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Developing Standards-Based e-Assessment for Maths Support

Shazia Ahmed, University of Glasgow

shazia.ahmed@glasgow.ac.uk

Sue Milne, ELandWeb Ltd

sue@elandweb.co.uk

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The Project

- Extend resources available to Maths Support
- Address formative assessment needs of numerate disciplines
- Improve capabilities of existing questions & quizzes
- Support self learning with individualised formative assessment
- Train staff in creating and delivering standards-based questions and tests

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Objectives

- Creation of 20 or so “seed” questions based on existing quiz questions
- Training for staff in using tools to edit questions and tests
- Support for staff following training
- Resources are available on Moodle at GU campus (no external access yet)
- Release of resources as OER

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QTIv2.1 Specification

Question and Test Interoperability – QTIv2.1

- Content and delivery are separate
  - **A renderer can run questions from many sources**
  - **A question or test can be run using many renderers**
- Efficient – less reinvention of wheels
- As "**transfer format**" between systems
- Releasing questions as OER also more efficient – find a question similar to the one you want and edit it.

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Maths Essentials

Questions for maths need to have

- Maths displayed correctly
- Input maths expressions
- Feedback on maths input
- Randomisation algorithms – 1000s of examples from 1 question

Authoring systems for maths should enable authoring of

- Maths expressions
- Randomisation algorithms
- Judging (response processing) algorithms
- Conditions
- Input facilities (for students)

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Previous Projects

MathAssess (Nov 2008 – April 2009, JISC funding)

Develop tools for:

- Rendering QTIv2.1 questions with maths extensions
- Authoring questions and tests
- Create a sample collection of QTIv2.1+Maths questions

FETLAR (May 2009 – April 2010, JISC/HEA funding) :

- Project website http://fetlar.bham.ac.uk/
- Collect Maths OER,
- Repurpose existing materials including questions
- Prepare tools for “external” use

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Project Plan

Stage 1

- Existing quizzes from Biology and Geography
- Convert sample questions to QTIv2.1+Maths format

Stage 2

- 2 workshops 1 week apart, using the questions and learning to create more

Stage 3

- Supported development

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Question Development

Topics:

- Ratio & Proportion, Percentages, Rounding, Units, Standard Form, Using Formulae, Algebraic manipulation, Simple Logs, Indices

Repurpose e-assessment questions from

- MathAssess samples,
- CALMAT and DIAGNOSYS
- QTI questions created from these under FETLAR
- GU Moodle quizzes (from printout)

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In Workshop 1...

In the first workshop, we intended to

- Introduce the FETLAR/MathAssess QTI Tools
- Look at QTI question structure
- Create a Multiple Choice Question
- Convert it to accept numerical input
- Add a randomisation algorithm
- Customise a question for a different context
- Create a question accepting maths input

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In Workshop 2…

In the second workshop, we intended to look at

- Different ways of saving a question
- Metadata for questions and tests
- Creating a simple test
- More advanced test features
- Setting a test in Moodle using the QTIPlayr plugin
- Output from QTIPlayr

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What actually happened...

Development was delayed until funding was available – hence questions not available in Semester 1 as planned

Workshop 1 –

- Technically adept staff found authoring tools got in their way – happy to use XML editor, etc.
- Novice authors liked the editors
- Progress was slowed by discussions around editor capabilities

Workshop 2 –

- Needed access to “development” server at last minute
- Went fine!

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What we'd do differently...

Development timing is not easy to schedule when it depends on funding...

Workshop 1 should have –

- Started with a demo of a running test in Moodle
- Contained demos of tools from renderer → test editor → question editor, rather than starting from questions

Workshop 2 should have –

- Used model questions instead of starting from scratch
- Made small changes to several questions rather than developing one question in several stages (MCQ → text input → maths)

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The Future…

Already have 20+ basic questions

Build on these:

- Same topic, different question (turn it round)
- Same topic, different context (still ratio but different subject)
- Same type of question, different subject,…
- Pick and Mix – combine parts of different questions to form a new one

Encourage staff trainees to take over!

Anyone want to have a go?

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Contact

Shazia Ahmed – shazia.ahmed@glasgow.ac.uk

Sue Milne – sue@elandweb.co.uk

MathAssess/FETLAR Tools http://fetlar.bham.ac.uk

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The Tools

This is what we used:

- **MathQurate – The QTI question authoring tool**
  http://aqurate.kingston.ac.uk/mathqurate/
- **Spectatus – The QTI assessment authoring tool**
  http://aqurate.kingston.ac.uk/spectatus/
- **MathAssess Engine – The QTI content renderer**
  http://www2.ph.ed.ac.uk/MathAssessEngine/
- **FETLAR Technical Tools Documentation:**

http://aqurate.kingston.ac.uk/files/tech-doc-final.pdf

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The Tools (2)

We also had this set up on a development server:

The FETLAR Virtual Appliance

- Moodle with QTI Playr plug-in
- Minibix repository for QTI questions
- STACK
- MathAssess Engine

Installs into VMWare Player or VirtualBox. Download from

http://aqurate.kingston.ac.uk/files/fetlar-vm.zip

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Other Tools

Those with more technical experience may find this useful:

Maxima Computer Algebra System

- Use WX Maxima for trying out CAS code
- Download from http://maxima.sourceforge.net/download.html

Oxygen XML editor

- Copy/paste chunks of code
- Checks validity if schemas in same folder as question
- Download (free trial, but pay for full licence) from http://www.oxygenxml.com/download_oxygenxml_editor.html

MikTex editor for LaTeX

- Prepare LaTeX expressions
- Construct solutions with several lines
- Download from http://miktex.org/2.8/setup