

A METHOD AND DATA-PROCESSING APPARATUS FOR TEACHING.

FIELD OF INVENTION

- 5 Preferred forms of the invention relate to a method, and to data-processing apparatus, for presenting questions to students, assessing their answers, and then presenting further questions to a new student based on the performance of earlier students.

10 BACKGROUND

In the field of academia, many students who struggle grasping a certain concept tend to have a common difficulty with another concept. This is because they approach an academic problem, or an academic field, in the same way or with the same underlying flaw of understanding. It is desirable to identify weaknesses in the approach or knowledge of students before they make a
 15 mistake in a critical situation, for example in an assessment exam. It is accordingly an object of a preferred form of the present invention to go at least some way towards addressing this issue. While this object applies to a preferred embodiment, it should not be seen as a limitation on the scope of the claims. The object of the invention *per se* is simply to provide the public with a useful choice.

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SUMMARY OF THE INVENTION

According to one aspect of the invention there is provided a method of teaching, comprising the steps of:

- 25 a) keeping a data record of educational questions in a computer means;
 b) keeping a data record in the computer means indicating which of the questions students answered incorrectly;
 c) causing, by way of the computer means, at least some of the questions to be displayed to a human subject by way of a display screen;
 30 d) the computer means receiving input for answers by the human subject to at least some of the questions displayed;
 e) the computer means processing the input to determine which questions the human subject answered incorrectly; and
 f) for at least one question answered incorrectly by the human subject, the computer
 35 means searching for a student who also answered that question incorrectly and causing a further question that such student answered incorrectly to be presented to the human subject for answering.

40 Optionally the computer means comprises one or more computerised device, for example a mainframe computer, a server, a desktop computer, a laptop, a tablet or a smart phone.

Optionally computer means causes correct answers to be displayed to the human subject by way of the screen for at least questions answered incorrectly by that person.

- 5 Optionally answers by the human subject become part of the second data record for use in assessing further human subjects.

Optionally the computer means presents questions to the students and/or the human subject by way of a web site.

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Optionally the computer means:

- a) determines the amount of time taken by the human subject to answer each question;
- b) in each case compares the amount of time with a data record indicating the time taken to answer the same question by the other students;
- 15 c) based on the comparison, determines that a question was more challenging to the human subject if that person took a statistically long time to answer it; and
- d) searches the data record of questions to identify and present to the human subject a question of a similar type to that which he or she found challenging.

- 20 According to a further aspect of the invention there is provided data-processing apparatus comprising:

- a) first data record representing educational questions;
- b) a second data record representing:
 - i) a plurality of students; and
 - 25 ii) which of the questions they answered incorrectly;
- c) the apparatus calling on the first data record and causing at least some of the questions to be displayed to a human subject by way of a display screen;
- d) the apparatus receiving input indicative of answers by the human subject to at least some of the questions displayed;
- 30 e) the apparatus processing the input to determine which questions the human subject answered incorrectly; and
- f) for at least one question answered by the human subject incorrectly, the apparatus searching the second data record for a student who also answered that question incorrectly and causing a further question that such student answered incorrectly to be
- 35 presented to the human subject for answering.

Optionally the data processing apparatus comprises one or more computerised device, for example a mainframe computer, a server, a desktop computer, a laptop, a tablet or a smart phone.

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Optionally data processing apparatus causes correct answers to be displayed to the human subject by way of the screen for at least questions answered incorrectly by that person.

5 Optionally the data processing apparatus causes answers by the human subject to become part of the second data record for use in assessing further human subjects.

Optionally the data processing apparatus presents questions to the students and/or the human subject by way of a web site.

10 Optionally the data processing apparatus:

- a) determines the amount of time taken by the human subject to answer each question;
- b) in each case compares the amount of time with a data record indicating the time taken to answer the same question by the other students;
- 15 c) based on the comparison, determines that a question was more challenging to the human subjects if that person took a statistically long time to answer it; and
- d) searches the data record of questions to identify and present to the human subject a question of a similar type to that which he or she found challenging.

Optionally the second data record also indicates one or more of:

- 20 a) the time of day at least some of the questions were answered;
- b) a school attended by each student;
- c) the age of each student;
- d) the gender of each student;
- e) the race of each student; and
- 25 f) a mark (eg % correct answers) scored by each student for a series of the questions;

and the data processing apparatus uses this to identify a correlation between incorrect answers and one or more of items a) to f).

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DESCRIPTION OF THE DRAWING

Some preferred forms of the invention will now be described by way of example and with reference to **Figure 1**, which schematically illustrates data processing apparatus configured for use as a teaching aid.

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DETAILED DESCRIPTION

As illustrated in figure 1, the data processing apparatus 1 comprises a first data record 2. The first data record 2 represents a series of educational questions and is used by the apparatus 1
40 to cause the questions to be presented to a plurality of students by way of student display

screens 3. In some embodiments this may simply involve the apparatus 1 sending signals to a network for transmission to student-owned computers, tablets or smart phones, etc. The students input answers to the questions, and the apparatus receives these and keeps a second data record 4 indicative of which questions each student answered incorrectly.

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The apparatus 1 may be in the form of a server which retains the data records 2 and 4, but in some embodiments all or some of these may be remote from one another. For example, the first and second data records 2, 4 may be on different mass storage devices, or they may be different parts of the same mass storage device.

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The data processing apparatus may communicate with students via the internet 5, although this is not essential.

Over time a statistically relevant record of students and their answers to the questions is built up. This provides a benchmarking tool for assessing new students, as described below.

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A new student uses the data processing apparatus 1 to input data representing answers to at least some of the questions referred to above. In the event the apparatus determines that the new student answered one or more of the questions (say 'question A') incorrectly, it runs a search through the second data record 4 to determine which of the earlier tested students also answered that question incorrectly. The apparatus then presents a further one or more question (say 'question B') to the new student. Question B is a question which was answered incorrectly by a statistically relevant number of the earlier students who also answered question A incorrectly.

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The data processing apparatus 1 repeats this sequence for other questions that the new student answered incorrectly. For example, if the new student answered another question (say 'question X') incorrectly then the apparatus 1 runs a search through the second data record 4 to see whether there is another question (say question Y) which a statistically relevant number of other students also got wrong. The apparatus then puts question Y to the new student, that is, because there is a high probability it will be a challenge to the new student. It is reasoned that students who struggle with question X are also likely to struggle with question Y (the questions may or may not be similar).

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Each new student's answers to questions are kept as part of the second data record 4 for reference when the apparatus assesses future students in the same way. This assists in building up the data record 4 over time. However, each new student's answers are not used as part of the assessment for that particular student, except, if desired, in cases where the student is repeat-tested.

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In some embodiments of the invention the apparatus measures and records the amount of time taken by the new student to answer each question. The apparatus compares this with a data record of the time taken by earlier students to answer the same questions. The apparatus determines that a question which has taken a long time to answer (compared with other students) has been more challenging to the student than questions which were answered correctly in a short time. For questions which the data processing apparatus determines were more challenging, the apparatus searches the data record 2 of questions for similar questions and causes these to be presented to the student.

In some embodiments of the invention the data processing apparatus presents a student with a number of academic questions and receives the student's input answers to these. The apparatus determines whether the answers are correct or incorrect. For incorrect answers the apparatus displays information to the student to assist him or her to see why the answer was incorrect. The apparatus then searches a data record of questions for a similar question and presents that to the student. This similar question is of a type which challenges the student in a similar way to the first mentioned question so as to assist the student's learning by way of repetition or reinforcement.

The data processing apparatus incorporates and is controlled by a software routine or routines appropriate to the type of apparatus being used.

In some embodiments of the invention the type of question put to a student may at least in part be determined by factors other than whether a related or similar question was answered incorrectly. For example, it may be determined, because of input from the student, that the student attends a particular school where, statistically speaking, students tend to struggle to understand certain subjects or concepts. Further, based on the performance of students in relation to certain questions strengths or weaknesses in the teaching provided by the school may be identified. This may be achieved by the system comparing the results of a school with those of other schools.

In some embodiments of the invention the data records 2, 4 may be downloaded to, or otherwise stored on, a computerised device, for example a desktop, laptop, tablet or smart phone, etc. The device has a software application installed which uses the data records 2, 4 to present questions to the student and process answers in the manner described above. In this embodiment everything may run on a single device. The data 2, 4 records can be updated by periodic download if desired. In some cases, answers recorded in the device may be uploaded to the data processing apparatus 1 periodically to supplement the data records there.

In some embodiments of the invention the second data record may indicate one or more of:

- a) the time of day at least some of the questions were answered;

- b) a school attended by each student;
- c) the age of each student;
- d) the gender of each student;
- e) the race of each student; and

5 f) a mark (eg % correct answers) scored by each student for a series of the questions;

This information may be used to determine what particular questions to put to a new student or to a student who is being re-tested. For example, if student A gets 75% of all questions correct, there may be an increased chance that he or she is similar to another student who gets 74% of all answers correct. So in the event Student A gets a question X wrong, it is determined that that

10 Student B might also get question X wrong. So question X is put to student B to answer.

While some preferred forms of the invention have been described by way of example, it should be appreciated that modifications and improvement can occur without departing from the scope of the following claims.

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CLAIMS

1. A method of teaching, comprising the steps of:
 - a) keeping a data record of educational questions in a computer means;
 - 5 b) keeping a data record in the computer means indicating which of the questions students answered incorrectly;
 - c) causing, by way of the computer means, at least some of the questions to be displayed to a human subject by way of a display screen;
 - d) the computer means receiving input for answers by the human subject to at least
10 some of the questions displayed;
 - e) the computer means processing the input to determine which questions the human subject answered incorrectly; and
 - f) for at least one question answered incorrectly by the human subject, the computer means searching for a student who also answered that question incorrectly and
15 causing a further question that such student answered incorrectly to be presented to the human subject for answering.

2. A method according to claim 1, wherein the computer means comprises one or more computerised device selected from a mainframe computer, a server, a desktop computer, a
20 laptop, a tablet and a smart phone.

3. A method according to claim 1 or 2, wherein the computer means causes correct answers to be displayed to the human subject by way of the screen for at least questions answered incorrectly by that person.
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4. A method according to claim 1, 2 or 3, wherein answers by the human subject become part of the data record mentioned at claim 1 item b) for use in assessing further human subjects.

5. A method according to any one of the preceding claims, wherein the computer means presents questions to the students and/or the human subject by way of a web site.
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6. A method according to any one of the preceding claims, wherein the computer means:
 - a) determines an amount of time taken by the human subject to answer each question;
 - 35 b) in each case compares the amount of time with a data record indicating the time taken to answer the same question by the other students;
 - c) based on the comparison, determines that a question was more challenging to the human subject if that person took a statistically long time to answer it; and
 - d) searches the data record of questions to identify and present to the human subject
40 a question of a similar type to that which he or she found challenging.

- 5 7. Data-processing apparatus comprising:
- a) first data record representing educational questions;
 - 5 b) a second data record representing:
 - i) a plurality of students; and
 - ii) which of the questions they answered incorrectly;
 - c) the apparatus calling on the first data record and causing at least some of the questions to be displayed to a human subject by way of a display screen;
 - 10 d) the apparatus receiving input indicative of answers by the human subject to at least some of the questions displayed;
 - e) the apparatus processing the input to determine which questions the human subject answered incorrectly; and
 - 15 f) for at least one question answered by the human subject incorrectly, the apparatus searching the second data record for a student who also answered that question incorrectly and causing a further question that such student answered incorrectly to be presented to the human subject for answering.
- 20 8. Data processing apparatus according to claim 7, comprising one or more computerised device selected from a mainframe computer, a server, a desktop computer, a laptop, a tablet and a smart phone.
9. Data processing apparatus according to claim 7 or 8, which causes correct answers to be displayed to the human subject by way of the screen for at least questions answered incorrectly by that person.
- 25 10. Data processing apparatus according to claim 7, 8 or 9, which causes answers by the human subject to become part of the second data record for use in assessing further human subjects.
11. Data processing apparatus according to any one of claims 7 to 10, which presents questions to the students and/or the human subject by way of a web site.
- 30 12. Data processing apparatus according to claim 7, which:
 - a) determines an amount of time taken by the human subject to answer each question;
 - b) in each case compares the amount of time with a data record indicating the time taken to answer the same question by the other students;
 - 35 c) based on the comparison, determines that a question was more challenging to the human subject if that person took a statistically long time to answer it; and
 - d) searches the data record of questions to identify and present to the human subject a question of a similar type to that which he or she has found challenging.
- 40 13. Data processing apparatus according to any one of claims 7 to 12, wherein the second data record also indicates one or more of:
 - a) the time of day at least some of the questions were answered; and/or

- b) a school attended by each student;
- c) the age of each student;
- d) the gender of each student;
- e) the race of each student; and

- 5 f) a mark scored by each student for a series of the questions;

and the data processing apparatus uses this to identify a correlation between incorrect answers and one or more of items a) to f) of this claim.