

COMPUTER-AIDED EDUCATION SYSTEM FOR GUIDING PERSONAL LEARNING BARRIER

1. Field of the Invention

The present invention relates to a computer-aided education system, more specifically to a computer-aided education system that guides students to determine a cause for failure in achieving understanding the subject matter of a study course and provides proposed curricula related to the learning barrier in the course to the student. Students study the proposed curricula to acquire knowledge of the specific course and thus can further study advanced curricula in the course more easily and successfully. However, there may well be a 'learning barrier' whereby the student is unable to grasp the true understanding of the subject. One reason for that barrier may be insufficient prior knowledge of foundation subjects and so the student cannot achieve success until the foundation knowledge is acquired.

2. Description of Related Art

Recently, the computer and Internet related technology has been developed fast and lots of information is represented on the Internet. That is why the Internet has been described as just like a super large library. Anyone using a computer or the like linked to the Internet can access virtually any required information and also can communicate with everyone else on line. Therefore, some businesses developed E-commerce for E-stores on the Internet to increase trading chances and provide lots of services for clients.

More and more people are getting linked to the Internet and spend more and more time on their computers or the Internet. Students even like to play

games, shop or chat on the computer or Internet. To accord with this habit, one on-line learning web site has been built for students. The web site provides all courses of each subject to allow students to obtain and study the content of the course on the web site. The on-line learning web site only provides students all courses of each subject to select so students have to somehow find a specific course from the huge range available. That is, the on-line learning web site does not teach or guide students which courses should be studied based on different learning abilities. Therefore, the on-line learning web site only has a school library function.

In Asian countries in particular, each student has a very large education load so most students have to go to supplementary classes at the end of the conventional school day and on weekends. Going to the supplementary classes not only occupies a student's rest time but also requires an extra fee. Using the on-line learning education web site seems a good idea to replace the supplementary classes, but the student finds it hard to overcome the learning barriers without grades or teachers. Therefore, the on-line education web site has to be further improved to provide an effective and convenient learning system for students.

To overcome the shortcomings, the present invention provides a computer-aided education system for guiding personal learning to overcome education barriers to mitigate or obviate the aforementioned problems.

An objective of the present invention is to provide a computer-aided education system for guiding personal learning that helps students to determine particular causes for educational failure that previously hindered students from

learning an advanced curriculum in a specific course successfully. The system will further automatically provide students the suggested curricula to overcome the previous failure. The student can select the suggested curricula to learn and overcome the learning barrier.

Another objective of the present invention further provides variable guidance lists to students, such as a relative curricula guidance list, a main proposed curricula guidance list, a sub-proposed curricula guidance list, a pre-chapter guidance list, a decreasing-gradeed curricula guidance list etc.

Another objective of the present invention further provides the curricula of a specific course, wherein the curricula are created to a 'tree' structure based on a relative foundation relationship among the curricula. The tree structure enables students to select easily a specific curriculum in a specific course.

Other objectives, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

In the drawings

Fig. 1 is a block diagram of a first embodiment of a computer-aided education system in accordance with the present invention;

Fig. 2 is a partial 'tree' structure of a specific course executed by the computer-aided education system in accordance with the present invention;

Fig. 3 is a flow chart of spreading the 'tree' structure executed by the computer-aided education system in accordance with the present invention;

Fig. 4 is a flow chart of producing a relative foundation curricula guidance list executed by the computer-aided education system in accordance

with the present invention;

Fig. 5 is a flow chart of producing a main proposed curricula guidance list and a sub-proposed curricula guidance list executed by the computer-aided education system in accordance with the present invention;

Fig. 6 is a flow chart of producing decreasing-gradeed curricula guidance list executed by the computer-aided education system in accordance with the present invention;

Fig. 7 is a block diagram of a second embodiment of a computer-aided education system in accordance with the present invention;

Figs. 8A to 8B are frames of displaying by the second embodiment of the computer-aided education system in accordance with the present invention; and

Fig. 9 is a flow chart of operating the computer-aided education system in accordance with the present invention.

With reference to Fig. 1, the present invention is related to a computer-aided education system and is set up in a computer (10) to provide personal guidance lists. The computer-aided education system includes steps of (a) storing various contents of multiple courses each of which includes multiple curricula; (b) creating curricula of each course to a curricula 'tree' structure based on a relative foundation relationship among the curricula; and (c) providing a personal learning interface.

The courses could be Mother language, Mathematics, Society, Health, Local Geography, English, Natural Science, Art, Comprehension, EQ training etc. Each course has multiple curricula, each of which is represented by a unique

code. Each code, name, content of the curricula is stored in a curriculum (11). The contents of each curriculum include audio, video, graphic, text etc. formats. The curricula tree structures are stored in a relative foundation curricula database (12). The personal learning interface (not shown) has various guidance lists for a user to select. Each guidance list provides multiple curricula for the user and the user selects an appropriate curriculum to obtain the content to study.

With reference to Fig. 2, for example: a specific course (Mathematics) has many curricula as Fractions, Multiplication, Division, Addition, and subtraction. The curricula are created as the 'tree' structure based on the relative foundation relationship. In general, before starting to learn Fractions, a user should have learned the relative foundation curricula as Multiplication and Division. On the other hand, if the user has learned the Multiplication, Subtraction and Addition will almost certainly have been learned before learning the Multiplication. Therefore, Multiplication, Division, Subtraction and Addition curricula are relative foundation curricula of Fractions. Therefore, when the user can not learn Fractions very well, one or more curricula of the Fractions may be the cause of the learning barrier of Fractions course.

The personal learning interface further includes:

- (a) providing an exam related to the current curriculum, wherein the exam includes multiple examination questions;
- (b) recording information from the learning progress and/or exam process such as selecting times of the current curriculum, learning time, answering time etc.; and
- (c) analyzing a learning capability of the user in the current curriculum

according to the recording information.

As mentioned above, the computer further establishes a curricula progress database (16) to store the information about the learning progress, an examination questions database (15) to store the examination questions related to each curriculum and a result database (14) to store the results corresponding to examination questions.

When the user selects a specific curriculum and then studies the curriculum, the personal learning interface will provide an exam to the user. The exam includes multiple examination questions related to the current curriculum and the foundation curricula of the current curriculum. The computer compares the results made by the user and further analyzes the user's learning capability. Some of the examination questions in the exam are selected from the relative foundation curricula of the learned curriculum, so the present invention can judge which curricula could be the cause of the user's learning barrier in a specific course. Further, the personal learning interface provides the guidance lists to the user based on a learning record database (13) and a relative foundation curricula database (12). The learning record database (13) records a learning history including curricula progress, selected numbers of the current curriculum, studying time etc.,

With further reference to Fig. 8C, the guidance lists include a complete foundation curricula guidance list, a relative foundation curricula guidance list, a main proposed curricula guidance list, a sub-proposed curricula guidance list, degrading curricula guidance list and a pre-chapter guidance list. The foundation curricula guidance list is represented directly to a curricula 'tree' structure of one

specific course on the personal learning interface.

With reference to Figs. 1 and 4, a method of producing the relative foundation curricula guidance list includes the steps of:

(a) reading one curricula tree structure of one specific course from the relative foundation curricula database (12); (S41)

(b) searching the current curriculum the user selected from the learning record database (13); (S42)

(c) obtaining all foundation curricula of the current curriculum in the curricula tree structure; (S43) and

(d) listing the foundation curricula of the current curriculum to be the relative foundation curricula guidance list. (S44)

The method of producing the relative foundation curricula guidance list further includes searching a foundation curricula guidance list of another curriculum step (S45) after step (d). If the user has selected to start a new course, step (a) will be re-executed, on the other hand the method will be terminated and only one relative foundation curricula guidance list is listed.

With reference to Figs. 1 and 5, a method of producing the main proposed curricula guidance list and the sub-proposed curricula guidance list includes the steps of:

(a) reading one curricula tree structure of one specific course from the relative foundation curricula database (12); (S51)

(b) reading the results of the final exam from the result database (14); (S52)

(c) marking nodes of the curricula tree structure based on some curricula

related to the examination questions each of which has the wrong result in the final exam; (S53)

(d) listing the relative foundation curricula represented by the marked nodes to be the main proposed curricula guidance list; (S54)

(e) searching other relative foundation curricula of each curriculum in the main proposed curricula guidance from the curricula tree structure; (S55) and

(f) listing the relative foundation curricula of step (e) to be the sub-proposed curricula guidance list. (S56)

The method of producing the main proposed curricula guidance list and the sub-proposed curricula guidance list further includes a searching a main proposed and sub-proposed curricula guidance lists of another curriculum step (S57) after step (f). If the user has selected to search another course's main proposed curricula guidance list and the sub-proposed curricula guidance list, step (a) will be re-executed. If not, the method will be terminated.

The curricula of each course are classified to multiple semesters based on principle of a national education system. Each curriculum of the semester still has the relative foundation relationship. With reference to Fig. 6, a method of producing the degrading curricula guidance list includes steps of;

(a) determining whether the user has the learning capability of the current curriculum or not, wherein if the user has enough learning capability for the current curriculum the step (a) is ended, and if the learning capability is enough the next step will be executed; (S61)

(b) recalling the last learned curriculum from the curricula progress database (16) and generating a degrading parameter; (S62)

(c) determining a lower specific semester than the current curriculum's semester based on the degrading parameter; (S63) and

(d) listing curricula in the lower specific semester as the degrading curricula guidance list (S64) and then the producing method is completed (S65).

Based on the foregoing description, the various guidance lists are produced according to the user's learning history. The personal learning interface further provides a spreading learning curricula tree structure function. The curricula tree structure is spread by a tree-shaped diagram or a network-shaped diagram. With reference to Fig. 2, the tree-shaped diagram (20) is composed of multiple father and son nodes (21). The father nodes are respectively connected to the relative son nodes (21) by lines and dotted lines. Each node's father nodes are pointed along a direction of each line. Each node's son nodes are pointed along the dotted lines.

With reference to Fig. 3, one course could have multiple curricula and one curriculum is represented to a node of the tree-shaped diagram, so the nodes of the tree-shaped diagram is further separated to N levels. The personal learning interface provides several levels of the tree-shaped diagram spreading function. That is, the personal learning has a spreading functional bottom. When the user click the bottom once several levels are shown on the personal learning interface until the all N levels are shown. A method of spreading learning levels of the curricula tree structure includes the steps of:

(a) reading one curricula tree structure of one specific course from the relative foundation curricula database; (S31)

(b) obtaining the node corresponding to the current curriculum; (S32)

(c) spreading forward n-levels of the tree-shaped diagram along the lines from a specific level where the node according to the current curriculum is. (S33)

The method of spreading learning curricula tree structure step further includes a second spreading step (S34) to spread other levels of the tree-shaped diagram based on another curriculum in the curricula tree structure. The user can select another curriculum in the same curricula tree structure to spread the tree-shaped diagram based on the new selected curriculum. If the user does not select another curriculum, the spreading method is over (S35).

The foregoing description discloses one embodiment of the present invention which is set up in one computer to operate. The present invention is also set up in a web server to provide one on-line education system for users. There are two structures of the web server that are suitable to set up the present invention; one is a 3-tier and the other is n-tier. With reference to Fig. 7, the present invention is set up in the web server (10a) creating homepages (18) and a server engine (19). For enabling convenient access to many users, the present invention further includes an identifying user's identity method. That is, users' identities are stored in a user identity database (17). Each user can use the computer (10) linked to the web server (10a) and then the web server (10a) will send the homepage to a browser of the computer (10). With further reference to Fig. 8A, as the user has to provide a login name and password, the web server will execute an identifying method to check the login number and password with the user identity database.

With reference to Fig. 8B, when the web server identifies the user has the correct identity, the web server will transmit the personal learning interface with

a course list to the browser on the user's computer. The user can select one of the courses on the course list. With reference to Fig. 8C, when a user has selected one course, the personal learning interface provides the various guidance lists. The user then selects an appropriate guidance list to start to study one specific curriculum in the course.

As mentioned above, with further reference to Figs. 8A to 8c and 9, the present invention set up in the web server is executed as the following steps:

- (a) providing the user number and password; (S71)
- (b) obtaining the user number and password from the user identity database; (S72)
- (c) obtaining the current course which the user selected; (S73)
- (d) displaying the various guidance lists of the current course to the user to select one curriculum; (S74)
- (e) displaying the content of the selected curriculum to the user; (S75)
- (f) recording and storing the learning process in the curricula progress database; (S76)
- (g) providing an exam about the current curriculum and the foundation curricula of the current curriculum to the user; (S77) and
- (h) recording and storing exam progress and result of the exam in the result database.(S78)

When the present invention executes the above steps, the present invention can further add a selecting another curriculum step (S79) after (h) step. When the user has finished study of one curriculum and the user wants to learn the next new curriculum, the present invention can provide the user the various

guidance lists.

To clearly show the relative foundation relationship among the curricula of the specific course, the curricula tree structure is represented by a tree-shaped diagram or a network diagram. The tree-shaped diagram has multiple father and son nodes, each of which is corresponding to the curricula. The nodes of the tree-shaped diagram create a sequence from the right direction to left direction based on the relative foundation relationship. That is, the left nodes directly or indirectly linked to the one specific node (curriculum) of the tree-shaped diagram are the relative foundation curricula of the specific curriculum. On the other hand, the specific curriculum is one foundation curriculum of each right node directly or indirectly connected to the one specific node.

Further, the personal learning interface has the various guidance lists and each guidance list is produced according to the relative foundation curricula database (12). Therefore, the curricula of the guidance list correspond to the nodes of the tree-shaped diagram and the curricula of the different guidance list are marked on the tree-shaped diagram by different colors.

Again, each guidance list could have numbers of the curricula so each guidance list is further created as a priority curricula list. That is, each guidance list will select more important curricula to display first when the user clicks the guidance list. The curricula listed in the priority curricula list are selected by different weight ratios each of which is calculated according to:

(a) a level difference where the current curriculum is;

(b) numbers of examination questions with wrong answers in an exam of the current curriculum; and/or

(c) numbers of father or son nodes linked to the current curriculum.

Therefore, each curriculum in the guidance list can be calculated to a total weight ratio. The curricula with larger weight ratios are listed in the priority curricula list.

Based on the foregoing description, the present invention designs various guidance lists according to the user's learning history so the user learning the courses can understand where the learning barrier is by using the present invention.

Even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosure is illustrative only, and changes may be made in detail, especially in matters of shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

Claims:

1. A computer-aided education system for guiding personal learning barrier built in a computer, comprising:

- (a) storing various contents of multiple courses each of which includes multiple curricula;
- (b) creating a curriculum of each course to a curricula 'tree' structure based on a relative foundation relationship among the curricula; and
- (c) providing a personal learning interface that has various courses, each of which includes multiple curricula, wherein the personal learning interface provides a relative foundation curricula guidance list after one specific course is selected by a user.

2. The computer-aided education system as claimed in claim 1, wherein the computer further establishes:

- a curricula database storing each curriculum's content, codes, name and storing address in the computer;

- a relative foundation curricula database storing the curricula 'tree' structure; and

- a learning record database storing a learning history, which includes curricula progress, clicking times and learning time information the user made.

3. The computer-aided education system as claimed in claim 1 or 2, wherein the computer has a method of producing the relative foundation curricula guidance list to produce the curricula guidance list on the personal learning interface, wherein the producing method comprises steps of:

- (a) reading one curricula tree structure of one specific course from the

relative foundation curricula database;

(b) searching the current curriculum the user selected from the learning record database;

(c) obtaining all foundation curricula of the current curriculum in the curricula 'tree' structure; and

(d) listing the foundation curricula of the current curriculum to be the relative foundation curricula guidance list.

4. The computer-aided education system as claimed in claim 1, 2 or 3 wherein the curricula 'tree' structure is spread by a network-shaped diagram or a 'tree-shaped' diagram, that is composed of multiple father and son nodes, wherein the father nodes are respectively connected to the relative son nodes (21) by lines and dotted lines, wherein each node's father nodes are pointed along a direction of each line and each node's son nodes are pointed along the dotted lines.

5. The computer-aided education system as claimed in claim 4, wherein each father and son node is represented as one curriculum.

6. The computer-aided education system as claimed in any one of the preceding claims, wherein the personal learning interface further comprises a method of spreading the learning curricula tree structure, wherein the spreading method comprises steps of:

(a) reading one curricula 'tree' structure of one specific course from the relative foundation curricula database;

(b) obtaining the node corresponding to the current curriculum; and

(c) spreading forward n-levels of the 'tree-shaped' diagram along the lines from a specific level where the node according to the current curriculum is;

whereby the curricula with larger weights are listed in the priority curricula list.

7. The computer-aided education system as claimed in any one of the preceding claims, wherein the relative foundation curricula guidance list is further created to a priority curricula list, wherein each curriculum has a weight ratio that is calculated according to:

(a) a level difference where the current curriculum is;

(b) numbers of examination questions with incorrect answers in an exam of the current curriculum; and/or

(c) numbers of father or son nodes linked to the current curriculum;

whereby the curricula with larger weight ratios in the relative foundation curricula guidance list are listed in the priority curricula list.

8. The computer-aided education system as claimed in any one of the preceding claims, wherein each content is represented as a video, graphic, or text media formation.

9. The computer-aided education system as claimed in any one of the preceding claims, wherein the computer further comprises a user identity database storing user identity information and an identifying user's identity method to check the user's identity.

10. A computer-aided education system for guiding personal learning barrier built in a computer, comprising:

(a) storing various contents of multiple courses each of which includes multiple curricula;

(b) creating a curriculum of each course to a curricula 'tree' structure based on a relative foundation relationship among the curricula; and

(c) providing a personal learning interface that has various courses, each of which includes multiple curricula, wherein the personal learning interface provides a main proposed and sub-proposed curricula guidance lists after one specific course is selected by a user.

11. The computer-aided education system as claimed in claim 10, wherein the computer further establishes:

a curricula database storing each curriculum's content, codes, name and storing address in computer;

a relative foundation curricula database storing the curricula 'tree' structure;

an examination questions database storing multiple examination questions of each curriculum; and

a result database storing multiple results according to the examination questions in the examination questions database.

12. The computer-aided education system as claimed in claim 10 or 11, wherein the computer has a method of producing the main proposed curricula guidance list comprising the steps of:

(a) reading one curricula 'tree' structure of one specific course from the relative foundation curricula database;

(b) reading the results of the final exam from the result database;

(c) marking nodes of the curricula 'tree' structure based on some curricula related to the examination questions each of which has an incorrect result in the final exam; and

(d) listing the relative foundation curricula represented by the marked

nodes to be the main proposed curricula guidance list.

13. The computer-aided education system as claimed in claim 10, 11 or 12 wherein the computer has a method of producing the sub-proposed curricula guidance list comprising the steps of:

- (a) searching other relative foundation curricula of each curriculum in the main proposed curricula guidance from the curricula 'tree' structure; and
- (b) listing the relative foundation curricula of step (e) to be the sub-proposed curricula guidance list.

14. The computer-aided education system as claimed in claim any one of claims 10 to 13, wherein the curricula 'tree' structure is spread by a network-shaped diagram or a 'tree-shaped' diagram, that is composed of multiple father and son nodes, wherein the father nodes are respectively connected to the relative son nodes by lines and dotted lines, wherein each node's father nodes are pointed along a direction of each line and each node's son nodes are pointed along the dotted lines.

15. The computer-aided education system as claimed in claim 14, wherein each father node and each son node represent one curriculum.

16. The computer-aided education system as claimed in claim any one of claims 10 to 15, wherein the personal learning interface further comprises a method of spreading a learning curricula 'tree' structure, wherein the spreading method comprises steps of:

- (a) reading one curricula 'tree' structure of one specific course from the relative foundation curricula database;
- (b) obtaining the node corresponding to the current curriculum; and

(c) spreading forward n-levels of the 'tree-shaped' diagram along the lines from a specific level where the node according to the current curriculum is;

whereby the curricula with larger weights are listed in the priority curricula list.

17. The computer-aided education system as claimed in any one of claims 10 to 16, wherein the main proposed and sub-proposed curricula guidance lists are further respectively created to a priority curricula list, wherein each curriculum has a weight ratio that is calculated according to:

(a) a level difference where the current curriculum is;

(b) numbers of examination questions with incorrect answers in an exam of the current curriculum; and/or

(c) numbers of father or son nodes linked to the current curriculum;

whereby the curricula with larger weight ratios in the relative foundation curricula guidance list are listed in the priority curricula list.

18. The computer-aided education system as claimed in any one of claims 10 to 17, wherein each content is represented as a video, graphic, text or media formation.

19. The computer-aided education system as claimed in any one of claims 10 to 18, wherein the computer further comprises a user identity database storing user identity information and an identifying user's identity method to check the user's identity.

20. A computer-aided education system for guiding personal learning barrier built in a computer, comprising:

(a) storing various contents of multiple courses each of which includes multiple curricula;

(b) creating curricula of each course to a curricula 'tree' structure based on a relative foundation relationship among the curricula; and

(c) providing a personal learning interface that has various courses, each of which includes multiple curricula, wherein the personal learning interface provides a degrading curricula guidance list after one specific course is selected by a user.

21. The computer-aided education system as claimed in claim 20, wherein the computer further establishes:

a curricula database storing each curriculum's content, codes, name and storing address in the computer;

a relative foundation curricula database storing the curricula 'tree' structure;

a learning record database storing a learning history, which includes curricula progress, clicking times and learning time information the user made;

an examination questions database storing multiple examination questions of each curriculum; and

a result database storing multiple results according to the examination questions in the examination questions database.

22. The computer-aided education system as claimed in claim 20 or 21, wherein the computer has a method of producing the degrading curricula guidance list comprising the steps of:

(a) determining whether the user has the learning capability sufficient for the current curriculum or not, wherein if the user has sufficient learning capability for the current curriculum the producing is end, and if the learning

capability is sufficient the next step will be executed;

(b) recalling the last learned curriculum from the curricula progress database and generating a degrading parameter;

(c) determining a lower specific semester than the current curriculum's semester based on the degrading parameter; and

(d) listing curricula in the lower specific semester as the degrading curricula guidance list.

23. The computer-aided education system as claimed in claim 20, 21 or 22, wherein the curricula 'tree' structure is spread by a network-shaped diagram or a 'tree-shaped' diagram, that is composed of multiple father and son nodes, wherein the father nodes are respectively connected to the relative son nodes (21) by lines and dotted lines, wherein each node's father nodes are pointed along a direction of each line and each node's son nodes are pointed along the dotted lines.

24. The computer-aided education system as claimed in claim 23, wherein each father and son node represents one curriculum.

25. The computer-aided education system as claimed in any one of claims 20 to 24, wherein the personal learning interface further comprises a method of spreading the learning curricula 'tree' structure, wherein the spreading method comprises the steps of:

(a) reading one curricula 'tree' structure of one specific course from the relative foundation curricula database;

(b) obtaining the node corresponding to the current curriculum; and

(c) spreading forward n-levels of the 'tree-shaped' diagram along the

lines from a specific level where the node according to the current curriculum is;
whereby the curricula with larger weights are listed in the priority curricula list.

26. The computer-aided education system as claimed in any one of claims 20 to 25, wherein the degrading curricula guidance list is further created to a priority curricula list, wherein each curriculum has a weight ratio that is calculated according to:

- (a) a level difference where the current curriculum is;
 - (b) numbers of examination questions with incorrect answers in an exam of the current curriculum; and/or
 - (c) numbers of father or son nodes linked to the current curriculum;
- whereby the curricula with larger weight ratios in the degrading curricula guidance list are listed in the priority curricula list.

27. The computer-aided education system as claimed in any one of claims 20 to 26, wherein each content is represented as a video, graphic, or text media formation.

28. The computer-aided education system as claimed in any one of claims 20 to 27, wherein the computer further comprises a user identity database storing user identity information and an identifying user's identity method to check the user's identity.