

EDP083N

Managing the Assessment Process

*Assessing existing skills with diagnostic
testing*

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INTRODUCTION

How do you assess someone's IT skills prior to attendance of a practical teaching session?

One of the key problems with teaching and running tutorial sessions in software applications are assessing students existing skills and knowledge. Assuming everyone has the same basic understanding or that they have used the application before is a mistake. Many enter Higher Education with limited or no interactions with PC's, often asking what is a mouse or browser and they are embarrassed to admit where they may be 'lacking' in experience. Perhaps it is something simpler such as 'not knowing' the technical term for the action they can already perform. Often, they are expected to 'teach them-selves', picking up rudimentary skills as they go or possibly being able to do 'just enough'. So how can one think of teaching more advanced skills in any software without assessing current experience levels?

Teaching IT skills can be extremely challenging for both the student and teacher as the student may have a variety of backgrounds and pre-existing skills, while the teacher has a set of learning outcomes and objectives that need to be achieved. So which is the most appropriate form of diagnostic test within an E-assessment environment that can be used to assess existing knowledge and skills, without offending the students?

Issues to be addressed

- Who and what are the student's backgrounds?
- How do you assess without causing offence?
- Diagnostic testing and an e-Assessment environment?

THE 'STUDENT'

Who and what are their backgrounds?

The 'students' attending the tutorials are lecturers or support staff that may not be used to being on the other side of the teaching process, they are no longer in control and as such can put up barriers from the start, making it difficult for any teacher to then apply the appropriate teaching for each students needs. These barriers need to be broken down and sometimes it can be just fear that prevents the student from progressing. When teaching software applications that fear can be related to the unknown and often thought to affect the older generation who may find it more difficult, this is not necessarily the case. Many, regardless of age, have the same fear and breakings down those barriers are extremely important if you want your students to progress 'to the next level' whatever that level may be.

Several students have pre-conceptions of how University life is and how their study will continue; this also applies to lecturers who often have their own experiences to draw on. They all have various backgrounds, ethnicities and experiences all of which needs to be taken into consideration when teaching the basics of how to use a particular software application. For example, teaching a Virtual Learning Environment (VLE) is something they may not have been exposed to or have experience of before, or perhaps they have, but it was a long time ago and they have since lost that skill.

The students may also be new to the university, 'finding their feet'; overloaded with teaching commitments and trying to learn all the other software's that is required for teaching, student support and their role on a daily basis.

It is therefore very important to ascertain their level of expertise as early as possible but without causing offence. This can be achieved by explaining the importance of the assessment and how it will help the teacher provide the most appropriate teaching and learning methods for each student.

Setting up any form of diagnostic test prior to a teaching session can be extremely difficult, many of the students would specify a lack of time or that they do not need to attend a tutorial as they have used it before, but from my own experience I can say that

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this is not ideal. A tutorial will have a number of diverse students with a range of abilities and in large classes, this diversity can cause a number of problems including adhering to the lesson plan or providing the teaching in the correct format suitable for the students.

For example, in mathematics courses, students are expected to have a certain level of understanding before starting the course and as we know, many courses provide a module handbook and a reading list prior to the start. Haßler, in his 2004 survey, argues that *"diagnostic tests provides both staff and individual students alike with an immediate picture of where the student stands"* but *"students were under the impression that the test was designed to measure their 'real ability' opposed to their 'present knowledge', and perhaps they also felt they were measured up in some way"*. This could be a key issue for the students, as many may believe that there is nothing they need to know or that they already have adequate experience and that the test is not aimed for them anyway.

It is important that the students engage with the tutorials and the material provided and that the teacher provides the appropriate test which will highlight the requirements for entry. This will provide the student with an idea of what they should already know and what will be covered, therefore allowing them to choose between, say, a basic, intermediary or advanced course. Actively engaging the student with the assessment process followed by the tutorials will help to evaluate their own current capabilities and skill level while highlighting where they can 'make improvements' to their technique. In the end, helping them to achieve their goal and work more efficiently in the future, reducing time spent using the application and increasing contact time with their students.

DIAGNOSTIC TESTING AND AN E-ASSESSMENT ENVIRONMENT

Why assess? Assessment is used for a number of purposes and can be described as "*assessment of learning, assessment for learning and assessment as learning*" (Bloxham & Boyd, 2007, p15). Diagnostic testing provides a formative assessment of student's capabilities and achievements allowing the teacher to assess their own teaching method, planning and adapting content according to the students needs, this therefore, is "*assessment for learning*".

Although a student may be able to adopt a "*surface approach*" to their learning, within the confines of the diagnostic assessment, a deeper approach would be more desirable as a student would be required to acquire more advanced skills and adapt them for future use. Many pieces of software are not transparent to use and therefore require an in-depth knowledge of the software instead. When constructing an assessment, it is not only important to test the students on their understanding, but also the "*principles and meaning*" (Bloxham & Boyd, 2007, p17) of the software's terminology. That way, the student can find what they need during the teaching and tutorial session while being able to apply that knowledge in the future.

Originally designed to assess student's abilities at the earliest possible stage, diagnostic test were used to ensure a student were placed in the most suitable teaching program for their abilities. These tests highlighted any strengths or weaknesses and provided an indicator as to which course best matched their abilities, therefore ensuring – hopefully – that a student would successfully complete the course. Diagnostic or diagnosis testing is commonplace within the medical community but have also been used for mathematics, grammar and writing skills as well as surveying and engineering skills, both here in the UK as well as the US. Many institutions introduce these assessments as early as possible in the first weeks of the first year modules and often during the interview process for a place on the course.

Often, the tests would be provided in paper format as illustrated in figure 1 for Aerospace and Aviation Education (<http://www.erau.edu>), where a teacher or lecturer would be able to see not only the answer but also how they arrived at it with any working out the

student had done. The teacher could adapt their teaching to accommodate any gaps in their knowledge.

Self-Diagnostic Exam

MA 106, 111, 120

1. Perform the indicated operations

a. $-|12| - |-4|$

b. $-5 \cdot 3^2 + 9\sqrt{4} - 3$

c. $\frac{1}{6} - \frac{3}{5} \left(-\frac{15}{2} \right)$

d. $\frac{3 - (-4)}{0}$

2. The low in Flagstaff was -3° F, and the high was 23° F. What is the difference in the high and low temperatures?

3. Given the number $-\frac{3}{7}$, find its

a. absolute value

b. reciprocal

4. Evaluate the expression $3\sqrt{n} + m + 5k$ if $k = -4$, $m = 2$, and $n = 16$

Figure 1: Embry Riddle Aeronautical University

Although a common practice, many paper-based tests have now been superseded by electronic submission through an E-assessment environment such as a VLE, thereby providing immediate feedback for both the student and teacher.

"E-assessment can be justified in a number of ways. It can help avoid the meltdown of current paper-based systems; it can assess valuable life skills; it can be better for users – for example by providing on-demand tests with immediate feedback, and perhaps diagnostic feedback ... The issue for e-assessment is not if it will happen, but rather, what, when and how it will happen. E-assessment is a stimulus for rethinking the whole curriculum, as well as all current assessment systems.

(Ridgway and McCusker 2007)

Figure 2 shows one such diagnostic test for grammar from the Oxford University Press (<http://www.oup.com/elt/global/products/practicegrammar/test/>). There are 20 steps, but it is very clear to the student what they are being tested on, this will be key to any diagnostic test that will be set up for teaching software applications as each set of questions will be specific and unambiguous to the task being assessed.

Oxford Practice Grammar

Students > Oxford Practice Grammar > Diagnostic Test

Choose the level:

- Basic
- Intermediate
- Advanced

- Choose a level.
- Do the test. It could take 30 minutes.
- Get your feedback and score.
- Print your results as a record.

Good luck!

Oxford Practice Grammar

Students > Oxford Practice Grammar > Diagnostic Test

Tenses: present

Choose the best way to complete the sentences.

- My brother a teacher.
- Sandra doesn't to the radio.
- you play tennis?
- John is football at the moment.
- you living in Cambridge this year?

[Next section](#)

Progress: End

Basic Your total score is 9 out of 100 or 9%

Click on the sections below to see your mistakes.

[Get some advice on what to do next](#)

▶ Tenses: present	100%	▶ Articles, nouns,	
▶ Tenses: past (1)	80%	▶ Adjectives and	
▶ Tenses: past (2)	0%	▶ Adjectives and adverbs (2)	0%
▶ Tenses: future (1)	0%	▶ Prepositions (1)	0%
▶ Tenses: future (2)	0%	▶ Prepositions (2)	0%
▶ Sentences and questions (1)	0%	▶ Verbs (1)	0%
▶ Sentences and questions (2)	0%	▶ Verbs (2)	0%
▶ Modal verbs (1)	0%	▶ Conditionals and reported speech (1)	0%
▶ Modal verbs (2)	0%	▶ Conditionals and reported speech (2)	0%
▶ Articles, nouns, pronouns, etc. (1)	0%	▶ Building sentences	0%

[Do another test](#) [Print my scores](#)

Figure 2: Oxford practice grammar diagnostic test.

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Further examples are from the California State Universities department of Mathematics and Statistics (<http://www.csus.edu/math/courses/diagnostic.htm>) where they have a number of resources to assess student's mathematical abilities, while the European Computer Driving Licence (ECDL) uses diagnostic testing to evaluate the level of basic understanding of Microsoft Office products, the passing of which would progress the student to the advanced level. eSkill, a software supplier in the US, provides commercial diagnostic tests for employers to assess a candidate's ability to meet the job specification in everything from primary work skills and Microsoft Office to programming languages such as Java and C++ prior to employment (<http://www.eskill.com/demo1.htm>). These help to illustrate the diversity of abilities being assessed within an E-assessment environment and will form the basis of the diagnostic test to be designed for software applications.

Fry et al (1999) suggests that if a piece of work is set early in the first term it will "*act as a diagnostic tool to enable tutors to identify students with weaknesses that might justify referral to a service department*", and is designed for a formative assessment. For assessing software applications, I would need to consider what I expect a student to have as a basic understanding, and use the diagnostic feedback to encourage or point a student in the right direction for other resources, which may help, prior to attendance.

Diagnostic tests can be short multi-choice questions (MCQ's), essays or, if the classes are small enough, conducted as an interview – usually these are used for the creative arts courses – generally indicating whether the student really needs to attend a compulsory tutorial or not. If the student is 'up to speed', it may be decided to exempt or prescribe an alternative which "*would broaden the student's knowledge*" thus "*reducing the time required completing the degree*" (Miller et al 1998). However, if MCQ's have only correct or incorrect responses then a student has a fair chance of getting it right from pure guess work or from a process of elimination, it is not very illuminating for the teacher and much of the student's ability is overlooked. Often the questions use open-ended or lists for the students to choose from and assumes that the scores obtained from such tests have greater validity than those containing only multiple-choice answers.

Figure 3 shows an example from Quinney (2001) of a mathematics diagnostic test, where the students have 20 MCQ's and the flexibility of answering where they can, then moving on to the next. Once completed they are provided with immediate feedback in the form

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of a report "which may be taken away and discussed with the student's departmental tutor", they are also provided with report which highlights their problems or knowledge plus "a profile of study which is linked to specific modules".

The screenshot shows a software interface for a diagnostic test. At the top, it says "Diagnostic Test" and "Department of Mathematics". There are icons for a calculator, a ruler, and a pencil, along with a score of 40. The question number is 15. The question text is: "If $I = \int \frac{dx}{2x+3}$ then to within an arbitrary constant of integration I equals...". Below the question are four options: [a] $\frac{1}{2} \ln(2x+3)$, [b] $2 \ln(2x+3)$, [c] $\frac{1}{(2x+3)^2}$, and [d] $\frac{-1}{(2x+3)^2}$. At the bottom, there are buttons for "a", "b", "c", "d", and "Abstain", and a navigation bar with question numbers 4, 9, 14, 15, 16, 17, 18, 19, and 20.

Figure 3: Computer based diagnostic testing and student centred support (Quinney 2001).

It is clear from the above that there are a number of forms of diagnostic tests, all of which could be adapted for the purposes of testing pre-existing IT and software application skills.

CONCLUSION

All of the techniques mentioned earlier have highlighted the good and bad of diagnostic tests and introducing any or all of these methods would be extremely useful in highlighting a student's current knowledge and their ability to undertake further tutorials. If a teacher is to make the correct assessment of needs then it is important to set up a diagnostic test correctly in the first place as this will inform the teaching program as well as address the learning outcomes. It must also be made clear as to the criteria that needs to be met by both the teacher and the student.

A combination of MCQ's and fill in the gap type responses would be the most effective in this instance as the MCQ's will highlight what the student already knows while the fill in the blanks will allow them to use their own terminology. Using a web or E-assessment environment such as a VLE for delivery will provide immediate and effective feedback for both the teacher and student.

However, planning the test requires careful consideration as much of it depends upon student's willingness to undergo this assessment in the first place as well as their access to appropriate equipment. The test would be set before teaching to ascertain each student's level of understanding of IT and/or software applications while directly assessing their web skills. It is also important to maintain consistency, if a student is expected to have basic web skills prior to the tutorial there is no point in providing a paper based test to see if they can write their answers down!

*"Students may experience **cognitive conflict** because they are generally expected to word process essays and engage in online tasks but use pens in examination halls (Brown et al, 1997) such that we are training them in one system and testing them in another."*

JISC Infonet.ac.uk (2008)

Each assessment would be delivered electronically via the web or VLE, thereby assessing simple web skills automatically while the questions would be more specific to, say, ascertain if they have used a VLE before. It would be conducted prior to attendance of the first tutorial session and would form part of the on-line booking process. On completion they would either be booked automatically on to the appropriate tutorial or be

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provided with further resources for familiarisation purposes so that all students attending the session would have the same level of understanding. Either way, immediate feedback would be provided enabling the student to establish what they need to achieve while the teacher would be provided with adequate notice to adjust the teaching, provide additional resources or training if necessary.

Haggstrom, in his paper on diagnostic test says "*a well developed set of diagnostic tests will help the teacher to individualise teaching by applying it to every pupil's individual knowledge*". The assessment would not only highlight what they don't know, but also encourage them to find out more, pointing them in the direction of resources which will help them 'brush up' their existing skills.

In setting up a diagnostic test it is important to clearly state the purpose and to start testing the basics, such as a question for browsers as shown in figure 4. The student would progress through a number of clearly defined stages, each stage testing particular skills or knowledge. Completed in their own time and before they attend the first tutorial, they would be provided with feedback diagnosing which skills would need further attention. A summary of the answers given would be accessible for the teacher, detailing the students current level. For the student it would (1) highlight their understanding and (2) provide assistance in the form of information sheets or help guides. It could also be used to suggest the most appropriate tutorial for their abilities.

Q1. Name a web browser? (Select all that apply)

- a) Internet Explorer (IE)
- b) Firefox
- c) Safari
- d) I don't know

If the student selects this option then, a help screen will provide the answer, perhaps as a picture of types of browser

Figure 4

Similarly, a diagnostic test for familiarisation with a VLE could be designed for students where, on completion, other course materials would be released within the VLE.

In the current set up, tutorials can be extremely difficult to teach as the students have their own pre-conceptions of what 'they' need to cover, not what's actually offered. A

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diagnostic test would provide the necessary information, feedback or instruction for the student to follow prior to a tutorial, enabling the teacher to teach, safe in the knowledge that everyone has the same basic skills and understanding.

APPENDICES

Appendix 1: Presentation Reflection

Would I use any or all of these assessment processes in the future? In principle yes, but why would a lecturer decide to use these assessment techniques? East (2008) mentions that the main advantage is that the *"marking burden for staff can be significantly reduced"*, this can be a real benefit for lecturers with large numbers of students. Rust (2001) claims *"Students can perform a variety of assessment tasks in ways which both save the tutor's time and bring educational benefits, especially the development of their own judgement skills"* so can I say the same from my experience of the assessment process? As it was, the process raised a few questions.

Firstly, was it fair? How do you provide fair grades if not all peers submit? If only 2/4 took part, should the average grade compensate? Should 2 receive 0 and would this principle apply to peers that did not submit peer grades either? If you decided to penalise for non-submission, the average grade would be lower.

Secondly, moderate or not? What one individual considers constructive feedback, another may not and it's all subjective, a personal opinion.

Finally, East (2008) explains *"critics base their concerns on the reliability of self assessment for certification purposes, fearing that students will, inevitably, be too lenient on themselves. This is not, however, necessarily the case"* and I for one found I was self critical and questioned my own performance. Did I meet the objectives? Did the group deliver and work well as a team? I believed I should have included more academic research, but omitted these through a fear of insufficient time, therefore I graded myself cautiously.

Group work is notoriously difficult to assess as it is not always clear whom and how much has been completed by an individual. Student involvement in the process provides a useful insight into their understanding of the task and can form a key role in the assessment and feedback process for both parties. By experiencing the assessment process first hand, informs and empowers the student to produce work which matches

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the criteria more successfully while the teacher obtains objective feedback which will influence how and what they teach in the future.

Appendix 2: Presentation Feedback

A selection taken from the summary feedback of presentation

Title: The use of E-assessment for laboratory practical's providing automatic marks and feedback

Assessment Criteria	
Structure (10%)	<ul style="list-style-type: none"> • Logical organisation of information • Coherent progression
Presentation (15%)	<ul style="list-style-type: none"> • Clear voice with good projection, clarity of language & good eye contact with audience • Appropriate use of presentation material
Content & Context (75%)	<ul style="list-style-type: none"> • Provide rationale and context for current assessment techniques in practicals. (25%) • Provide a clear explanation of why and how E-assessment can be used. (25%) • Discuss the pros and cons of the proposed E-assessment in practicals. (25%)

Self (presenting group)

- Criteria matched well, each aspect flowed, time was okay and presentation clear.
- Content was adequately covered. Coherent assessment of information.
- Presentation matched all assessment criteria.
- Assessment criteria clear and well constructed.

Peers

- Good but no reference to literature in this area, which would have helped to contextualised the material. This should have come out in the section 'provide rationale and context'.
- Fairly addressed.
- Good criteria, however should be simplified in terms of making % - presentation did match criteria.
- Summary rushed due to time running out. Quite plain.
- I feel the weighting does not reflect the content and is too biased to content and context.
- Assessment criteria well planned and marks well distributed.
- Good organization of material. Very clear presentation, very interesting content.
- Good match.
- Good fit. Perhaps could have considered the disadvantages more, and more integration with the theory.
- Good match.
- Content well presented. Good use of bullet points to highlight aspects being discussed. Very well structured. Very well presented, however, towards the end it became rushed due to excessive information.

Tutors

- Very interesting, clear and coherent presentation and coverage of chosen topic – the specific issues arising from the practical example could be tied back to the key themes from the literature.
- AC1, 2 and 3 excellent.
- All LO's were clearly explained and met.

- All assessment criteria met at 'distinction level'.
- Well met. Useful criteria.

Learning Outcomes	
LO1	Critically engage with the purposes and principles of assessment in higher education contexts and apply them in an institutional and subject context and within quality systems
LO2	Understand the relative merits of a variety of assessment instruments and methods and be able to identify appropriate assessment methods within given modules, programmes and/or a subject area
LO3	Design and select instruments and methods for assessment to suit particular circumstances
LO5	Critically reflect on outcomes arising from considerations of assessment and analyse implications for future thinking and practice.

Self (presenting group)

- If more time, could have gone into more detail of e-assessment at HE but seemed more important to talk about application. Otherwise good.
- All learning outcomes discussed, could deal with LO5 in greater depth as highlighted by tutor.
- Good match – covered all learning outcomes.
- LO1 may have been a bit lacking, others all covered.

Peers

- LO5 – wasn't really dealt with in the presentation.
- Matched fairly.
- LO1 – not sure about applicability to HE? Good context of use of E-assessment. LO2 – covered lots of assessment variety. LO3 – good examples to use for particular situations. LO5 – covered disadvantages and considerations.
- Learning outcomes achieved but needs to explain how it will affect their future practice.
- Engagement to LO1, understanding to LO2, design and selection LO3, critical reflection LO5 – all covered.
- Good match.
- Good match.
- Learning outcomes matched to a good extent.
- All areas covered well. E-assessment was considered in terms of methods, rationale, and even feedback was considered.

Tutors

- Very good coverage of these issues with regards to e-assessment.
- LO1, 2, 3, 5 – yes.
- All LO's met, particularly good on LO2/LO3 (with a few 'emergent' learning pieces demonstrated).
- Well met.

Comments on grading schedule

Self (presenting group)

- Clear and appropriate, easy to grade against.
- Grading schedule met AS.
- Complaints that the calculations were unnecessarily complex.
- Providing clear layout to what can be assessed.

Peers

- I didn't feel the learning outcomes were fully represented in the grading schedule – e.g. LO5.
- Clearly structured and relevant to the depth of the various dimensions.
- Too complex, too many categories – to achieve an overall mark is a mathematical nightmare! If used for 25 students+, open to mistakes. Looks like too much discussion, not enough agreement on simplifying criteria.
- Good clear sections.
- Unclear on marking methods i.e. how to allocate the marks and weighting so I have marked it holistically with consideration to the weighting.
- Explanatory and well graded.
- Useful.
- Clear and relates well to the presentation.
- Perhaps too many categories with unequal weighting.
- Very good. Detailed but still easy and logical to follow.
- Clear and coherent, easy to follow.
- Difficult maths.
- Well laid out with good use of weighting.

Tutors

- Clear and logical but distinctions between certain categories rather vague. What is the logic for subdividing content section?
- I liked the criteria and weighting idea although I found I was trying to think of a percentage of 75% which confused me so I used it as a guide which I think is the intention.
- I am not convinced that all distinction level comments were equivalent or that descriptors represented expected all-level activity. However, the format was helpful even if the maths received was challenging.
- Useful – but needs information on value of topic and scholarship re advantages / uses / disadvantages needed.

Overall comments

Self (presenting group)

- Presentation & flowed very well together. Interesting application of e-assessment.
- Good, engaging presentation.
- Presentation gave rise to a lot of questions and a stimulated discussion.
- Excellent presentation.

Peers

- Good presentation, clear and informative but would have benefited in a grading in appropriate literature.
- Very interesting although I still wonder how this can be merged with summative assessment too.
- Good intro, clear and interesting. Informative slides. Visually clear. Generally engaging topic, only real criticism is grading schedule.
- Good use of slide at end with comments flashing on and off the screen.
- Slides had a clear presentation style. Primary discussed in the context of the first presenters own discipline but then was transferable and became generic. As the presentation went on some repetition of facts.
- Well presented in clear and simple language although it appears to be a complicated topic.
- Good background to the traditional methods which lead into the e-assessment. Students' responses as quotes is a good idea. It would be useful to say how the students' feedback affect the summative assessments.

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- Very attractive slides. Interesting examples.
- Good delivery – good use of lay-mans terms.
- Good, confident answers to questions.
- Clear presentations, good understanding, practical applications, coherent structure.
- Held audience attention well by good projection and tone of voice. Just the right amount of written content on slides compared to spoken explanations. Poor timing – too long.

Tutors

- Excellent presentation enriched by an illuminating example from real practice – the potential of reinforcing formative feedback with links to learning resources could be further explored.
- Excellent, informative and clear presentation. I would have liked to see some examples of MCQs in relation to pros and cons as this seems key to using e-assessment in this way. The handout is very much an overview – not sure if it included the refs on your slide?
- Overall a very interesting presentation. Perhaps if less time had been given to the general discussion on potential uses of e-assessment, then more time could have been given to the pilot project and its implications for all of your future practice. The presentation of student comments in the Q&A section was both innovative, illuminating and distracting.
- Very well structured and contextualized. There are many pointers to the emerging assessment 2.0
- Useful, practical project / intervention – seems highly effective, the future review, meeting with an analysis of module results/feedback etc to develop future practice. Well done.

Marks (%)

1. **Self** (presenting group): 75%, 70%, 72% and 74% = Average of 73%
2. **Peers**: 65%, 66%, 68%, 67%, 69%, 80%, 70%, 75%, 65%, 75%, 75%, 70% and 70% = Average of 70%
3. **Tutors**: 78%, 75%, 69%, 75% and 70% = Average of 73%)

- Overall Average: 72%
- Recommended mark: 72%

Moderator's Comments

The overall average is in the same grade category as the tutor average, therefore the overall average stands giving a group mark of 72%

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