1, 2. Paper: Improving Construct Validity Yields Better Models of Systematic Inquiry, Even with Less Information

Authors: Sao Pedro, Baker, Gobert (2012)

Context: Scientific Simulation

Construct: Designing Controlled Experiments and Testing Stated Hypotheses

Time taken for all actions (min, max, standard deviation, mean, mode)

Time taken for complete simulation runs (min, max, standard deviation, mean, mode)

Time taken for incomplete simulation runs (min, max, standard deviation, mean, mode)

Time taken for simulation pauses (min, max, standard deviation, mean, mode)

Time taken for data table displays (min, max, standard deviation, mean, mode)

Time taken for hypothesis table displays (min, max, standard deviation, mean, mode)

Time taken for changing variables when making hypotheses (min, max, standard deviation, mean, mode)

Time taken for making full hypotheses (min, max, standard deviation, mean, mode)

Time taken for simulation variable changes. (min, max, standard deviation, mean, mode)

Number of actions (min, max, standard deviation, mean, mode)

Number of incomplete simulation runs (min, max, standard deviation, mean, mode)

Number of data table displays (min, max, standard deviation, mean, mode)

Number of hypothesis list displays (min, max, standard deviation, mean, mode)

Number of full hypotheses created (min, max, standard deviation, mean, mode)

Adjacent repeat trials count (min, max, standard deviation, mean, mode)

3,4. Paper: Detecting Learning Moment-by-Moment

Authors: Baker, Goldstein, & Heffernan (2010)

Context: ASSISTments (math tutor with multi-step problems)

Construct: Moment-by-moment learning

Percent of all past problems that were wrong on this KC

Total number of past problems that were wrong on this KC

Number of {last 5, last 8} problems that were wrong.

Time taken (SD faster/slower than average across all students).

Time taken in last {3,5} actions (SD off average)

Total time spent on this KC across all problems

Time since the current KC was last seen.

First response is a help request.

Bottom-out hint is used.

Number of last 8 problems that used the bottom-out hint.

Second to last hint is used – indicates a hint that gives considerable detail but is not quite bottom-out

Number of last {5,8} problems that included a help request.

Problem ends with scaffolding.

Total scaffolding for this KC in the past.

Total problems attempted in the tutor so far.

Total practice opportunities on this KC so far.

Response is chosen from a list of answers (Multiple choice)

5, 6. Paper: Automatic Detection of Off-Task Behaviors in Intelligent Tutoring Systems with Machine Learning Techniques

Authors: Cetintas, Si, Xin, & Hord (2010)

Context: Mathematics tutor (multiple steps per problem)

Construct: Off-Task Behavior

Time taken for action

Time taken (SD faster/slower than average across all students)

Percent of correct answers so far in worksheet

Percent of correct answers so far in worksheet (on diagrams)

Percent of correct answers so far in worksheet (in equation boxes)

Percent of correct answers so far in worksheet (final answers to multi-step problems)

Percent of correct answers so far in worksheet (SD better or worse than other students)

Percent of correct answers so far in worksheet (on diagrams) (SD better or worse than other students)

Percent of correct answers so far in worksheet (in equation boxes) (SD better or worse than other students)

Percent of correct answers so far in worksheet (final answers to multi-step problems) (SD better or worse than other students)

Maximum time between mouse clicks

Average {X,Y} mouse movement

Maximum time between mouse clicks (SD slower or faster than other students)

Average {X,Y} mouse movement (SD more or less than other students)

7, 8. Paper: When Off-Task is On-Task: The Affective Role of Off-Task Behavior in Narrative-Centered Learning Environments

Authors: Sabourin, Rowe, Mott, & Lester (2011)

Context: Crystal Island (virtual learning environment where player solves puzzles)

Construct: WTF Behavior (off-task within environment)

Relevance of game object to scenario

Relevance of location to scenario

Time spent in location

Height of player location

Relevance of location to object

Type of action (picking up object, dropping object)

9, 10. Paper: Predicting At-Risk Novice Java Programmers Through the Analysis of Online Protocols

Authors: Tabanao, Rodrigo, & Jadud (2011)

Context: Introductory classes in programming

Construct: Midterm score (failing or acceptable)

Average number of errors per compilation

Average number of compilations

Average number of seconds between compilations

Number of pairs of consecutive compilations with at least one error

Number of pairs of consecutive compilations with same error

Number of pairs of consecutive compilations with error in same location in code

Number of pairs of consecutive compilations with edit in same location in code

Sum number of distinct errors made by student

11, 12. Paper: Predicting drop-out from social behavior of students

Authors: Bayer, Bydzovska, Gryk, Obsivac, Popelinsky (2012)

Context: Czech college

Construct: Drop-out

Gender

Age

Entrance exam score (missing in some cases)

Exempted from entrance exam

Number of finished semesters

Courses completed in other undergrad programs

Credits gained so far

Credits being taken in current semester

Failed courses

Number of courses re-taken

Number of days absent from course

Average grade (weighted by course credits, and unweighted)

Number of undergrad programs enrolled in (currently and ever)

Number of students that student interacts with on discussion forums

Number of students that respond to current student’s discussion forum posts

Number of students who the current student responded to in discussion forum posts

Total number of discussion forum responses student made

Total number of discussion forum responses student received

Student centrality in discussion form social network (we’ll discuss this later in the semester)

Average grade of main students the student interacts with on discussion forum