Use of computer-aided assessment to assist teaching and learning

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Introductory module on biological chemistry/biochemistry

- For students on paramedical/health science courses and HND Applied Biology
- Around 60 students
- Inhomogeneity of science qualifications and educational background

Introductory module on biological chemistry/biochemistry

- Content of module
  - Introductory chemistry (formulae, equations, solutions, rates and equilbria)
  - Organic chemistry
  - Carbohydrates and fats
  - Amino acids and proteins
  - Enzymes and Metabolism

Introductory module on biological chemistry/biochemistry

- How do I ensure that students engage with the module content???
- How do I monitor the performance of students throughout this module???

Teaching organisation

- Bank of 400 computerised questions in introductory biochemistry for health sciences
- Good quality support materials (handouts, textbook)
- Class contact is much lower than for traditional modules
- Classes on problem solving, NOT lectures

Teaching organisation

- There are five topic areas in the module
- CAA practice questions, all with comprehensive feedback, on each topic
- CAA summative supervised tests held at approx. fortnightly intervals
- Can be used with or without end of module exam

Questionmark Perception

- We have been running assessments on the web for nearly four years
- Stand-alone software and also seamlessly integrates with WebCT
- can also be delivered on CD
- Through use of wide variety of question types and use of graphics can engage with the “emotional centre” of the brain

Question (Response or Item) Types

- Multiple choice
  - One choice from many
    - True/False
    - Yes/No
    - Lykert scale
- Multiple response
  - Several choices from many
- Numeric
- Drag and Drop
- Matrix

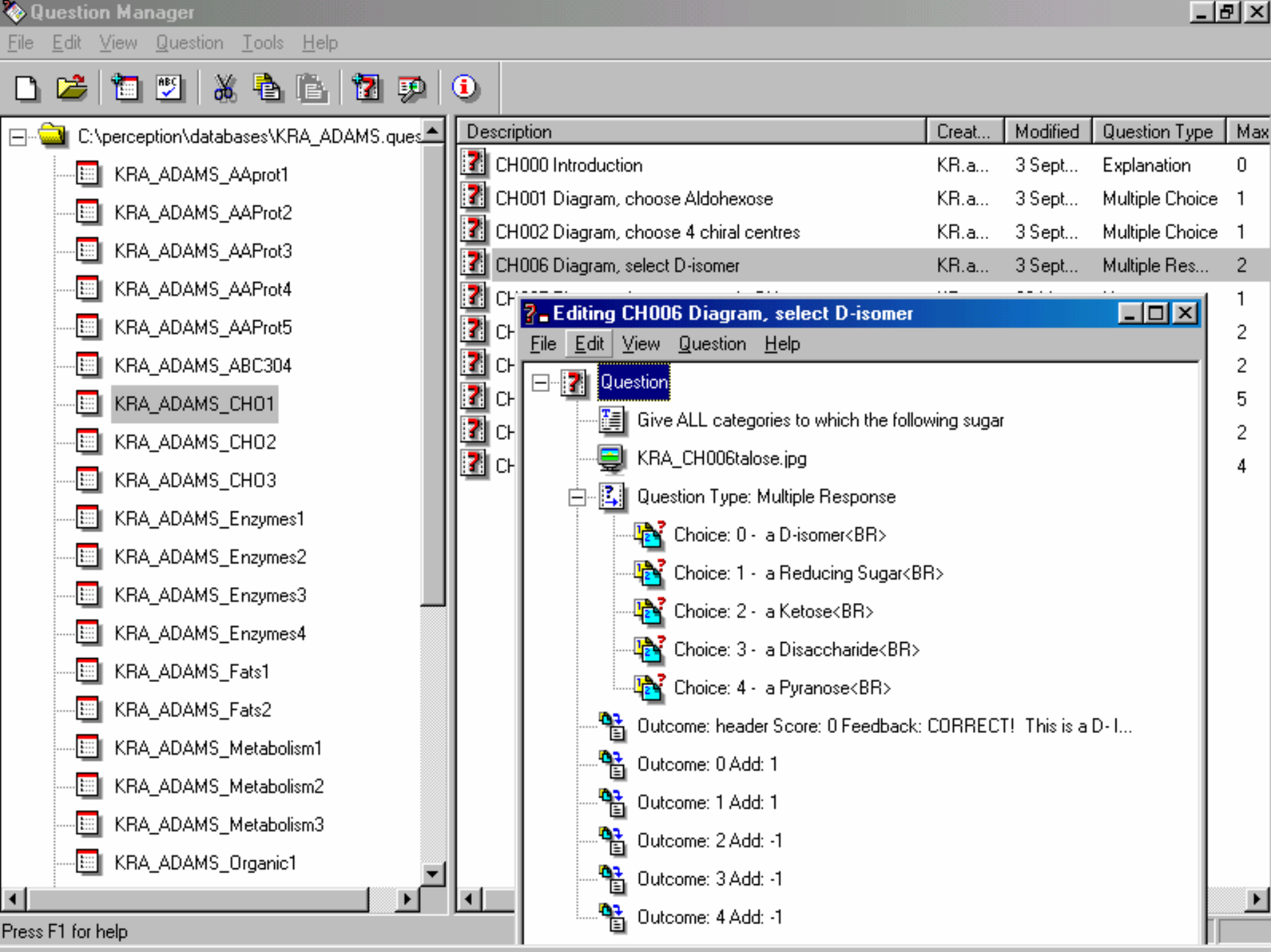
- Text response
  - Text Match
  - Paragraph
  - Free text answer
- Essay
- Ranking of statements
- Selection
  - Matching
  - Pull Down list
- Explanation
  - To explain scenarios

Student comments

- “....tests helped you to see where you were going wrong.”
- “The computer side of this module makes it more exciting instead of looking at notes all the time.”
- “Computer tests were very informative.”
- “....interactive classes - good involvement.”
- “It’s easy to ask questions in class.”

Advantages of CAA

- Marking is automated, freeing staff time
- Better monitoring of student progress through more frequent testing
- Greater coverage of subject matter
- Immediate feedback to students both in formative and summative assessment
- Questions can be evaluated with sophisticated statistical anaysis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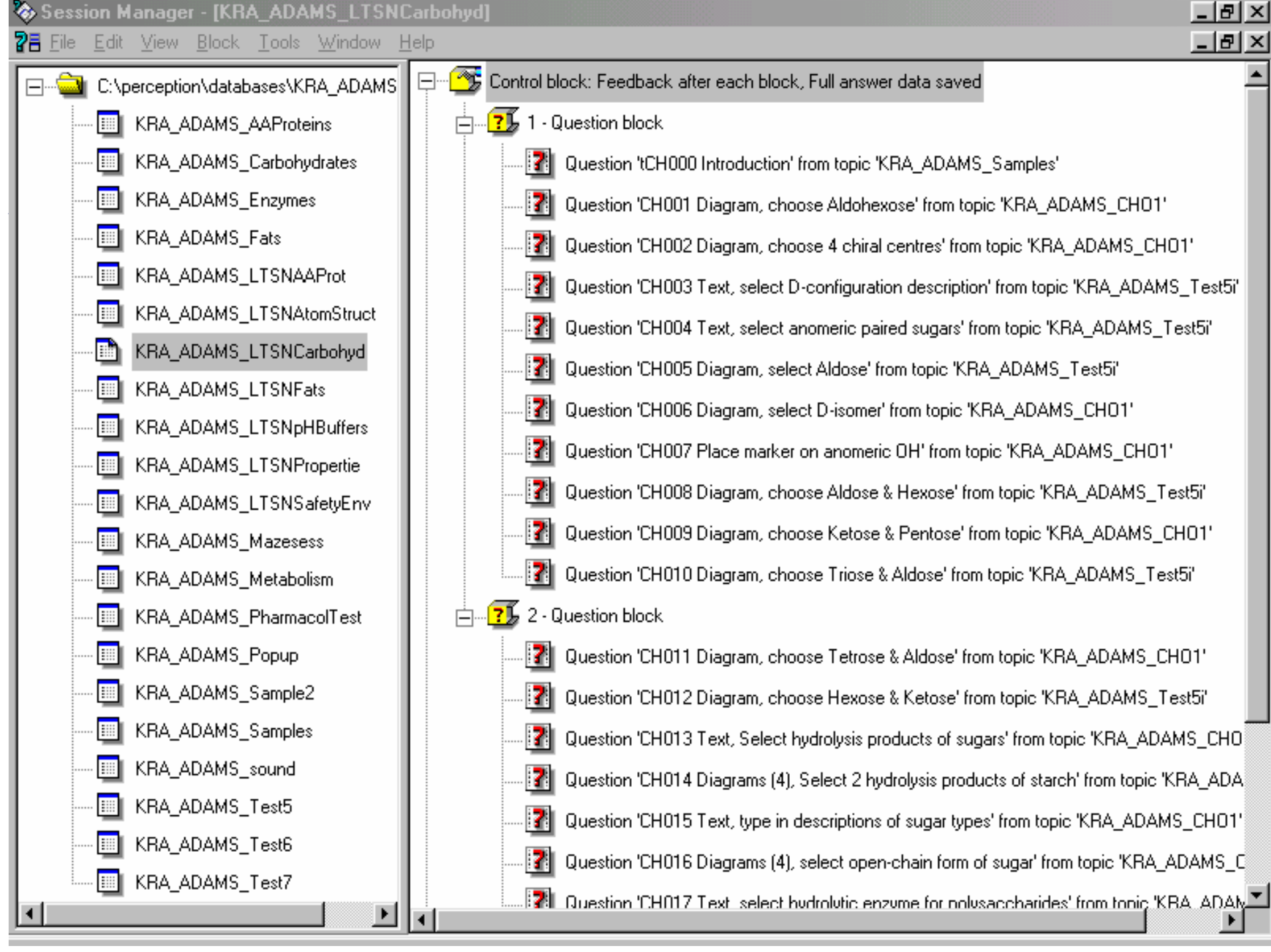
Description
Creat...
Modified
Question Type
Max
CH000 Introduction KR.a... 3 Sept... Explanation 0
CH001 Diagram, choose Aldohexose KR.a... 3 Sept... Multiple Choice 1
CH002 Diagram, choose 4 chiral centres KR.a... 3 Sept... Multiple Choice 1
CH006 Diagram, select D-isomer KR.a... 3 Sept... Multiple Res... 2
Editing CH006 Diagram, select D-isomer
File Edit View Question Help
Question
Give ALL categories to which the following sugar
KRA_CH006talose.jpg
Question Type: Multiple Response
Choice: 0 - a D-isomer
Choice: 1 - a Reducing Sugar
Choice: 2 - a Ketose
Choice: 3 - a Disaccharide
Choice: 4 - a Pyranose
Outcome: header Score: 0 Feedback: CORRECT! This is a D-I...
Outcome: 0 Add: 1
Outcome: 1 Add: 1
Outcome: 2 Add: -1
Outcome: 3 Add: -1
Outcome: 4 Add: -1
Press F1 for help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KRA_ADAMS_Enzymes
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KRA_ADAMS_LTSNAtomStruct
KRA_ADAMS_LTSNCarbohyd
KRA_ADAMS_LTSNFats
KRA_ADAMS_LTSNpHBuffers
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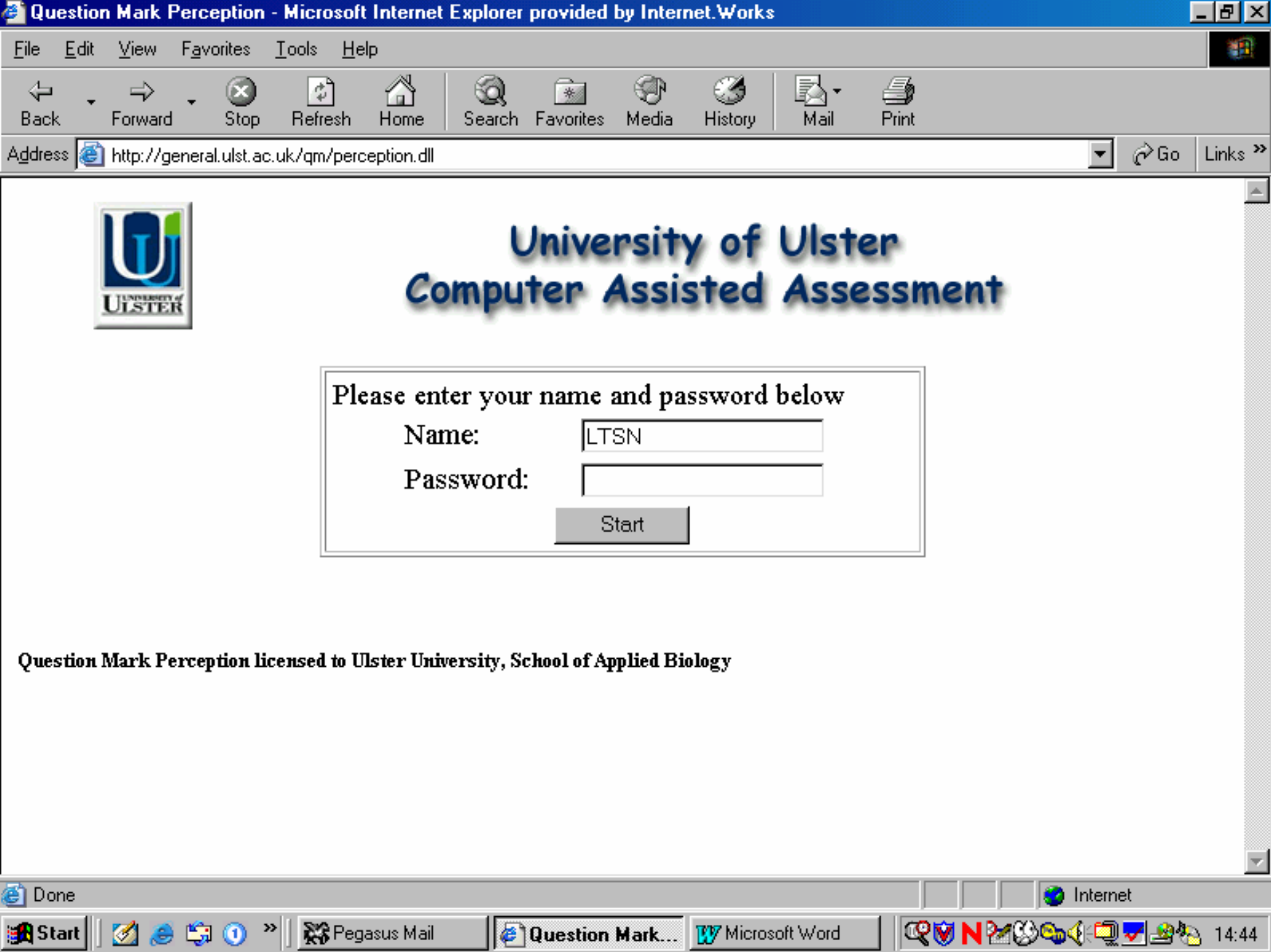
KRA_ADAMS_LTSNSafetyEnv
KRA_ADAMS_Mazesess
KRA_ADAMS_Metabolism
KRA_ADAMS_PharmacolTest
KRA_ADAMS_Popup
KRA_ADAMS_Sample2
KRA_ADAMS_Samples
KRA_ADAMS_sound
KRA_ADAMS_Test5
KRA_ADAMS_Test6
KRA_ADAMS_Test7
Control block: Feedback after each block, Full answer data saved
1 - Question block
Question 'tCH000 Introduction' from topic 'KRA_ADAMS_Samples'
Question 'CH001 Diagram, choose Aldohexose' from topic 'KRA_ADAMS_CH01'
Question 'CH002 Diagram, choose 4 chiral centres' from topic 'KRA_ADAMS_CH01'
Question 'CH003 Text, select D-configuration description' from topic 'KRA_ADAMS_Test5i'
Question 'CH004 Text, select anomeric paired sugars' from topic 'KRA_ADAMS_Test5i'
Question 'CH005 Diagram, select Aldose' from topic 'KRA_ADAMS_Test5i'
Question 'CH006 Diagram, select D-isomer' from topic 'KRA_ADAMS_CH01'
Question 'CH007 Place marker on anomeric OH' from topic 'KRA_ADAMS_CH01'
Question 'CH008 Diagram, choose Aldose & Hexose' from topic 'KRA_ADAMS_Test5i'
Question 'CH009 Diagram, choose Ketose & Pentose' from topic 'KRA_ADAMS_CH01'
Question 'CH010 Diagram, choose Triose & Aldose' from topic 'KRA_ADAMS_Test5i'
2 - Question block
Question 'CH011 Diagram, choose Tetrose & Aldose' from topic 'KRA_ADAMS_CH01'
Question 'CH012 Diagram, choose Hexose & Ketose' from topic 'KRA_ADAMS_Test5i'
Question 'CH013 Text, Select hydrolysis products of sugars' from topic 'KRA_ADAMS_CHO
Question 'CH014 Diagrams (4), Select 2 hydrolysis products of starch' from topic 'KRA_ADA
Question 'CH015 Text, type in descriptions of sugar types' from topic 'KRA_ADAMS_CH01'
Question 'CH016 Diagrams (4), select open-chain form of sugar' from topic 'KRA_ADAMS_C


Question Mark Perception - Microsoft Internet Explorer provided by Internet.Works
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Back Forward Stop Refresh Home Search Favorites Media History Mail Print
Address http://general.ulst.ac.uk/qm/perception.dll
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University of Ulster
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Please enter your name and password below
Name: LTSN
Password:
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Question Mark Perception licensed to Ulster University, School of Applied Biology
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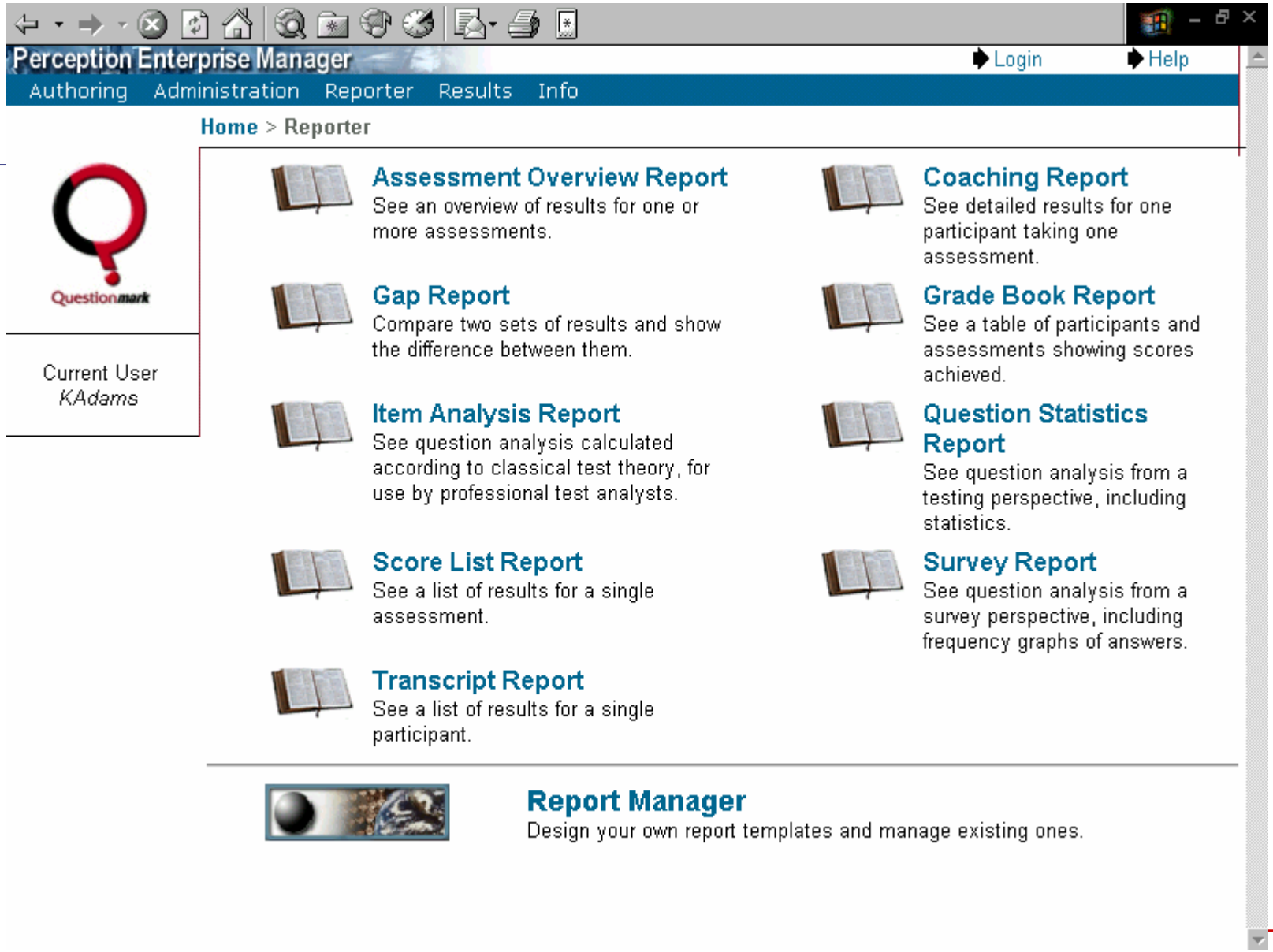
Computer Assisted Assessment

The following sessions are available to you:

1. Introduction to Atoms and Formulae
2. Introduction to Properties of Molecules
3. Introduction to pH and Buffers
4. Introduction to Fatty Acids and Fats
5. Introduction to Carbohydrates
6. Introduction to Amino Acids and Proteins
7 Introduction to Enzymes
8. Health, Safety and the Environment
9. Introduction to Metabolism


Perception Enterprise Manager
Login
Help
Authoring
Administration
Reporter
Results
Info
Home > Reporter
Questionmark
Current User
KAdams
Assessment Overview Report
See an overview of results for one or more assessments.
Coaching Report
See detailed results for one participant taking one assessment.
Gap Report
Compare two sets of results and show the difference between them.
Grade Book Report
See a table of participants and assessments showing scores achieved.
Item Analysis Report
See question analysis calculated according to classical test theory, for use by professional test analysts.
Question Statistics Report
See question analysis from a testing perspective, including statistics.
Score List Report
See a list of results for a single assessment.
Survey Report
See question analysis from a survey perspective, including frequency graphs of answers.
Transcript Report
See a list of results for a single participant.
Report Manager
Design your own report templates and manage existing ones.

Drag and Drop Question Style

- Question template which allows construction of image map
- Hotspots can be hidden in various places behind the image
- Student attempts to place labels at particular places on the image
- When used with simple drawing software, eg Smartdraw, access to a whole new range of question styles is possible

Drag and Drop Question Style

Sequencing and Classification of Data

- Can place data, facts or arguments in a logical sequence
- Can test higher order skills, comparable to the organisation of arguments in an essay

Drag and Drop Question Style

Venn Diagrams

- Provides a more sophisticated way of classifying data
- Can test much higher order skills, examine the student's knowledge of the inter-relationships between ideas/facts/observations etc

Drag and Drop Question Style

Assertion - Reason Questions

- Tests the student's ability to evaluate the **quality** of an argument, observation, or other evidence **in support of** a given statement

- Can be very difficult questions to author, but potentially very powerful

Drag and Drop Question Style

Laboratory Work

- Many students enter the laboratory with little understanding of the procedures they are about to carry out (Johnstone and Wham 1982)
- Phenomenon of recipe working (following instructions without underlying appreciation of the process)
- Effective solution is to get students to undertake pre-laboratory exercises - **Prelabs**

Drag and Drop Question Style

Concept Maps

Numerous articles have been published on the use of **Concept Maps** (eg J Res Science Education 1990, *27,* no 10) to improve teaching, assess learning, assist laboratory activities and improve school education.

Robinson 1999: “A concept map is a diagram consisting of **nodes** that represent concepts and **labeled lines** that represent the relationships between these concepts.” Labels are called **propositions**.

Conclusions

- Perception CAA software permits stronger engagement with the student due to:
  - **variety of question design**
  - **attractive visual format**

- Questions can be edited in HTML (QML) and can therefore use all the resources that HTML has to offer eg access to variety of symbols, hyperlinks to web material, popup windows etc.

References

- www.science.ulst.ac.uk/caa/

- Examples of questions at
  http://general.ulst.ac.uk/qm/perception.dll
  enter name: LTSN and pw = LTSN-psc
  (case-sensitive)