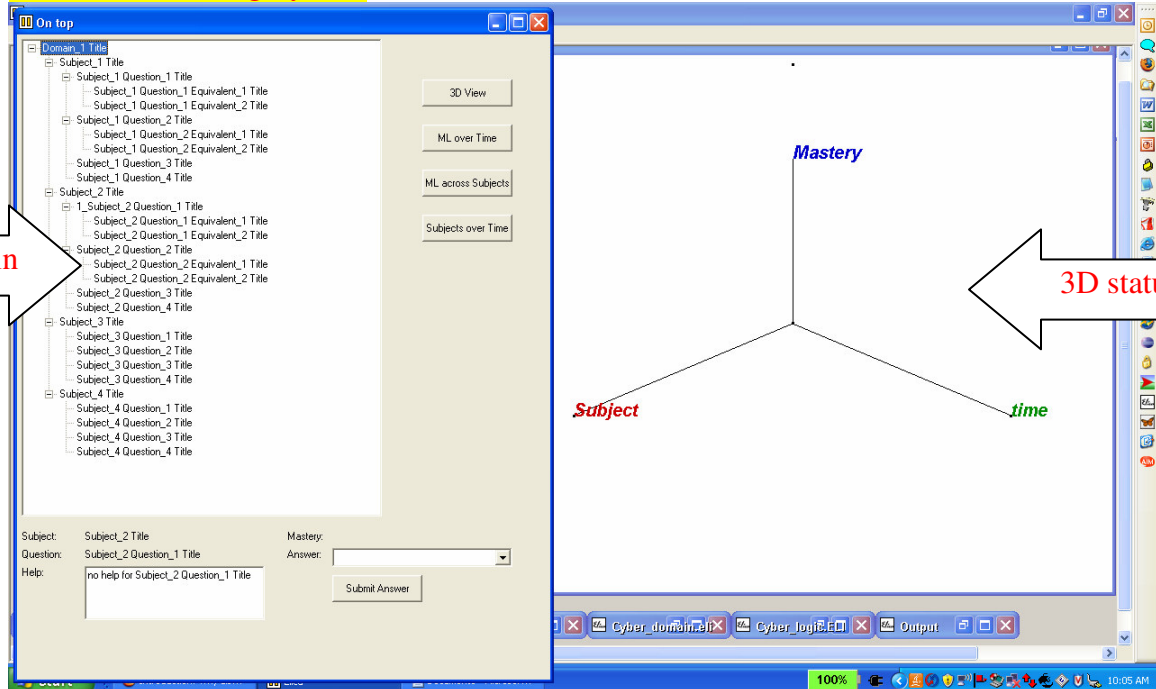


Final Project – Second Order automatic Feedback System**12/7/07****Automatic Tutoring System**

The knowledge and skills assessment session starts within the Domain Model, on a topic/subject that “matches” the User Model (profile). For example, the topic/subject is one that the performer indicated interest in, or where s/he feels he needs some exercises and assessments, and so on.

The questions on the left panel are assembled from the Domain Model (a Topic Map), by visiting all appropriate/relevant topics (see “matching” above), and gathering the Question, Equivalent Question, Answers, and Help topic nodes (see details below).

The screenshot shows a software interface with a hierarchical tree on the left and a question display area on the right. The tree is titled "Domain_1 Title" and contains four subjects, each with multiple questions and equivalent questions. The question display area shows "Subject: Subject_2 Title", "Question: Subject_2 Question_1 Title", and "Help: no help for Subject_2 Question_1 Title". There is a "Submit Answer" button and a mastery level dropdown menu.

Starting point (points to the tree structure)

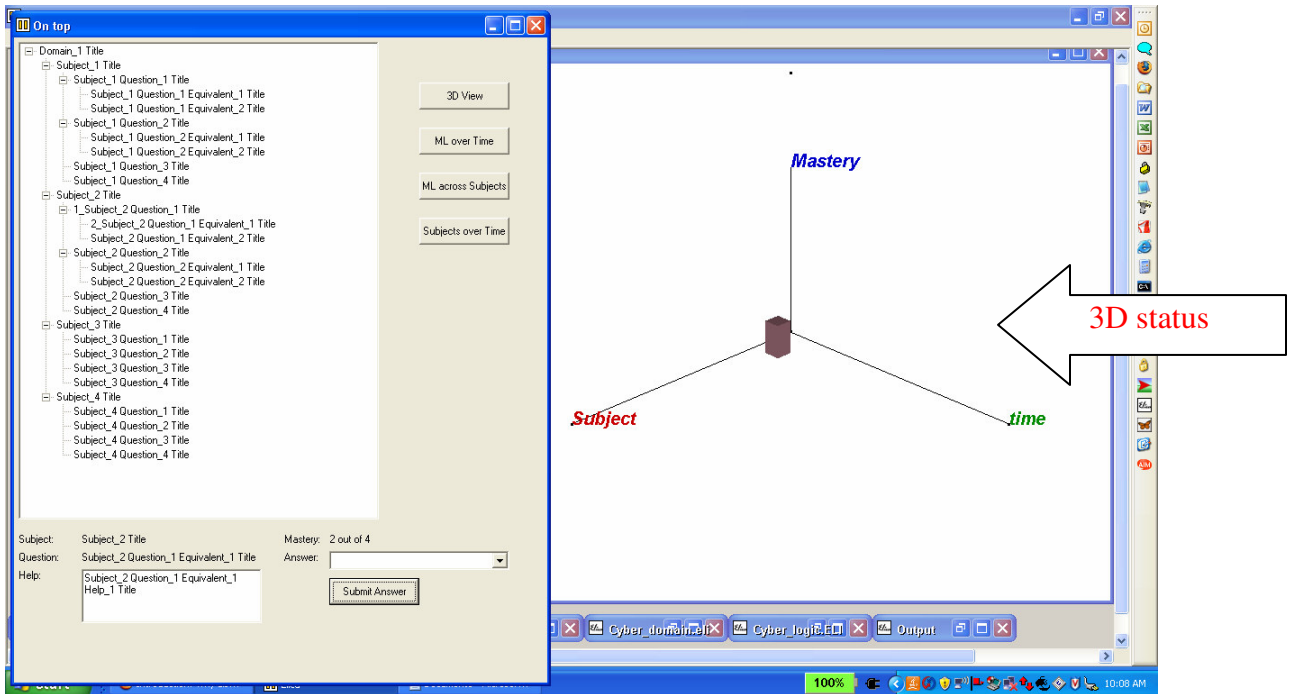
1st question (points to the question text)

No help (points to the help text)

Initially, the topic/subject title is displayed (gathered from the Domain Model Topic Map), along with a question, matching the learner's profile (mastery level, learning style, etc.)

Also, no help is provided, since the system is trying to establish what mastery level the learner has achieved.

The learner picks an answer from the drop-down list. This implementation assumes text-based Q&A, but the Domain Model contains and can support multiple modes, formats, and styles of knowledge/skills assessments (e.g. multimedia, simulation, synthesis, etc.)



Once the learner submits his/her answer, the system assesses its correctness, and displays the mastery level (ML).

If the ML is below the goal, the system looks for an Equivalent Question: one that is about the same topic, at about the same level of difficulty, style, etc. The system also displays a first help topic. Subsequently, more help is offered if the learner continues to perform below the goal.

The system also displays the performance in the “3D status” panel, reflecting status dimensions such as Subject, Mastery Level, and time.

On top

- Domain_1 Title
 - Subject_1 Title
 - Subject_1 Question_1 Title
 - Subject_1 Question_1 Equivalent_1 Title
 - Subject_1 Question_1 Equivalent_2 Title
 - Subject_1 Question_2 Title
 - Subject_1 Question_2 Equivalent_1 Title
 - Subject_1 Question_2 Equivalent_2 Title
 - Subject_1 Question_3 Title
 - Subject_1 Question_4 Title
 - Subject_2 Title
 - 1_Subject_2 Question_1 Title
 - 2_Subject_2 Question_1 Equivalent_1 Title
 - Subject_2 Question_1 Equivalent_2 Title
 - Subject_2 Question_2 Title
 - Subject_2 Question_2 Equivalent_1 Title
 - Subject_2 Question_2 Equivalent_2 Title
 - Subject_2 Question_3 Title
 - Subject_2 Question_4 Title
 - Subject_3 Title
 - Subject_3 Question_1 Title
 - Subject_3 Question_2 Title
 - Subject_3 Question_3 Title
 - Subject_3 Question_4 Title
 - Subject_4 Title
 - Subject_4 Question_1 Title
 - Subject_4 Question_2 Title
 - Subject_4 Question_3 Title
 - Subject_4 Question_4 Title

3D View

ML over Time

ML across Subjects

Subjects over Time

Subject: Subject_2 Title Mastery: 2 out of 4

Question: Subject_2 Question_1 Equivalent_1 Title Answer:

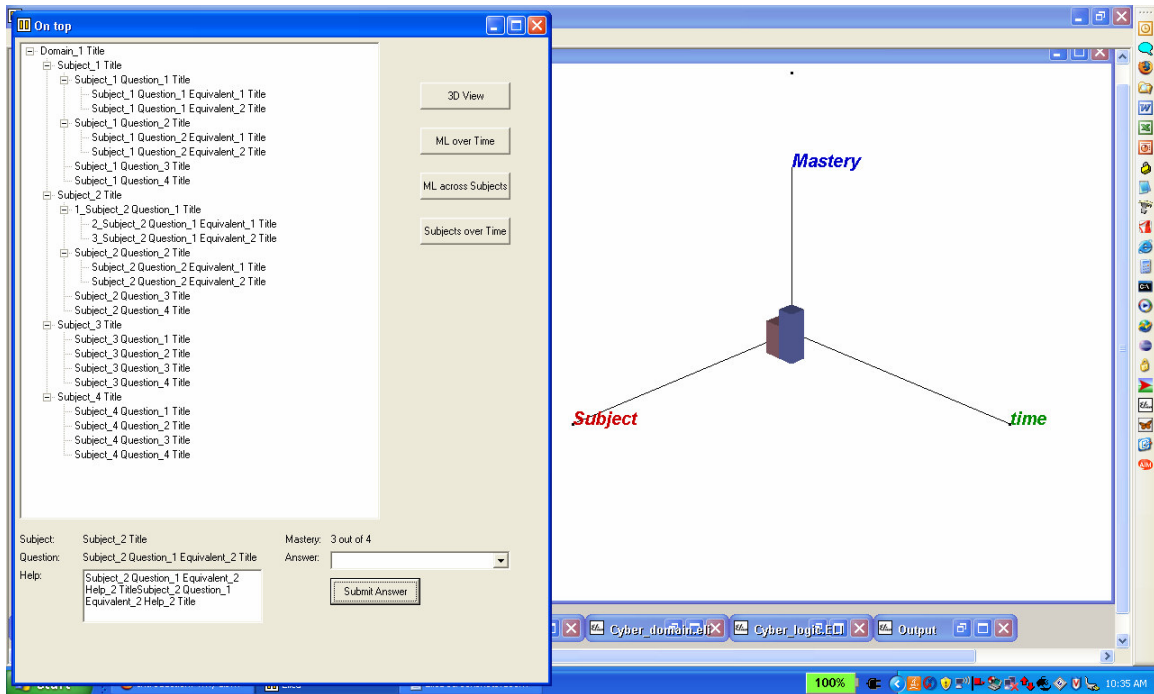
Help: Subject_2 Question_1 Equivalent_1

Help_1 Title

Equivalent Q

Some help

Low ML



After each question is answered, the 3D status is updated, indicating how the learner is progressing, along the 3 axis (subject, mastery level, time). Depending on the mastery level indicated by the answer, the next appropriate question is selected and displayed.

On top

- Domain_1 Title
 - Subject_1 Title
 - Subject_1 Question_1 Title
 - Subject_1 Question_1 Equivalent_1 Title
 - Subject_1 Question_1 Equivalent_2 Title
 - Subject_1 Question_2 Title
 - Subject_1 Question_2 Equivalent_1 Title
 - Subject_1 Question_2 Equivalent_2 Title
 - Subject_1 Question_3 Title
 - Subject_1 Question_4 Title
 - Subject_2 Title
 - 1_Subject_2 Question_1 Title
 - 2_Subject_2 Question_1 Equivalent_1 Title
 - 3_Subject_2 Question_1 Equivalent_2 Title
 - Subject_2 Question_2 Title
 - Subject_2 Question_2 Equivalent_1 Title
 - Subject_2 Question_2 Equivalent_2 Title
 - Subject_2 Question_3 Title
 - Subject_2 Question_4 Title
 - Subject_3 Title
 - Subject_3 Question_1 Title
 - Subject_3 Question_2 Title
 - Subject_3 Question_3 Title
 - Subject_3 Question_4 Title
 - Subject_4 Title
 - Subject_4 Question_1 Title
 - Subject_4 Question_2 Title
 - Subject_4 Question_3 Title
 - Subject_4 Question_4 Title

3D View

ML over Time

ML across Subjects

Subjects over Time

Subject: Subject_2 Title Mastery: 3 out of 4

Question: Subject_2 Question_1 Equivalent_2 Title Answer:

Help:

Equivalent Q

Still low ML

More help

The screenshot displays a software application window with a blue title bar. On the left, a tree view shows a hierarchical structure of domains and subjects. The main area features a 3D bar chart with three axes: 'Mastery' (vertical, blue), 'Subject' (horizontal, red), and 'time' (depth, green). A red arrow points from the right towards the chart, labeled 'ML progress'. Below the chart is a question input form with fields for 'Subject', 'Question', and 'Help', and a 'Submit Answer' button. The bottom of the window shows a taskbar with several open applications and a system tray with the time '10:35 AM'.

On top

- Domain_1 Title
 - Subject_1 Title
 - Subject_1 Question_1 Title
 - Subject_1 Question_1 Equivalent_1 Title
 - Subject_1 Question_1 Equivalent_2 Title
 - Subject_1 Question_2 Title
 - Subject_1 Question_2 Equivalent_1 Title
 - Subject_1 Question_2 Equivalent_2 Title
 - Subject_1 Question_3 Title
 - Subject_1 Question_4 Title
 - Subject_2 Title
 - 1_Subject_2 Question_1 Title
 - 2_Subject_2 Question_1 Equivalent_1 Title
 - 3_Subject_2 Question_1 Equivalent_2 Title
 - 4_Subject_2 Question_2 Title
 - Subject_2 Question_2 Equivalent_1 Title
 - Subject_2 Question_2 Equivalent_2 Title
 - Subject_2 Question_3 Title
 - Subject_2 Question_4 Title
 - Subject_3 Title
 - Subject_3 Question_1 Title
 - Subject_3 Question_2 Title
 - Subject_3 Question_3 Title
 - Subject_3 Question_4 Title
 - Subject_4 Title
 - Subject_4 Question_1 Title
 - Subject_4 Question_2 Title
 - Subject_4 Question_3 Title
 - Subject_4 Question_4 Title

3D View

ML over Time

ML across Subjects

Subjects over Time

Subject: Subject_2 Title Mastery: 4 out of 4

Question: Subject_2 Question_2 Title Answer:

Help: no help for Subject_2 Question_2 Title

Submit Answer

Subject Mastery time

Cyber_DomainMatrix Cyber_Logic Output

100% 10:35 AM

ML progress

The screenshot shows a software interface with a blue title bar that says "On top". On the left is a tree view of content:

- Domain_1 Title
 - Subject_1 Title
 - Subject_1 Question_1 Title
 - Subject_1 Question_1 Equivalent_1 Title
 - Subject_1 Question_1 Equivalent_2 Title
 - Subject_1 Question_2 Title
 - Subject_1 Question_2 Equivalent_1 Title
 - Subject_1 Question_2 Equivalent_2 Title
 - Subject_1 Question_3 Title
 - Subject_1 Question_4 Title
 - Subject_2 Title
 - 1_Subject_2 Question_1 Title
 - 2_Subject_2 Question_1 Equivalent_1 Title
 - 3_Subject_2 Question_1 Equivalent_2 Title
 - 4_Subject_2 Question_2 Title
 - Subject_2 Question_2 Equivalent_1 Title
 - Subject_2 Question_2 Equivalent_2 Title
 - Subject_2 Question_3 Title
 - Subject_2 Question_4 Title
 - Subject_3 Title
 - Subject_3 Question_1 Title
 - Subject_3 Question_2 Title
 - Subject_3 Question_3 Title
 - Subject_3 Question_4 Title
 - Subject_4 Title
 - Subject_4 Question_1 Title
 - Subject_4 Question_2 Title
 - Subject_4 Question_3 Title
 - Subject_4 Question_4 Title

On the right side of the interface are four buttons: "3D View", "ML over Time", "ML across Subjects", and "Subjects over Time".

At the bottom, there is a status area with the following text:

Subject: Subject_2 Title Mastery: 4 out of 4
Question: Subject_2 Question_2 Title Answer:
Help: no help for Subject_2 Question_2 Title

Next Q, new Subject

Goal ML

No help

The learner is doing well (goal ML achieved), and the system moves to the next subject, removes help, and indicates high ML on the 3D panel above.

On top

- Domain_1 Title
 - Subject_1 Title
 - Subject_1 Question_1 Title
 - Subject_1 Question_1 Equivalent_1 Title
 - Subject_1 Question_1 Equivalent_2 Title
 - Subject_1 Question_2 Title
 - Subject_1 Question_2 Equivalent_1 Title
 - Subject_1 Question_2 Equivalent_2 Title
 - Subject_1 Question_3 Title
 - Subject_1 Question_4 Title
 - Subject_2 Title
 - 1_Subject_2 Question_1 Title
 - 2_Subject_2 Question_1 Equivalent_1 Title
 - 3_Subject_2 Question_1 Equivalent_2 Title
 - 4_Subject_2 Question_2 Title
 - 5_Subject_2 Question_2 Equivalent_1 Title
 - Subject_2 Question_2 Equivalent_2 Title
 - Subject_2 Question_3 Title
 - Subject_2 Question_4 Title
 - Subject_3 Title
 - Subject_3 Question_1 Title
 - Subject_3 Question_2 Title
 - Subject_3 Question_3 Title
 - Subject_3 Question_4 Title
 - Subject_4 Title
 - Subject_4 Question_1 Title
 - Subject_4 Question_2 Title
 - Subject_4 Question_3 Title
 - Subject_4 Question_4 Title

3D View
ML over Time
ML across Subjects
Subjects over Time

Subject: Subject_2 Title Mastery: 1 out of 4
Question: Subject_2 Question_2 Equivalent_1 Title Answer:
Help: Subject_2 Question_2 Equivalent_1 Help_1 Title

Cyber_DomainMatrix Cyber_Logic Output

100% 10:37 AM

On top

- Domain_1 Title
 - Subject_1 Title
 - Subject_1 Question_1 Title
 - Subject_1 Question_1 Equivalent_1 Title
 - Subject_1 Question_1 Equivalent_2 Title
 - Subject_1 Question_2 Title
 - Subject_1 Question_2 Equivalent_1 Title
 - Subject_1 Question_2 Equivalent_2 Title
 - Subject_1 Question_3 Title
 - Subject_1 Question_4 Title
 - Subject_2 Title
 - 1_Subject_2 Question_1 Title
 - 2_Subject_2 Question_1 Equivalent_1 Title
 - 3_Subject_2 Question_1 Equivalent_2 Title
 - 4_Subject_2 Question_2 Title
 - 5_Subject_2 Question_2 Equivalent_1 Title
 - Subject_2 Question_2 Equivalent_2 Title
 - Subject_2 Question_3 Title
 - Subject_2 Question_4 Title
 - Subject_3 Title
 - Subject_3 Question_1 Title
 - Subject_3 Question_2 Title
 - Subject_3 Question_3 Title
 - Subject_3 Question_4 Title
 - Subject_4 Title
 - Subject_4 Question_1 Title
 - Subject_4 Question_2 Title
 - Subject_4 Question_3 Title
 - Subject_4 Question_4 Title

3D View

ML over Time

ML across Subjects

Subjects over Time

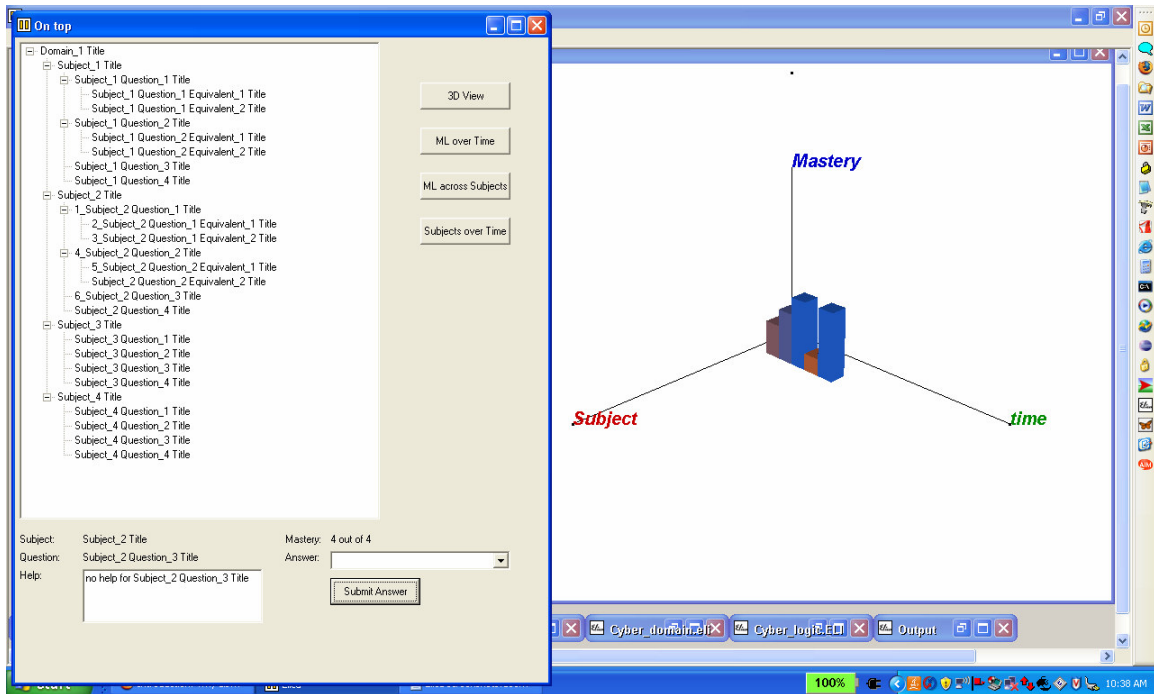
Subject: Subject_2 Title Mastery: 1 out of 4

Question: Subject_2 Question_2 Equivalent_1 Title Answer: 2 Question 2 Equivalent 1 Answer 4

Help: Subject_2 Question_2 Equivalent_1 Help_1 Title

Submit Answer

On new subject, low ML again. System provides more help and moves to an equivalent question, not a new one, to give the learner another chance to master the topic.



After the low mastery, the student recovers, and the status indicates that.

On top



- [-] Domain_1 Title
 - [-] Subject_1 Title
 - [-] Subject_1 Question_1 Title
 - Subject_1 Question_1 Equivalent_1 Title
 - Subject_1 Question_1 Equivalent_2 Title
 - [-] Subject_1 Question_2 Title
 - Subject_1 Question_2 Equivalent_1 Title
 - Subject_1 Question_2 Equivalent_2 Title
 - Subject_1 Question_3 Title
 - Subject_1 Question_4 Title
 - [-] Subject_2 Title
 - [-] 1_Subject_2 Question_1 Title
 - 2_Subject_2 Question_1 Equivalent_1 Title
 - 3_Subject_2 Question_1 Equivalent_2 Title
 - [-] 4_Subject_2 Question_2 Title
 - 5_Subject_2 Question_2 Equivalent_1 Title
 - Subject_2 Question_2 Equivalent_2 Title
 - 6_Subject_2 Question_3 Title
 - Subject_2 Question_4 Title
 - [-] Subject_3 Title
 - Subject_3 Question_1 Title
 - Subject_3 Question_2 Title
 - Subject_3 Question_3 Title
 - Subject_3 Question_4 Title
 - [-] Subject_4 Title
 - Subject_4 Question_1 Title
 - Subject_4 Question_2 Title
 - Subject_4 Question_3 Title
 - Subject_4 Question_4 Title

3D View

ML over Time

ML across Subjects

Subjects over Time

Subject: Subject_2 Title

Mastery: 4 out of 4

Question: Subject_2 Question_3 Title

Answer:

Help:

Submit Answer

On top

- Domain_1 Title
 - Subject_1 Title
 - Subject_1 Question_1 Title
 - Subject_1 Question_1 Equivalent_1 Title
 - Subject_1 Question_1 Equivalent_2 Title
 - Subject_1 Question_2 Title
 - Subject_1 Question_2 Equivalent_1 Title
 - Subject_1 Question_2 Equivalent_2 Title
 - Subject_1 Question_3 Title
 - Subject_1 Question_4 Title
 - Subject_2 Title
 - 1_Subject_2 Question_1 Title
 - 2_Subject_2 Question_1 Equivalent_1 Title
 - 3_Subject_2 Question_1 Equivalent_2 Title
 - 4_Subject_2 Question_2 Title
 - 5_Subject_2 Question_2 Equivalent_1 Title
 - Subject_2 Question_2 Equivalent_2 Title
 - 6_Subject_2 Question_3 Title
 - 7_Subject_2 Question_4 Title
 - Subject_3 Title
 - Subject_3 Question_1 Title
 - Subject_3 Question_2 Title
 - Subject_3 Question_3 Title
 - Subject_3 Question_4 Title
 - Subject_4 Title
 - Subject_4 Question_1 Title
 - Subject_4 Question_2 Title
 - Subject_4 Question_3 Title
 - Subject_4 Question_4 Title

3D View
ML over Time
ML across Subjects
Subjects over Time

Subject: Subject_2 Title Mastery: 4 out of 4
Question: Subject_2 Question_4 Title Answer:
Help: no help for Subject_2 Question_4 Title

Cyber_DomainMatrix Cyber_Logic Output

100% 10:38 AM

On top

- Domain_1 Title
 - Subject_1 Title
 - Subject_1 Question_1 Title
 - Subject_1 Question_1 Equivalent_1 Title
 - Subject_1 Question_1 Equivalent_2 Title
 - Subject_1 Question_2 Title
 - Subject_1 Question_2 Equivalent_1 Title
 - Subject_1 Question_2 Equivalent_2 Title
 - Subject_1 Question_3 Title
 - Subject_1 Question_4 Title
 - Subject_2 Title
 - 1_Subject_2 Question_1 Title
 - 2_Subject_2 Question_1 Equivalent_1 Title
 - 3_Subject_2 Question_1 Equivalent_2 Title
 - 4_Subject_2 Question_2 Title
 - 5_Subject_2 Question_2 Equivalent_1 Title
 - Subject_2 Question_2 Equivalent_2 Title
 - 6_Subject_2 Question_3 Title
 - 7_Subject_2 Question_4 Title
 - Subject_3 Title
 - Subject_3 Question_1 Title
 - Subject_3 Question_2 Title
 - Subject_3 Question_3 Title
 - Subject_3 Question_4 Title
 - Subject_4 Title
 - Subject_4 Question_1 Title
 - Subject_4 Question_2 Title
 - Subject_4 Question_3 Title
 - Subject_4 Question_4 Title

3D View

ML over Time

ML across Subjects

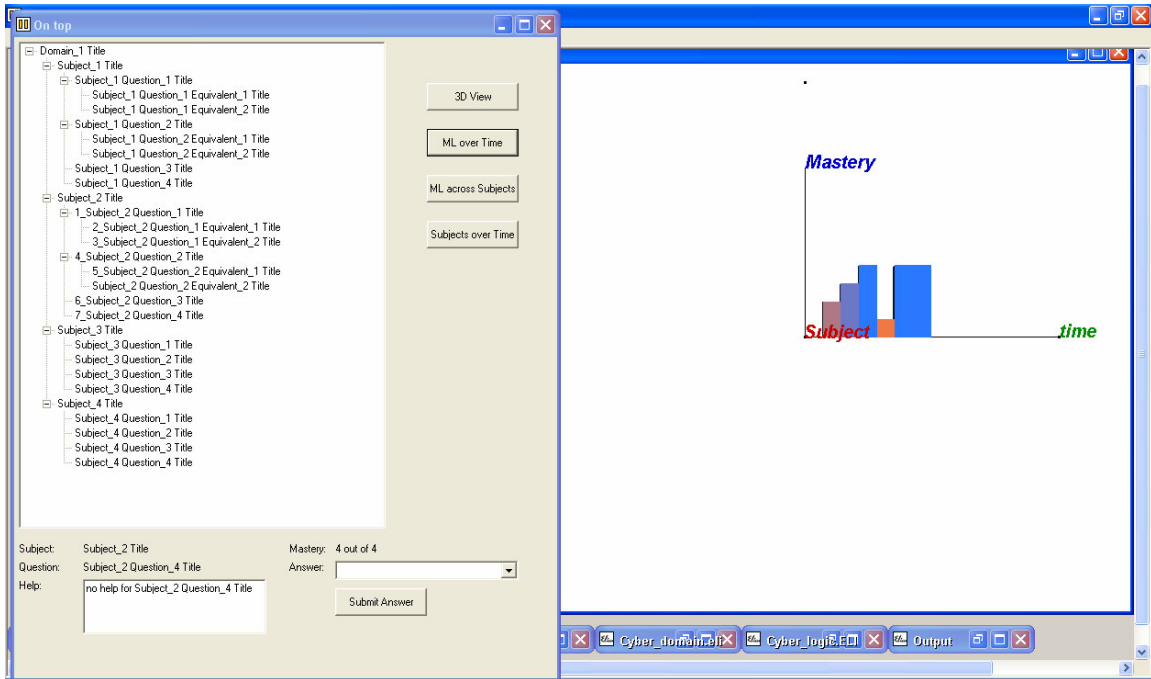
Subjects over Time

Subject: Subject_2 Title Mastery: 4 out of 4

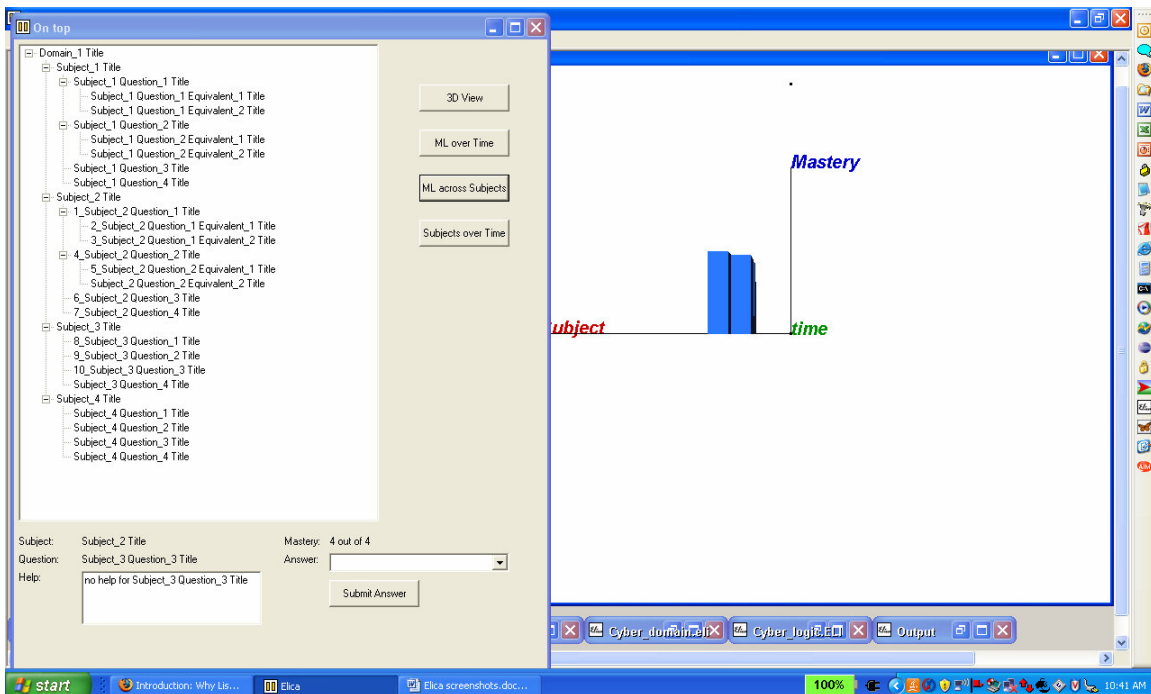
Question: Subject_2 Question_4 Title Answer:

Help:

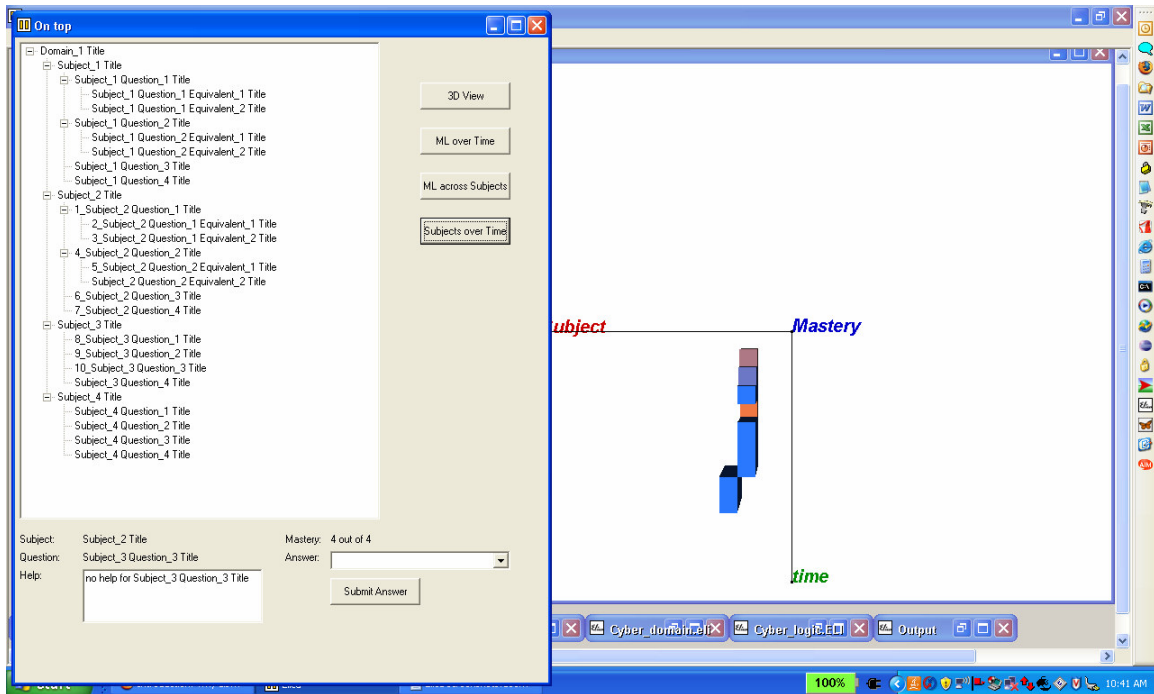
Submit Answer



The 3D status panel can be rotated around its Mastery axis, to show mastery level over time.



The 3D status panel can be rotated around its Mastery axis, to show mastery level across subjects, basically giving an indication of Domain Model coverage (how many topics/subjects have been mastered, regardless of the time it took).



The 3D status panel can be rotated around its Subject axis, to show subject coverage (Domain Model coverage) over time, where the mastery level is indicated by different colors.