



The *Cineris* RBM Objective Assessment System Delivering Authentic Questions supported by Intelligent Feedback

Problem: Achieving Deeper Learning via Computer Based Assessment

Simple Multiple Choice & True/False questions save huge amounts of staff time in testing rote and declarative knowledge. However, learning is about thinking and understanding, and gaining the assessed practice required to straighten out concepts rather than simply learn facts. More advanced and authentic question styles are needed from computer-based testing, to provide questions that directly relate to real-life professional problems.

Modern web browsers have the capacity to generate any objective question. Traditional teachers have no difficulty interpreting errors made by students. However, industry standard computer-based testing systems simply identify wrong answers, they do not diagnose the error types that are symptomatic of specific faulty logics, or misconceptions about process. An absence of diagnosis prevents two vital steps: learners cannot get intelligent feedback, and staff are unaware of the difficulties of learners.

Solution: RBM Objective Assessment System

In Cineris' solution, questions are marked by a Rules Based Marking system. This provides on-line learners with personalised intelligent feedback so they gain a more fundamental understanding of each question they tackle.

Questions are customised to create authentic mental challenges. There is no restriction to the number and types of interaction that can be built into a single question (see overleaf).

Textbook diagrams turned into interactive problems that challenge an understanding of process; e.g. labelled illustrations, flow charts, and the sequencing and tabulation of information.

Normal academic marking schemes are applied to answers through the Cineris Rules Based Marking (RBM) system. RBM emulates the processes staff traditionally use to evaluate student answers. RBM tests answers for adherence to the rules and logic of the subject, the presence of common misconceptions or sub-optimal solutions, and for consistency of decision-making. These milestones are encountered as students develop mastery of a topic (see overleaf).

Intelligent feedback On a question-by-question basis, and under the control of RBM, feedback is personalised to address the errors of individuals' answers. Intelligent feedback addresses faulty logic and partial understanding, it is not just a perfect explanation of the right answer.

Students may re-attempt questions and review past answers, using intelligent feedback to help them to build their answers iteratively. To promote this process, the question interface is designed to enable students (in formative mode) to review a succession of their personal attempts at the same question, review feedback, and annotate attempts for future reference.

RBM Informatics detects the strengths and weaknesses of answers individuals and classes. Central to assessing the properties of questions and the performance of students (see overleaf).

Examination marking is supported by Cineris' fully web-based system, which can be used for summative as well as formative assessment. It can also import and mark answers that have been captured from paper-based examinations, and present examination answers back to students, in later post-mortem mode, as on-line questions with feedback supplied automatically.

If you use computer based assessment and would like to exploit it for more advanced classes, or if you are a novice, or a sceptic with a passion of high quality teaching, please seek further information about **Cineris RBM**. If you evaluate written or other creative work personally (for medium to large classes), **Cineris Referee** may handle your routine and advanced problems in returning personalised feedback.

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	YS	yS	Ys	ys
YS	Yellow Smooth YYSS	Yellow Smooth YySS	Yellow Smooth YYsS	Yellow Smooth YySs
Ys	Yellow Smooth YYsS	Yellow Smooth YySs	White Wrinkled YYrr	White Wrinkled YyRr
yS	Yellow Smooth YySS	Green Smooth yySS	White Wrinkled YYrr	White Wrinkled YyRr
ys	Yellow Smooth YySs	Green Smooth yySs	White Wrinkled YYrr	White Wrinkled YyRr

Gamete Row and Column Order

It helps to have well ordered gametes, so answers can be checked for errors before submitting them. Best practice is to have in the ORDER of genotypes in the horizontal cells the same as the ORDER of genotypes in the vertical cells.

Part g
Part g is correct.

Inset

1. Dynamic tabulation: This Question started as a blank table, without column and row headers, and contains 40 drag and drop targets. All the visible text are on individual drag and drop options. In the *best* answer the headers are entered symmetrically. In *this* Answer, the options dragged into the central column & row headers are not symmetrical (starred red in this illustration). The entries in the body of the table are correct, as the student has correctly allowed for the lack of symmetry in the headers. Unsymmetrical tables are more difficult for students to scan for errors.

The feedback (inset) points this out (blue icon), and still awards good marks for an otherwise flawless piece of work (green tick icon).

2. Flow chart. Options were dragged into target boxes linked by arrows. Marking is proportionate, & on the basis of

The main cause of mental retardation in Phenylketonuria is an:

Overproduction of phenylpyruvic acid

Underproduction

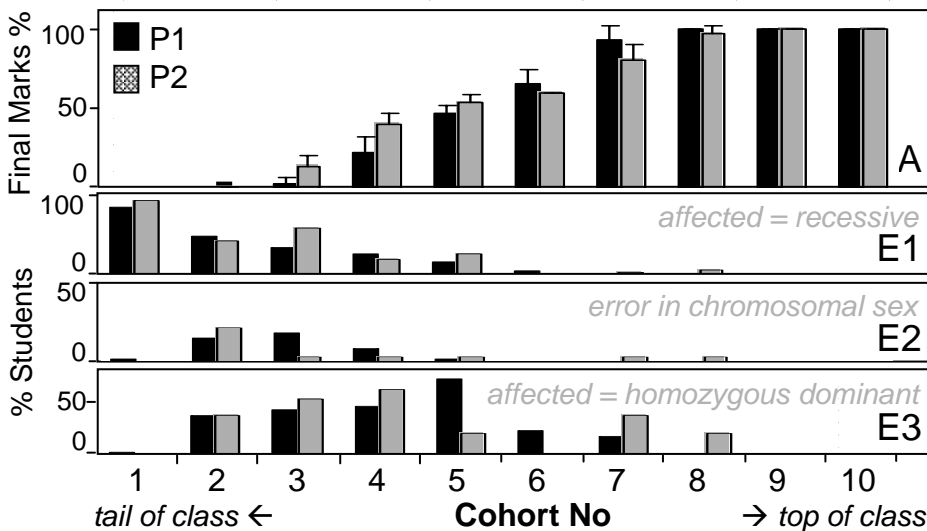
(radio buttons) (dropdown menu) (free text entry)

For the option you selected, state the effect this has on brain function (write up to 8 words)

neurotoxin

relationships between options, *not* placement in specified targets. Thus, if the two options outlined in black [labelled 'degrading'] were exchanged with the two options [also outlined in black & labelled 'Dopa pathway'] are *exchanged in position*, the answer will be awarded the same (correct) mark, as the two pathways have the same relationship to the option 'tyrosine'. The *i* button reveals local feedback. The menu box had 8 options from which 1 is to be chosen.

3. Informatics on the incidence of errors in a formal exam



576 students ranked by score into ten cohorts. Each took a logically different version (P1 or P2) of essentially the same problem. The solutions to P1 and P2 were somewhat different, but tested the same deductive abilities. Panel A: mean marks per cohort for P1 & P2. Panels E1-E3: count of 3 different error types. Error E1 ('howler') was most frequent in the weakest cohorts. Error E3 was a subtle error that attracted partial marks. Error E2 was scarcer.