

Curriculum Design Pattern

Global Learning by Design

Name of Pattern

Supporting Articulation with adaptive learning

Date

December 2014

Abstract

This pattern outlines an approach to provide templates for online self-learning and assessment instruments capable of identifying and successively eliminating discrepancies between different levels of student learning.

Learning Context

A scaffolded adaptive system of integrated training and assessment procedures was designed to provide:

- Assessment instruments identifying two groups of students, the main-stream (MS) group characterised by a satisfactory level of all required pre-requisite knowledge and capabilities and the secondary-stream (SS) with significant deficiencies in pre-requisite knowledge and capabilities.
- Continuous training, monitoring and assessment of students learning progress of both MS and SS groups;
- Instantaneous feedback and online learning support when delays and deficiencies are detected in the learning progress in both groups.
- An ongoing, systematic integration of the SS group with the MS group.

Adaptive learning is applicable to any level of learners when executed appropriately.

Rationale/Aim

The design of the combined scaffolded training-assessment and integration procedures was guided by the following underlying considerations:

- The SS students did not hear, talk, or learn about certain concepts due to the previous learning circumstances.
- The lack of pre-requisite knowledge in the SS group creates increased cognitive load (CL) or mental effort during the learning process compared to the MS group.
- To address the CL discrepancies between the MS and the SS streams, the learning and testing instruments should be adapted to the particular CL conditions of individual streams.
- The scaffolded testing system provides integration between assessment and teaching of students at three capability levels:
 - Level 1: Knowledge of key concepts, formulas and definitions;
 - Level 2: Ability to analyse and solve problems using the key concepts, formulas and definitions;
 - Level 3: Ability to rate the complexity of relationships between various concepts.
- As the SS students progress through the scaffolded self-learning and assessment system they develop superior basic understanding (Level 1) and analytical capacities (Level 2) allowing them to merge with the MS group. The highest synthetic skills (Level 3) are not required from the SS students at the merging state and are expected to be developed after joining the MS group. However, different individuals may become ready to merge at different times.
- Using the scaffolded learning system students develop metacognition, which helps them to understand their own learning activities.
- Finally, they gain greater content knowledge through their experiences. These elements help reduce cognitive load in students as they progress through the learning system.

Learning Design

As illustrated in Figure 1, at the beginning of each week all students are in Stream 1 (the main stream) which means that they have open access to the Blackboard Learn self-learning modules. After finishing the learning process the students have to complete a Blackboard Stream 1 assessment test. This test is done during class time (eg. 40 minutes) and each student has to answer N questions out of a larger pool of M questions. Due to the randomness of the question selection, each student is given a different set of questions to answer. However, the pool of questions was created in a balanced way to provide a uniformly distributed level of difficulty.

Students who score greater than or equal to 50% in Stream 1 will have automatically open access to the Stream 1 test next week. This will be done through the adaptive release mechanism available on Blackboard. Notice that the comments build into the test questions will direct Stream 2 student to recommended self-study materials and provide examples of correct solutions and answers.

Students who score less than 50% in Stream 1 will have open access to Stream 2 test. They will be allowed to do Stream 2 test many times but as soon as they score greater than or equal to 50%, the adaptive release mechanism will close for these students Stream 2 test and open access to Stream 1 test next week.

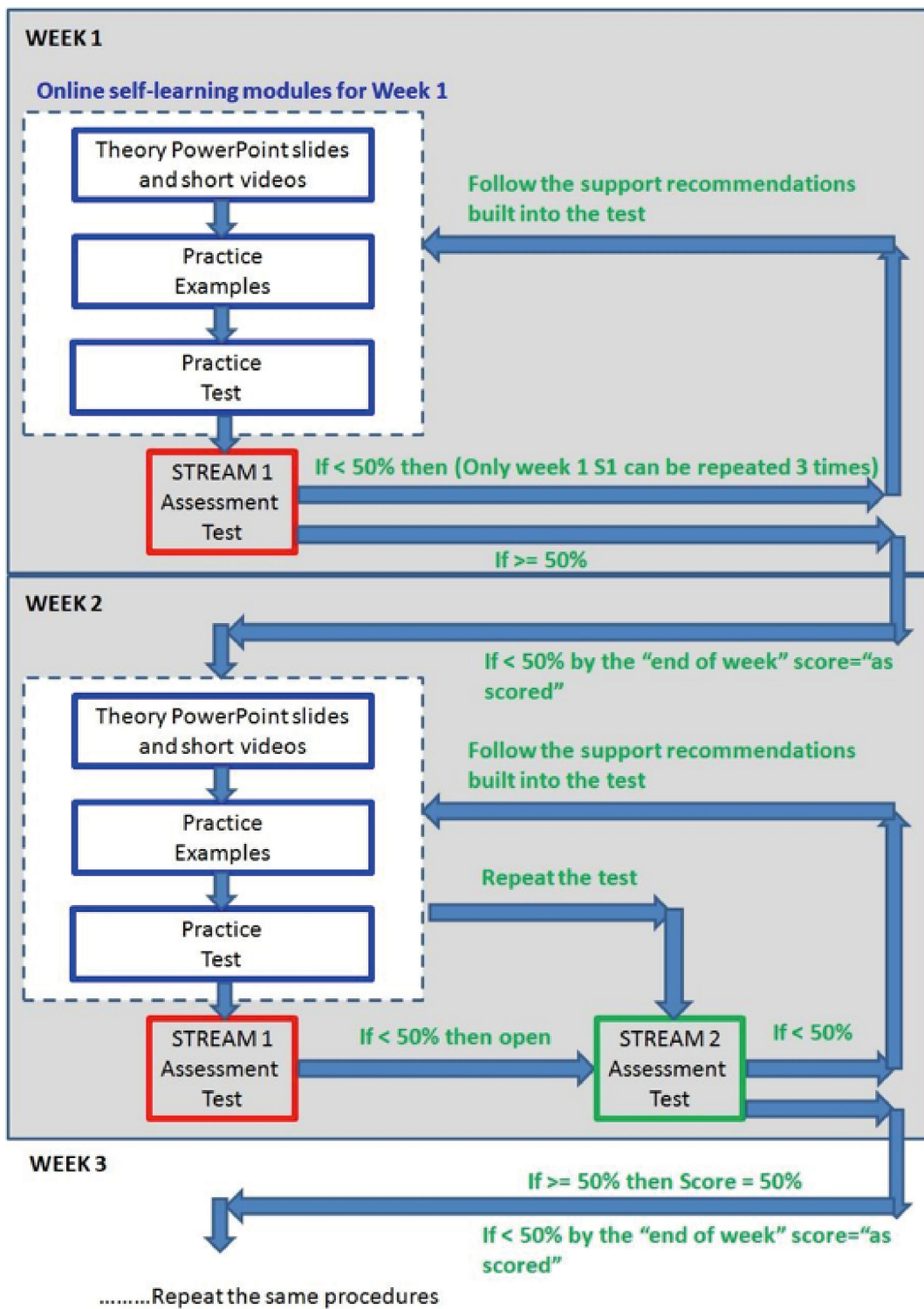
Students will be allowed to do the Stream 2 test anytime and anywhere but will have to complete it by “the end of the week”.

Disregarding the actual mark achieved in the Stream 2 test, the mark for students who scored greater than or equal to 50% will be 50%.

Students who fail to achieve greater than or equal to 50% in Stream 2 by “the end of the week” will have open access to Stream 1 in the next week but their score for Stream 2 will be set to maximum “as scored” value.

Students who fail to achieve greater than or equal to 50% in Stream 2 in two consecutive weeks will be asked to have a face to face meeting with the course coordinator to discuss individual study needs and ways to improve their performance.

Figure 1. Adaptive Self-Paced Assessment and Learning Procedure as implemented on the Blackboard Learn system named: GLbD-A.



Conditions

At the time of writing this pattern (November 2015), it appears that Blackboard Learn is incapable of being able to automatically compare the marks for two or more tests and display the marks for the test with the highest score. This is something which may need to be done manually unless we can come up with a technological solution.

The system has already been developed in the GLbD-A subject in Blackboard Learn. It will be tested during Semester 1 2016 in delivery of Digital Signal Processing 1 (EEET2113).

Resources/Technology

Education resources

A fully functioning subject has been developed in Blackboard Learn. This subject contains the following:

- staff information and contact details
- assessment rubrics
- announcements from course coordinator with email and mobile phone links to all students enrolled in the course
- links to textbooks
- PowerPoint presentations
- short videos explaining main theoretical issues and important concepts
- a set of training tests (not assessed and only used for learning purposes)
- a set of instruction videos for all laboratory work that practically eliminates discrepancy in tutorial skills of supporting staff
- a recursively structured testing scaffolded testing/learning and assessment system (as described above in Section 5).

Other resources

- Google Site: [Blackboard, Adaptive Release](#)
- Blackboard Learn: [Basic and Advanced Adaptive Release](#)
- Wikipedia: [Adaptive Learning](#)



Case Studies

The pattern will be implemented for the first time in Semester 1, 2016 in Digital Signal Processing 1 (EEET2113).

Outcomes

The pattern has been implemented in the development Blackboard Learn subject named GLbD-A.

Keywords

Adaptive, adaptive release, adaptive release testing, online self-learning, online self-assessment.