar (which is used to flag which other learning resources need to be used each week), and using instructivist phraseology (e.g. ‘check your understanding’), the intention is that this will emphasise that this resource is an integral part of the course and that paced engagement (each week) will enable students to test and strengthen core skills and application of knowledge.

**Pedagogic benefits of adaptive questions and responsive feedback**

To ensure learners recognise the SOFAs are beneficial to learning progression, they must respond ‘intelligently’ to individual learner needs (Chi Ng & Murphy, 2005). Although many current ICT learning systems provide instant summative feedback (while simultaneously collating a variety of statistical data that can be used by the tutor to adapt and develop more effective learner support), many of these systems cannot provide the level of formative feedback needed to assist informed academic progression, where this feedback can be used to focus on specific issues (Ross et al., 2005). The SOFA framework offers a certain level of variability and choice within the questions, but more particularly offers responsive feedback that can help to direct future learning by focusing attention on particular strengths and weaknesses apparent within the student’s responses.

Although not adaptive in the true sense of the meaning (in which the context and level of the questions change to meet the demonstrated needs of the student), by setting the questions at two pre-defined levels (and explicitly stating they are not expected to get the higher questions correct first time round), learners have the option of adapting their use of the system by opting to complete subsets of questions that match their needs and/or current capabilities. In addition to this coarse grade variation in academic level, the level of difficulty progressively increases, with each successive question progressively more challenging than its predecessor and between each of the SOFAs, with SOFA 2 (Chapter 2) more challenging than SOFA 1 and so on. This approach enables progressively higher levels of academic, cognitive and key skills to be tested, and so has the potential to support learners in the development of a deeper approach to learning as their academic knowledge and understanding evolves as they progress through the course.

In relation to the feedback, OpenMark allows a bank of specific and targeted feedback to be incorporated into the system on a stepped basis and triggered in response to pre-determined common errors and misconceptions. The stepped and targeted feedback (in which the advice and guidance increases in depth of explanation with each attempt) enables students to recognise and correct the specific errors or misunderstandings they have made, whilst working through the assessment (Ross et al., 2005), rather than having to critically compare and contrast their answers with a generic response to determine where they had gone awry. The overall
pedagogical benefit of such an adaptive feedback framework is the provision of pertinent and immediate formative feedback that is specific to each learner, thereby helping them recognise current weaknesses and misunderstandings, and so develop more effective approaches to learning development.

**Evaluation methods**

Analysis and critical evaluation of student (and tutor) interactions with the SOFAs from the first year of presentation is still ongoing, with the results presented in this report are based on the first year of the course (February – September), focusing on actual usage and perceived value of the SOFAs in relation to learning progression, with this first phase evaluation based on three main sources of information:

- analysis of quantitative data automatically collected within the OpenMark system;
- Question 11 - an online questionnaire, available end of each SOFA;
- a series of targeted telephone interviews, using the Success Case Method (SCM) approach.

Continued investigations and analysis of usage and non-usage is scheduled to continue with some students from the first course presentation period. These results will be compared with surveys carried out with students during the second year of presentation. (The primary aim of this is to ascertain what impact the tutor has on perception and usage of the SOFAs now that they are more comfortable with the course content and aware of how the SOFAs were used by different types of students in the first year.)

**‘Question 11’ – focused and open student feedback**

At the end of each SOFA, students were encouraged to provide feedback using a combination of short multi-option questions and an open text feedback box (Figure 2). The multi-option questions were designed to obtain rapid insight into the amount of time individual users believed they had spent on each SOFA, along with how they rated the assessment in terms of usefulness in enhancing their understanding of the course materials, pacing learning, demonstrate learning progression, making the learning outcomes more apparent and/or acting as a useful self-assessment/revision tool. In contrast to this closed feedback, the open feedback allowed students to submit personalised comments about their experience and to flag aspects of the assessment, course or their learning, they considered to be of importance.

**Success Case Method (SCM)**

The Success Case Method (SCM) evaluation technique was initially devised by Robert Brinkerhoff (2003), as a mechanism to investigate why particular practices were working for some individuals/organisations (but not for others), and how this insight could be used to improve practices for others. It employs a mixture of quantitative and qualitative social science research methods, combining story-telling with scientific analysis of ‘hard data’, as a means of turning emotive findings into practical solutions. As such, SCM is particularly useful for assessing social practices, outcomes and impacts; areas that are typically very difficult to quantify (Brinkerhoff, 2003, p.xi).

At the most basic level, the SCM technique works from the premise that majority of data collected in most studies will form a bell-like distribution curve, with examples of ‘absolute success’ and ‘absolute failure’ forming at the extreme ends. Within the core of this bell curve distribution, trying to identify the key issues within a complex programme will be virtually impossible due to the amount of additional information (or ‘noise’), related to what the majority perceive as being ‘satisfactory’ practice. In contrast, by focussing on the extreme ends of the
distribution curve, it easier to quickly assemble and compare extreme perceptions, opinions and practices, and from this determine the key influences and in turn, how this information can be used to improve the experiences and practices of the majority. When carrying out such studies, it is vitally important to recognise that the definition of ‘absolute success’ and ‘absolute failure’ will vary between different stakeholders, and that failure does not necessary represent the complete absence of success.

The SCM evaluation technique is based on a five steps, which consist of: i) developing models of what ‘success’ and ‘non-success’ look like; ii) locating robust (and verifiable) examples of success and non-success cases by means of a preliminary questionnaire; iii) identifying the most ‘powerful’ (and hence most useful) stories; iv) interviewing and documenting these extreme cases; v) communicating the findings and making recommendations for improvement (Brinkerhoff, 2003, p29; Williams, 2007).

Within this study, success was defined as the SOFAs being proactively used to test understanding and application, with the results allowing users to identify strengths, weaknesses and misconceptions, gauge personal progression, and enable targeted revision and on-going learning development. The resultant outcomes of such success was predicted to be the development of more confident and motivated learners, who were enabled and willing to take responsibility for their own learning progression and more aware of personal achievements, and tutors who were able to target support and guidance both reactively and proactively to meet specific, defined needs of their learners. (Non-success meanwhile would be represented either by the non-use of the SOFAs or by use of the SOFAs but failure to assist users in recognising how to use their experiences to direct learning and aide future progression.)

**Success Case Method Interview process**

Two key stakeholders were identified for investigation using the SCM technique – the students and the tutors; a brief four-step questionnaire (step ii) was made available to both of these groups via the course website and dedicated online forums, with ten students (eight potential success cases and two potential non-success cases) and two tutors (one potential success and one potential non-success case) then selected to participate in more detailed telephone interviews (steps iii-iv). Each ~1-hour interview used the standard ‘bucket filling’ protocol in which success case stories investigated: i) what was used that works; ii) what results were achieved; iii) what good did it do (e.g. what was its value); iv) what helped; and v) what could be done to make further improvements; the non-success case stories followed a simpler protocol examining: i) the barriers; and ii) suggestions on how to make it a success (Brinkerhoff, 2003, p142-145). In this instance, all potential non-success case stories focussed on individuals who had tried several (to all) of the SOFAs, but did not find the experience of value. Examples of use, effectiveness and/or failure described by each of the success-case and non-success case individuals were subsequently verified by reference to quantitative data collected within the system and by cross-referencing with external sources (e.g. other students/ tutors, assignment grades etc).

**Results**

**Usage and style of student interaction**

Detailed examination of the quantitative metadata automatically collect within OpenMark is still ongoing, but investigations to date reveal that in total, approximately 62% of 2007 student population for Our Dynamic Planet attempted at least one of the SOFAs during the course, with usage of each SOFA ranging from 52% (SOFA 1, mid-February) to 19% (SOFA 7, end of May), averaging at ~27% per assessment. Investigation of the log-on data indicates a varied pattern of usage, with 42% of student population completing at least two or more of the Book 1 SOFAs,
while 15% of student population completed all seven of the main Book 1 SOFAs. Furthermore, a significant proportion of students chose to attempt some or all of the questions more than once, doing so both within individual passes through a particular SOFA and on return visits at a later time/date (with one student opting to repeat one entire SOFA seven times over a period of a few weeks). Analysis of a selection of this repeat data reveals that the majority of students went on to successfully complete repeated question using fewer attempts, and also took less time to complete entire SOFAs (e.g. the average time decreasing from ~70 minutes to ~55 minutes). Although such improvements are to be expected as a result of increased familiarity with the questions, it is important to recall that the vast majority of questions contain variables that alter on each attempt, thereby offering students with a ‘new version’ on subsequent visits. (The subtle nature of some of these variables clearly by-passed a small minority of students who, when retrying questions involving calculations attempted to input the correct answer from previous versions, only to be informed their answer was incorrect and encouraging them to review the different data used in the question before attempting it again.)

**Question 11 – focused and open feedback responses**

The majority of students stated that each SOFA took between 60 – 90 minutes to complete (although a small minority indicated the assessments were taking in excess of 2-3 hours), with the perceived times comparing very favourably with actual time spent per student on each assessment, averaging at ~70 minutes. Although the majority of students completed each SOFA in one sitting, a proportion used the option to complete the assessments over several days (to several weeks in a few instances). Comparison between these two groups in terms of the final results obtained for a particular assessment and their perceived value of the SOFA, reveals no significant difference; one assumption for the difference in style of usage may therefore simply relate to the availability of time students had to spend on this resource.

In terms of perceived value, students consistently ranked ‘tested my understanding’ as the reason why they had found the SOFA useful, followed by ‘useful revision tool’, ‘measured progress’, and ‘made learning outcomes more apparent’, with ‘paced learning’ coming in as the least important/valued reason. These rankings remained relatively constant between SOFAs 1-7, whereas SOFA 8 (the series of revision SOFAs) was understandably perceived as being of equal value for ‘testing understanding’ and being a ‘useful revision tool’.

**Free comments**

A total of 113 free comments were submitted by students in response to the Book 1 SOFAs, with these broadly categorised according to their style as positive (31 responses), neutral (29 responses), negative (28 responses) or suggestions (25 comments), with the neutral comments and suggestions typically involving some level of reflection. Further analysis of this open feedback, has enabled it to be grouped as relating to: i) comments and queries about specific questions; ii) the student’s reflections on their personal progression; iii) issues associated with technical aspects of OpenMark and/or working within an online, web-based system; and iv) comments about maths and the use of equations (Table 1).

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<thead>
<tr>
<th></th>
<th>Positive (31)</th>
<th>Neutral (29)</th>
<th>Negative (28)</th>
<th>Suggestions (25)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question</td>
<td>4</td>
<td>12</td>
<td>13</td>
<td>15</td>
<td>34</td>
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<tr>
<td>Progression</td>
<td>18</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>27</td>
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<tr>
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<td>3</td>
<td>7</td>
<td>9</td>
<td>23</td>
</tr>
<tr>
<td>Maths</td>
<td>3</td>
<td>9</td>
<td>4</td>
<td>1</td>
<td>17</td>
</tr>
</tbody>
</table>

**Table 1:** Classification of open feedback submitted to ‘Question 11’ within the Book 1 SOFAs, according to the style and content of each comment.
Comments relating to specific questions and issues surrounding the use of Maths and equations, were typically phrased as an enquiry or in a discursive style, implying the student expected or was seeking some level of a dialogue with the system, inferring that the SOFA was perceived as fulfilling the role of a ‘surrogate online tutor’ (Chi Ng & Murphy, 2005). In contrast, comments relating to technical issues took one of two forms – those that were directed and instructional in style, with students highlighting actual and perceived errors for correction, and more emotive comments referring to perceived technical limitations that had a negative impact on the learning approach of the individual. Finally, comments regarding learning progression, were typically reflective in style, with the student often describing specific examples of how the SOFA or a particular question had helped them recognise personal strengths, weaknesses or improvements in their learning, as well as what strategies they intended to employ to make further (or new) progress (Table 2).

<table>
<thead>
<tr>
<th>Example free comments</th>
</tr>
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<tbody>
<tr>
<td><strong>Positive experiences</strong></td>
</tr>
<tr>
<td>This was my first OFA and I really enjoyed it. Great study and revision tool, very convenient to work through, and quite fun to boot!</td>
</tr>
<tr>
<td>…interactive assessment a particularly good learning tool, if you are getting the answer wrong it doesn’t give you the answer right away but gently coaches you till you get it right yourself. The references to relevant sections in the sciences good study guide are particularly useful.</td>
</tr>
<tr>
<td>I found this very useful in the fact that it tested me right when I needed it.</td>
</tr>
<tr>
<td>It is a very useful tool to point out where I was lacking. Have made several notes to myself on what to revise (mainly the maths!). Would be good to have some more of these in the run-up to the exam.</td>
</tr>
<tr>
<td><strong>Reflective comments (neutral and suggestions)</strong></td>
</tr>
<tr>
<td>The SOFA results indicate I have a good understanding and I do not feel this is truly reflective of my current state. I guess only the TMA [summative assignment] result will tell!!</td>
</tr>
<tr>
<td>The assessment has made me appreciate just how difficult this course is … I will definitely need to use all help available.</td>
</tr>
<tr>
<td>This is a great way to test what has been learnt and is a great revision tool!! I now know where I have gaps in my knowledge and also learnt some things which I didn’t pick up when reading the book. You don’t always appreciate what your reading and its significance, until you try and apply it.</td>
</tr>
<tr>
<td><strong>Negative experiences</strong></td>
</tr>
<tr>
<td>Made me feel like a drongo!</td>
</tr>
<tr>
<td>Struggled with the maths, but then again I always do :-(</td>
</tr>
<tr>
<td>I am finding these sofas very frustrating - so much printing, even short questions print on to 3 pages</td>
</tr>
<tr>
<td>The other thing I found frustrating was being unable to put aside the question and come back to it later. I find at the end of a chapter in a book I’ll bob about the questions and if I’m struggling I’ll move on to another question then come back to the one I felt more difficult.</td>
</tr>
</tbody>
</table>

Table 2: A selection of open text feedback comments submitted to Question 11 on SOFAs 1-8, outlining a range of positive, negative and reflective experiences.

**Summary review of SCM interviews – identifying values**

A summary of the success and non-success case interviews is presented below for consideration (Tables 3-4).
Examination of past and current course records revealed the students interviewed as part of the SCM process, were spread across the academic spectrum, with some relatively new to ODL, whereas others were more experienced, in relation of the number of ODL courses successfully completed. They also varied according to prior educational experiences (ranging from no declared higher secondary or tertiary qualifications to having completed a tertiary diploma and/or degree), current employment status and age. In terms of gender, nine student interviewees were female and one was male. Although the sample size in this study is currently too small to reach definitive conclusions, on the basis of evidence currently available, it would appear that there are no apparent correlations between the variables listed above and the level of success or non-success. In contrast to the student group, differences in duration and breadth of teaching experience of the two tutors interviewed as part of this preliminary study may have had a significant impact on the perceived value of the SOFAs in terms of their usefulness to support the tutor in their facilitative role and in relation to their perceptions of student engagement.

Before any conclusions can be reached, additional tutoring staff must be interviewed. As the issues raised and discussed by both sets of stakeholders (students and tutors) in this preliminary study were overall comparable, the results have been combined and will be considered from the perspective of what underlies the successful use and perceived value of the SOFAs compared with non-success case examples.

Success case stories

Analysis of the success case stories indicates these individuals adopted a constructive approach to their learning (and teaching), consistently looking for positive and practical solutions to problems as they arose. They did this through a range of deep-level and strategic learning approaches, varying tactics as appropriate to address both extrinsic and intrinsic needs. They tended to be organised and methodical in their approach to learning, and held the belief that all resources should be tried ‘at least once’ to gauge the potential value of a resource to meet a defined and/or declared learning need; the majority also indicated that they expected to see some form of immediate extrinsic benefit upon use.

The level of personal confidence expressed by individuals in this group varied, with some very confident in their ability to recognise their own strengths and weaknesses and to successfully learn and apply new concepts, altering their approach to learning to suit their perceived needs at specific points in time. In contrast, some of the others were less certain in the efficiency of their learning approach and whether they were capable of applying this new knowledge, skills and understanding at the expected academic standard. All individuals expressed an intrinsic desire to increase their level of confidence in their academic abilities and application of learning, whilst simultaneously seeking some form of extrinsic motivator, typically in the form of physical evidence by which to demonstrate that they were progressing successfully with their studies.

Each of the individuals expressing a success case story stated that they immediately recognised both an extrinsic and intrinsic value to the SOFAs in terms of: consolidating and clarifying learning; offering a ‘no risks’ environment in which they could make mistakes without fear of reproach; assess their academic progress on a regular basis; recognising and resolving any misunderstandings, gaps or common errors prior to the summative assessments (i.e. before it was ‘too late’); and benefit from being exposed to new and/or alternative ways of approaching the course content. All found the system easy to access and use, liked the structure and format of the SOFAs (which some described as being ‘...like a mini exam, in that you don’t know what the questions are going to be beforehand and have to really think about them to get the answer’, whilst others described them as ‘...like a game, but designed to be like a real test…’), and set themselves personal goals to consistently improve on previous results.

Individuals in this group tended to alter the way in which they used the SOFAs depending on what they wanted to gain from that particular experience. For example, several students described how they would typically work through each of the questions with the intention of
obtaining an accurate indication of whether they had understood the issues and apply the skills it was testing, whilst at other times (due to time pressures or recognition that they did not understand the question or the topic it was testing), they would skip through the three attempts to get to the final explanation, carefully read through this and relate it back to the main course materials as appropriate, before attempting an alternative version of the question to see if they could now successfully apply this knowledge and understanding. Another common adaptation in the style of usage was to return to a SOFA several days (or weeks) after first working through it and to determine which of the questions and associated topics could be answered with relative ease, compared with those that proved to be more problematic. This approach was used by individuals to reinforce their learning and to demonstrate that they retaining what they had learned and making what they perceived to be visible progress.

Although responses to the ‘Question 11’ questionnaire did not rank the SOFAs as being of particular value in terms of a pacing mechanism, it was apparent that on reflection, the majority of students involved in the success case interviews did perceive it as helping to pace learning, describing how the results obtained from each SOFA made them stop and reflect on how much they had learned, retained and could apply. For all of the students, the outcome of this reflective practice was that it made them return and review a particular section or chapter and retest themselves, before progressing on to the next part of the course. Several of these students went on to described how they were aware that they had the tendency of skim read through course materials, believing they had absorbed, synthesised and understood the content, only to discover once they tried to apply this as part of a summative assessment that they had not understood it at all. They therefore saw the SOFAs as ‘invaluable’, enabling them to regularly test themselves and receive ‘real feedback’ on the effectiveness and efficiency of their learning approach, and their ability to apply their learning.

One of the most valued aspects of the SOFAs was the targeted feedback, which was identified as being a major help in demonstrating learning, boosting confidence and aiding progression. One student was convinced she was interacting directly with a member of teaching staff within the SOFAs because without fail, the feedback always picked up on the exact errors and omissions in her answers. She therefore rated the stepped feedback as being of explicit direct relevance to her personal progression, going on to state that when the feedback kept flagging a particular error or made the same corrective comment, that this indicated it was a ‘real issue’ that she needed to resolve before the next summative assignment (or SOFA) rather than something she could pass off as a simple, one-off error. She went on to describe how after completing early SOFAs and using the feedback to see where and why she had gone wrong in a particular answer, that she started to use the summary feedback to think about the skills she needed to develop and which of the common errors she needed to avoid in subsequent questions, thereby changing her use of the feedback from a reflective tool to focussed feed-forward advice.

Other individuals described similar scenarios in which they started to the final learning outcomes summary to gauge progression and determine which areas they needed to focus their attention on. For many, obtaining a ‘not yet demonstrated’ or ‘just demonstrated’ result provided as a personal challenge, the goal being to increase this to ‘demonstrated’ or preferably ‘well demonstrated’ status. This was typically achieved by repeating specific questions that related to the learning outcome(s) that had obtained the lower status within a particular SOFA, and by comparing summary results between SOFAs to see whether improvements had been made. When improvements were made and retained between subsequent SOFAs, a strong sense of achievement was attained, fulfilling an extrinsic motivational role to encourage ongoing progression and self-assessment.

All bar one of the students, who expressed a strong positive experience from using the SOFAs, stated they would value the addition of a print function in which each question and its summary explanation was available to print as an individual page, thereby forming an instant revision
resource. (The one student who did not want to print out the summaries, was a competent ICT user, who was already saving this information electronically and adapting it into a format that suited her own revision strategies.) None of the students wanted to replace the online assessments with conventional text-based ITQ and SAQ assessments, nor with downloadable Word files, recognising the need to be online to gain the stepped and targeted feedback as well as the learning outcomes summaries listing the levels of competency achieved. These two forms of feedback were therefore perceived as being of more intrinsic value in terms of demonstrating learning achievements and allowing academic progression to be assessed, than the added flexibility that accompanied conventional paper based assessments that could be completed anywhere and at anytime (i.e. without the need to access a computer). Having access to this new form of personalised and timely feedback, was perceived by all of the students as being one of the major factors that was making them feel more confident about their learning and the fact that they were making constant and consistent progress, which they could independently review as and when required.

<table>
<thead>
<tr>
<th>Success case bucket</th>
<th>Summary responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>General benefits</td>
<td>consolidate and clarify depth and efficiency of learning</td>
</tr>
<tr>
<td></td>
<td>no risks learning environment</td>
</tr>
<tr>
<td></td>
<td>revealed gaps, misunderstandings and ‘unknown unknowns’ and offered practical advice on how to address these</td>
</tr>
<tr>
<td></td>
<td>offered an impartial and ‘real’ test of learning and application</td>
</tr>
<tr>
<td></td>
<td>developed alternative ways of interpreting material</td>
</tr>
<tr>
<td>What was used that worked?</td>
<td>easy access via the course website under ‘Check your understanding for week…’</td>
</tr>
<tr>
<td></td>
<td>no risks environment – ‘private’ interaction between the system and the user</td>
</tr>
<tr>
<td></td>
<td>sense of familiarity (recall using of something similar that had proved useful)</td>
</tr>
<tr>
<td></td>
<td>being able to repeat individual questions and tests as and when required (and getting different variables)</td>
</tr>
<tr>
<td></td>
<td>flexibility of use – being able to use the SOFAs as and when required, in a way that suited specific needs and interests at that point in time</td>
</tr>
<tr>
<td>What results were achieved?</td>
<td>recognised strengths and weaknesses, focussing attention on areas/skills in need of extra work and/or revision</td>
</tr>
<tr>
<td></td>
<td>paced/slowed down learning (seen as positive) by revealing how effective individual study approaches were</td>
</tr>
<tr>
<td></td>
<td>allowed tangible progress to be demonstrated</td>
</tr>
<tr>
<td></td>
<td>changing attitudes towards the feedback from used to reflect on results achieved, to a focussed feed-forward identifying topics/skills for future work</td>
</tr>
</tbody>
</table>
What was its value? | focussed attention and helped to direct ongoing learning  
| enhanced confidence in abilities through tangible results  
| encouraged repeated self-assessment and review of progress  
| sense of personal competition (was ‘like a game’), with individuals striving to improve on prior attempts;  
| sense of achievement at visible progress  

What helped? | targeted feedback on specific errors, misunderstandings and omissions;  
| consistent format and approach (quickly developing a sense of familiarity)  
| focussed attention on content and skills development  
| putting all aspects of learning into context (within the realms of the course and learning in general)  

Future improvements? | ability to print questions and summary feedback to be used for revision purposes (although initial attempts and stepped feedback needed to remain online)  

Table 3: Summary of key responses from success-case interviews; the table combines results from student and tutor interviews.

**Non-success case stories**

Analysis of the non-success case interviews from individuals who had tried the SOFAs but did not perceive them as a worthwhile experience, indicated that one of their main concerns was time management. All felt under growing time pressures to maintain their pace with that suggested on the study calendar, stating that they felt there was sufficient work to complete within the course texts and DVD-ROM activities without looking at the supplementary resources (including online activities, additional reading, the online forum and online tutorials). Furthermore, each individual expressed a preference to learning from books, resorting to computer-based activities only where necessary, viewing these as auxiliary to the core learning resource and subconsciously ranking them as less ‘cost effective’ in terms of overall time management of their studies and offering an explicit route through to address the demands of the summative assessments (which occupied a central position alongside the two course texts).

It also became quickly apparent that these individuals did not expect the SOFAs to be academically challenging and so became quickly demoralised when they got questions wrong. Even though they acknowledged that the SOFA introductions explicitly stated students were not expected to get all of the questions correct on the first attempt (or first pass through a SOFA), they did not feel this related to them and hence saw incorrect answers as a personal failure. This sense of failure was not helped by consistently being told that their answer was incorrect nor to ‘try again’ when they knew that they would get the answer wrong yet again. Once they had got the first few questions wrong or found that they needed all three attempts before getting the answer right, they stated that their confidence and motivation dropped, resulting in them either entering nonsensical answers just to get to the summary explanation or trying hard but making progressively more mistakes, culminating in yet further ‘failures’. Even once they had reached the summary explanation, these individuals stated that they did not find this information helpful as they could not see how it related to what they had been doing nor how apply it to their learning to aide academic progression.

In terms of the style and format of the SOFAs, these individuals described the experience as feeling as if they were ‘…under examination conditions and so not allowed to have fun’. They
also felt they were ‘cheating’ by looking at the course books (even though the majority of questions explicitly required them to do so in relation to referring to specific diagrams and data, to obtain their answer) and/or found it logistically difficult to switch between working with their course texts and working on-screen.

When asked why they had repeatedly accessed subsequent SOFAs after their first negative experiences, the primarily reason was that they ‘…did not want to feel they were ‘missing out on anything’, with one of the students going on to state that with each new SOFA she attempted the feeling of impending failure grew in strength, such that she stopped trying to attempt any of the questions, opting instead to repeatedly hit the return button and go straight to the final explanations, so that she could print these out to read later.

Each of the non-success case individuals expressed a preference for the conventional text-based ITQs and SAQs (and downloadable Word-based files containing self-assessment questions and their answers) over and above the SOFAs, as they enabled them to read the question and then immediately compare their thoughts with the expected answer, or to read the question and final answer alongside each other. They felt that reading the expected answers to self-assessment questions and activities, was a more time efficient way to learn and better use of their time, than trying to devise their own answer (which was likely to contain errors and omissions) for something that not part of the summative assessment and therefore of low extrinsic value.

To be of any value, these users felt the SOFAs should either fulfil a completely different role, helping to ‘…fill gaps in prior knowledge’ and being pitched at a much lower (remedial) academic level so that ‘everyone would get all of the questions right first time’, or resort to the standard ITQ/SAQ format in which individuals had the choice of immediately reviewing the expected answer or attempting to complete the question themselves if they so wished. They also stated that they should be based on separate downloadable files or preferably be located in the course text, to make them easier to access and more flexible to use temporally and spatially. In this instance, the flexibility of accessing this learning resource through the course-text (or by printing them out as discrete files) and so being able to read them as and when desired, out-ranked the additional feedback and guidance available by making the SOFAs interactive and online.

Furthermore, the general opinion was that if the SOFAs were to retain a level of interactivity, that they should be based on the DVD-ROM, and be more ‘game-like’, colourful and tactile (e.g. with buttons depressing when clicked, the option for sound, more information sections and less question, and the creative use of colour throughout).

<table>
<thead>
<tr>
<th>Non-success case bucket</th>
<th>Summary responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barriers – general issues</td>
<td>working online – strong preference to working with paper, as perceived to be more flexible</td>
</tr>
<tr>
<td></td>
<td>academic level – felt to be too high</td>
</tr>
<tr>
<td></td>
<td>time pressures – going online was time consuming; too many resources and too much work within the course</td>
</tr>
<tr>
<td></td>
<td>accessing answers – preference to read the correct answer alongside the question</td>
</tr>
<tr>
<td>Barriers to value</td>
<td>results – expected to get all questions correct on first attempt; felt demoralised when this was not achieved;</td>
</tr>
<tr>
<td></td>
<td>feedback – did not like to be told to ‘try again’ or that answer was incorrect</td>
</tr>
<tr>
<td></td>
<td>operability – too many ‘clicks’/ screens to get from the question to</td>
</tr>
</tbody>
</table>
Future improvements/suggestions

| Content – focus on background skills and content to ‘fill gaps’ in knowledge |
| Print-function – ability to print question and final answer from the outset |
| Design and focus – should be colourful, tactile and more ‘game like’ |

| Table 4: Summary of key responses from non-success-case interviews; the table combines results from student and tutor interviews. |

Impact

**Value of the SOFAs – improving experiences and future implications**

There are a growing number of studies that have demonstrated a strong link between the style and format of an assessment and the learning approach that it encourages its users to adopt (e.g. Gibbs & Simpson, 2005; Haigh, 2007); where the assessment focuses primarily on the recall of information, surface and strategic learning approaches are more likely to develop; in contrast, if students are required to apply and demonstrate a range of cognitive and key skills, and/or reflect on how their experiences are impacting on their learning progression, they are more likely to use and develop deeper approaches to learning. As well as encouraging a deeper approach to learning, effective formative assessment systems should engender a strong sense of self-belief and motivate the user to continuously strive to enhance their academic knowledge, skills and application. It should also provide a low stakes environment in which the learner feels able to try different approaches/tasks and to make mistakes in the knowledge that appropriate support and advice will be forthcoming, which in turn make assist in the development of approach used for high-stakes learning activities (e.g. summative assessments).

Although current logistical limitations of working within a technologically-based learning environment (such as OpenMark) impacts on the style and complexity of question that can be set (primarily due to limitations on the style and extent of targeted feedback that can then be offered), preliminary results indicates that where the SOFAs have been perceived as being of value, overall, students have developed and used a deeper, more reflective and inquiry-based learning approach.

This is most evident in the gradual change in usage of the specific feedback and learning outcomes based summaries (at the end of each question and at the end of each assessment), where during the SCM interviews, students described moving from the strategic level in which they looked to see where and why they had made mistakes, to a deeper, reflective level in which the feedback summaries were being used to help feed-forward and focus attention on future work and ongoing progression. (Although caution needs to be applied to any conclusions drawn from the SCM interviews, due to their small sample size, broad inferences can however be made given consistency of responses between individuals and corroboration with the Question 11 feedback and other external sources of information on usage and impact.)

It is also apparent that the SOFAs are seen as a ‘safe environment’ in which to test learning and application, without the fear of being reprimanded or penalised in any way. The fact that the majority of the success case interview students altered the approach in which they engaged with the SOFAs, to meet their immediate learning needs, indicates a level of confidence in the framework to support their learning progression and develop personal awareness of strengths, weaknesses and achievements. For all of these users, getting questions wrong did not necessarily equate to failure, as being able to use the summary feedback to analyse errors and
misconceptions in their work was a positive feature, which could be used to enable ongoing progression. This notion of the SOFAs as a support tool that was to be used as and how the individual decreed, and which frequently offered an alternative way to view and interpret issues presented within the course, increased the extrinsic and intrinsic value of this resource to the individual, enabling them to use it to focus on their needs and academic performance, without the fear of being watched or compared with others.

Overall, summary implications from the Question 11 open feedback comments and success case interviews indicate that for majority of students who used the SOFAs, they are:

- providing a formative safe, learning environment in which to test their learning and enhance their awareness of personal strengths, weaknesses, achievements and progression;
- working in an adaptive manner, allowing students to recognise and resolve misunderstandings through targeted feedback, and in some instances enable students to recognise progress by repeating specific questions/assessments;
- encouraging students to recognise the value of the different components that make up the course and how using different resources can aide learning progression and integration; and
- offering timely self-directed study options, that allow the student to check the effectiveness of their learning and resolve gaps in their knowledge and misconceptions at an early stage in their learning.

**Student experience, teaching issues and strategic change**

**Continued usage versus single and non-usage**

Overall, ~62% of students accessed the Book 1 SOFA framework at least once, which means that ~38% of the students decided (consciously or subconsciously) not to use this formative resource. Of those who accessed the SOFAs, 27% of this group (15% of the total 2007 course population) continued to access and actively use each of the seven main assessments as well as the revision assessment throughout the year, whereas another ~27% of this group only accessed one assessment (the majority but not all of whom accessed SOFA 1). Further work needs to be carried out to ascertain why these two groups of students (non-users and single SOFA users) decided against continued use of this learning resource. Some of the potential limiting factors on usage can be determined from the non-success case interviews and may be related to time issues, the academic level of the assessments or the fact that required online access. Other reasons may relate to those identified by Kirkwood (2003) and Kirkwood and Price (2005), associated with its perceived position (and function) within the course compared to other 'more central' learning resources, and due to lack of familiarity of how to learn from such a tool. If the SOFAs are to retain their formative function, all users must be encouraged to recognise the extrinsic and intrinsic value this tool can offer.

**Time issues**

Although the majority of users stated that each SOFA took between 60-90 minutes to complete, with the system confirming an average time of ~70 minutes per assessment, a small but considerable number of students were taking significantly longer to complete each assessment. This may indicate that the questions are too complex, need more preliminary information to help guide the student through the answer or contain improved directions to specific parts of the course text to allow the student to access the relevant information more easily. Further investigation needs to be carried out to resolve this issue.

Irrespective of the reason underlying these extended time periods required to complete an assessment, if an individual is already feeling under pressurised from the amount and range of learning they need to complete to remain on target within their studies, resources that are
perceived as peripheral to the core learning process, will be rapidly dropped (Kirkwood and Price, 2005). The importance of a learning resource is also be affected by how easily it can be accessed (Kirkwood, 2003).

Although the SOFAs are accessed via the web-based study calendar (which students are expected to check on a weekly basis), this additional step and need to seek it out may have resulted in them moving further out to the periphery of the course learning resources, in contrast to those resources sent to the students (i.e. the course text and DVD-ROM). Further studies need to be carried out on the usage levels of these two resources compared with those provided online to ascertain whether this is an issue. Two potential solutions would be to enhance the advice and guidance provided to students to help them recognise the importance of accessing the online study calendar regularly and using all learning resources listed, and/or to develop a skeletal SOFA framework on the DVD-ROM, which the student could load on to their computer and use to access the web-based system. In addition, work-load issues associated with the course as a whole, need to be reviewed to ascertain whether shorter, more regular SOFAs would be more accessible (and value) to greater number of students, or whether other triggers (such as explicit references in other activities associated with the course) would increase use of the SOFAs without making the student feel they were diverting study time away from the core resources.

**Academic level and function**

Feedback from the non-success case interviews indicates that the academic level of the SOFAs needs be reviewed. One of the major issues raised by those individuals who did not have a positive experience when engaging with the SOFAs, was the academic levels of the questions. Repeatedly being told to ‘try again’ and that their answer was incorrect, served to demoralise this group of users, and result in them feeling they were unable to cope with the academic demands of the course (an issue that was not replicated in their summative assessment scores, which all indicated good to high passes). Ehrlich (1995, cited in Haigh, 2007) described a similar experience in which earlier versions of self-assessment quizzes proved to be too challenging, resulting in his students becoming more demoralised by their lack of apparent ability rather than being motivated by positive results.

Furthermore, although one of the early objectives for this formative assessment tool was that it should not be viewed by stakeholders as a remedial support system, designed to fill gaps in knowledge and understanding, it is clear that a number of users approached it from this perspective. Either improved information about the role and intended outcomes of the SOFAs need to be provided to all users, or they need to be adapted to incorporate a pre-course remedial section to enable students to review and revise skills, knowledge and application required to enable engagement and progression within the new course materials.

**Current conclusions**

Effective learning will only occur in a supportive and interventionist environment, where the individual learner can benefit from personalised feedback on academic accomplishments, obtain explicit guidance on what is needed for further improvements, and are encouraged to develop, apply and expand their new skills and knowledge (Vygotsky, 1978; Mayes, 2001). The SOFA framework attempts to do all of this by providing the learners with the opportunity to test their learning ‘on-demand’ and recognise achievements made, whilst receiving targeted guidance on how to address remaining weaknesses and misunderstanding. By explicitly linking student result to the levels of competency achieved across the learning outcomes and relating these to the development of skills needed to tackle the summative assessments, provides learners with an extrinsic motivation to engage with and hence benefit from this interactive learner support framework, whilst simultaneously developing a deeper approach to learning. It also acts as
direct response to QAA recommendations to enhance current assessment methods by assessing a broader and deeper range of cognitive skills, using formative assessment to support effective learner progression, while involving the learner in such a way as to become more aware of their academic abilities, their developing skills and competencies, and hence more able to assess and reflect on their own performance. In conclusion, as Boud (1986, quoted in Challis, 2005) stated “The development of skills in self-assessment lies at the core of higher education, and as teachers we should be finding whatever opportunities we can to promote self-assessment in the courses we teach”; the SOFA framework provides its learners such an opportunity.

In summary, to be successful, formative assessments need to motivate users through positive reinforcement, engender self-confidence and ability to recognise personal strengths and weaknesses, and encourage users to reflect on their personal progression in relation to ongoing studies.
List of deliverables

World access SOFA URLs

See Appendix for further information about usage of these sites

https://students.open.ac.uk/openmark/s279-07.book1chapter1world/
https://students.open.ac.uk/openmark/s279-07.book1chapter2world/
https://students.open.ac.uk/openmark/s279-07.book1chapter3world/
https://students.open.ac.uk/openmark/s279-07.book1chapter4world/
https://students.open.ac.uk/openmark/s279-07.book1chapter5world/
https://students.open.ac.uk/openmark/s279-07.book1chapter6world/
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https://students.open.ac.uk/openmark/s279-07.book1chapter8geotermsworld/
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https://students.open.ac.uk/openmark/s279-07.book1chapter8diagmodworld/
https://students.open.ac.uk/openmark/s279-07.book1chapter8diagtaxingworld/
https://students.open.ac.uk/openmark/s279-07.book1chapter8tablesworld/

Papers and presentations


Presentation: Using an online formative assessment framework to enhance student engagement: a learning outcomes approach, ISL Conference, September 2007 (similar versions were presented at CTSS and OpenCETL conferences)

Papers (submitted for publication)

Figures

Figure 1a: Example of the summary feedback presented at the end of each SOFA outlining the levels of competency demonstrated for the assessment overall and for each learning outcome tested. To enable users to review particular strengths and/or weaknesses, each learning outcome is accompanied by the list of question in which it was tested.

![Figure 1a: Example of the summary feedback](image)

Figure 1b: The five levels of competency listed at the bottom of each final results page, used in describe how well the learner has demonstrated overall and in relation to each of the learning outcomes assessed.

![Figure 1b: The five levels of competency](image)
Figure 2: ‘Question 11’ feedback form, presented at the end of each SOFA.
References


Chi Ng, K. & Murphy, D. (2005) 'Evaluating Interactivity and Learning in Computer Conferences Using Computer Analysis Techniques.' Distance Education, 26:1, p.89-109


Kirkwood, A. (2003) 'Understanding Independent Learners' Use of Media Technologies.' Open Learning, 18:2, p155-175


Appendix

Accessing the S279 Student Online Formative Assessments (SOFAs)

The following links are fully accessible to any user interested in seeing how the SOFAs work. The format is identical to the learning environment presented to students on the OU course Our Dynamic Planet (S279) in 2007, in which the students are expected to refer to the course text whilst completing each assessment (rather than attempt each question from memory).

The majority of questions contain a number of variables that change when the question is revisited either within or between attempts at that particular assessment. This is achieved by the system logging which versions have been completed by a particular student, and cycling through the alternative options. As these versions of the SOFAs do not require users to log-on, access to different versions of a particular question may be slightly less predictable but should be obtainable by repeating a question within one sitting or by restarting the whole assessment.

Although many of the questions require users to refer to specific diagrams and information within the course text to obtain the correct answer, this does not prohibit users working through each question (inserting random answers where necessary) to experience the stepped levels of feedback and support that would be presented to students attempting each question for real.

Book 1 of S279 starts by examining the formation and early evolution of the Earth, before investigating different internal processes within the Earth’s mantle, and how interactions between the atmosphere, biosphere, hydrosphere and geosphere have shaped the ongoing evolution of the planet.

https://students.open.ac.uk/openmark/s279-07.book1chapter1world/
https://students.open.ac.uk/openmark/s279-07.book1chapter2world/
https://students.open.ac.uk/openmark/s279-07.book1chapter3world/
https://students.open.ac.uk/openmark/s279-07.book1chapter4world/
https://students.open.ac.uk/openmark/s279-07.book1chapter5world/
https://students.open.ac.uk/openmark/s279-07.book1chapter6world/
https://students.open.ac.uk/openmark/s279-07.book1chapter7world/

The following links were entitled ‘SOFA 8’, and offered students a choice of four ‘random’ assessments consisting of 10 questions selected from across Chapters 1-7 within Book 1, alongside a series of more focussed assessments testing specific skills and learning approaches developed within the course. In some of these more focussed assessments, the students were offered two levels of question difficulty – described as ‘moderate’ and ‘more taxing’. Moderate assessments comprise of odd numbered questions from SOFAs 1-7 (which had previously been flagged to the students as the expected level of understanding students show attain by the end of each chapter), whereas the ‘more taxing’ assessments consist of even numbered questions from SOFAs 1-7 (which had been flagged as more challenging questions, devised to stretch their understanding and application of concepts and processes described within the course).

https://students.open.ac.uk/openmark/s279-07.book1chapter8ran1world/
https://students.open.ac.uk/openmark/s279-07.book1chapter8ran2world/
https://students.open.ac.uk/openmark/s279-07.book1chapter8ran3world/
https://students.open.ac.uk/openmark/s279-07.book1chapter8ran4world/
Defining geological terms
https://students.open.ac.uk/openmark/s279-07.book1chapter8geotermsworld/

Mathematical problems
https://students.open.ac.uk/openmark/s279-07.book1chapter8mathmodworld/
https://students.open.ac.uk/openmark/s279-07.book1chapter8mathtaxingworld/

Understanding geological processes
https://students.open.ac.uk/openmark/s279-07.book1chapter8geoprocessmodworld/
https://students.open.ac.uk/openmark/s279-07.book1chapter8geoprocessstaxingworld/

Working with diagrams
https://students.open.ac.uk/openmark/s279-07.book1chapter8diagmodworld/
https://students.open.ac.uk/openmark/s279-07.book1chapter8diagtaxingworld/

Working with tables
https://students.open.ac.uk/openmark/s279-07.book1chapter8tablesworld/