

Concept Navigator

*Optimizing Student Performance with
Concept Mapping and Learning Analytics*

*Robert Campbell
Bowen Hui*



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a place of mind

THE UNIVERSITY OF BRITISH COLUMBIA

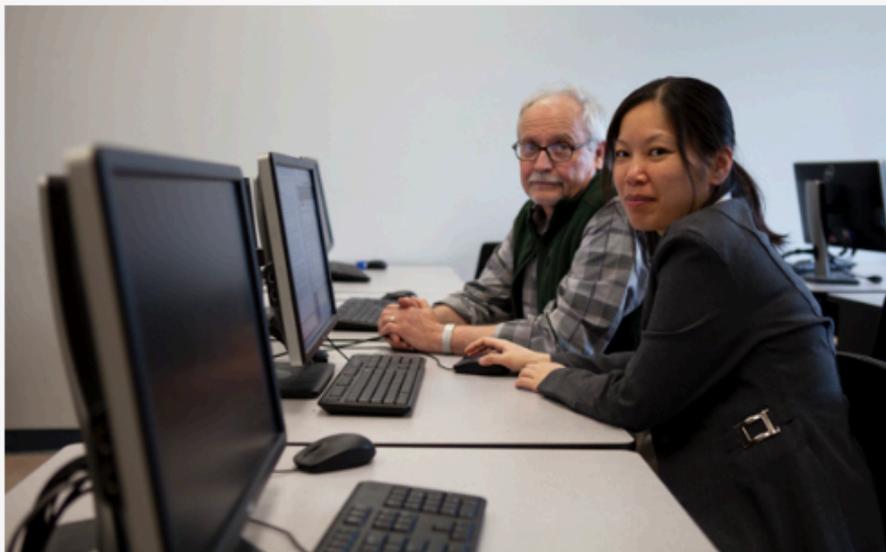
OKANAGAN NEWS

Faculty of Education News

Faculty News, Publication, Research, Student News

Interdisciplinary research: Concept navigator promotes personalized learning

Tags: [Dr. Robert Campbell](#), [Interdisciplinary](#), [Research Grant](#)

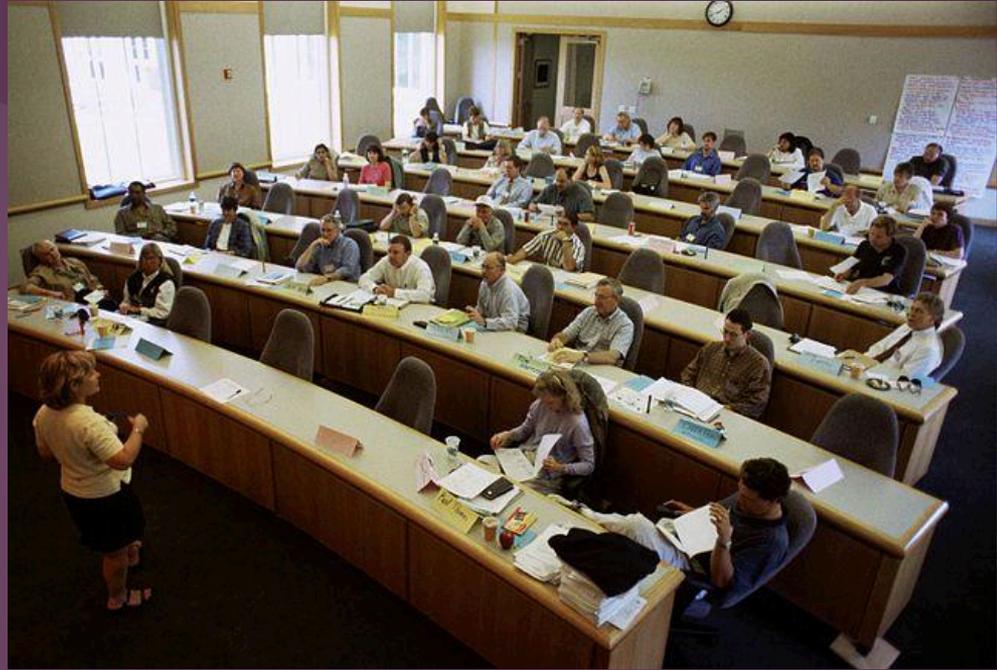


Dr. Robert Campbell, from the Faculty of Education, and Dr. Bowen Hui, from the Barber School Department of Computer Science.

General Descriptors

- Learning is like diving into a pool to any location you wished.
- User in control of the depth, direction, and pace of progress.
- Ongoing assessment of performance and navigation keys to other directions—analytics with heuristics.
- Optimizing personalized learning to occur—learning at your own pace—customized curriculum.
- *New Media Consortium* “Horizon Reports” describe analytics and personalized learning as key technological influences that are likely to have a large educational impact in coming years.

In many cases, the lecture format of today's instructional classrooms has changed very little over the centuries.



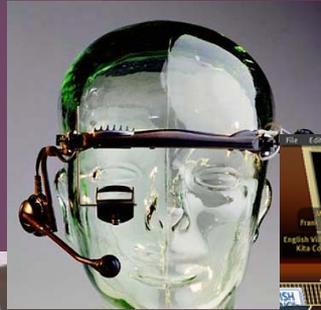


Since medieval times the mainstay model of instruction has been the lecture--a teacher centric model that generally incorporates a one-size fits all curriculum.

Even with the advent of computer technology an instructor-centric and single path curriculum persists.



There have been explorations and envisionings beyond traditional strategies, but realities of costs, resources and “culture lag,” often preserve what we have done in the past.



Overview

We are, perhaps, nearing a period where we can actually develop what had previously only been perceived of as an ideal environment for learning.

We can create learning contexts where the student's performance can be analyzed and assessed and the instructor/computer can determine in which areas the student is excelling, or in which areas the student is experiencing difficulty--all of which can be done in real time with ongoing feedback to the learner.

Proposal

Investigating student performance in an optimal learning environment that includes self-directed learning with embedded learning analytics. This learning environment will be structured as an online virtual environment representing instructional content through a concept-mapping model.

The study includes the development of a pilot software platform that will serve as a medium to present course content to students.

Since the instruction relies upon students learning by navigating through a concept-map, the working name for this pilot platform will be the “Concept Navigator.”

Research Context

Concept Mapping: developed at Cornell University as a graphic organizing tool devised to allow children to better understand scientific concepts.

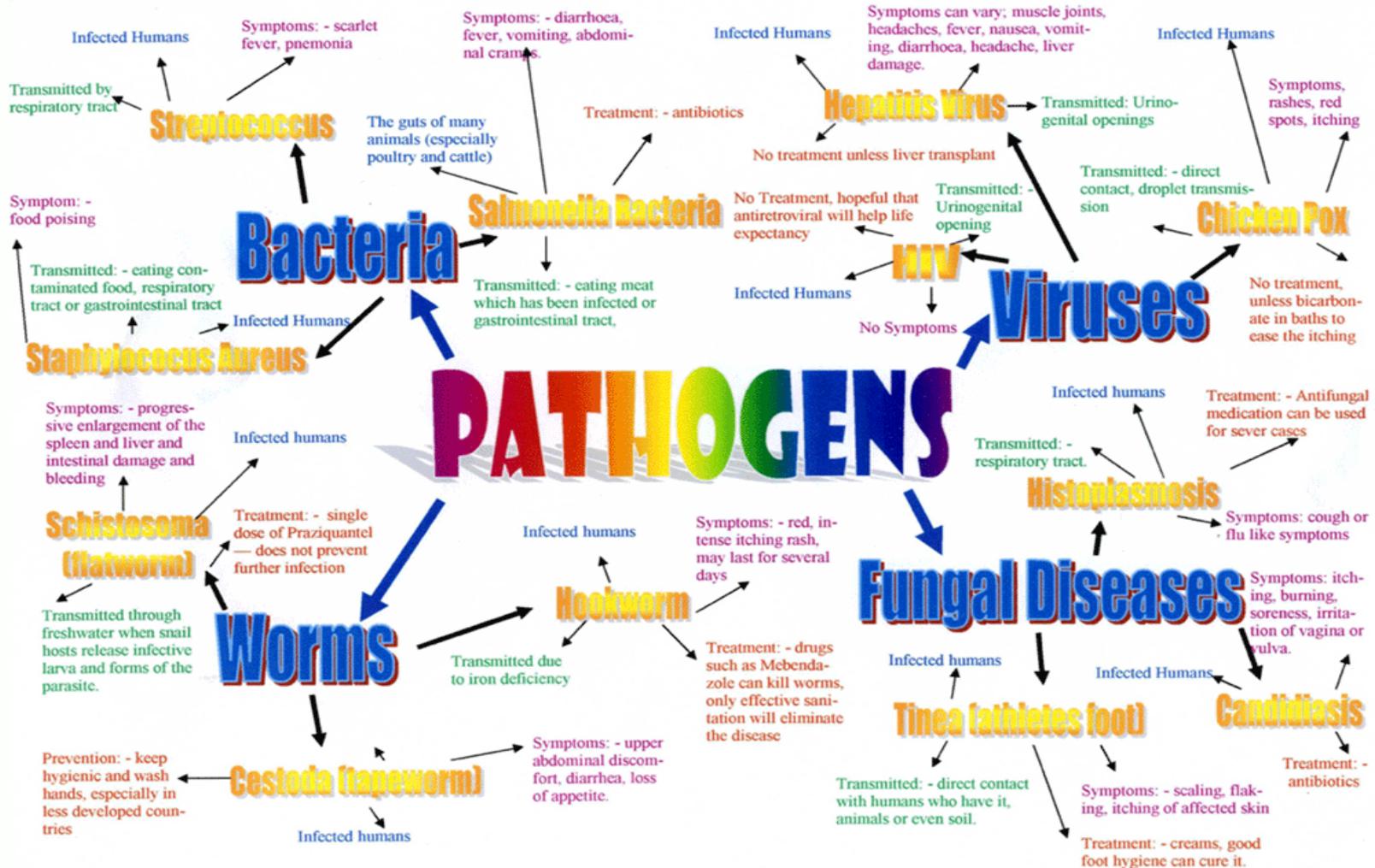
Concept mapping relied on the work of David Ausubel (assimilation theory and advance organizers).

Computer generated concept-mapping software programs like Inspiration™ has been available since the 1990s and is marketed to educational and business areas.

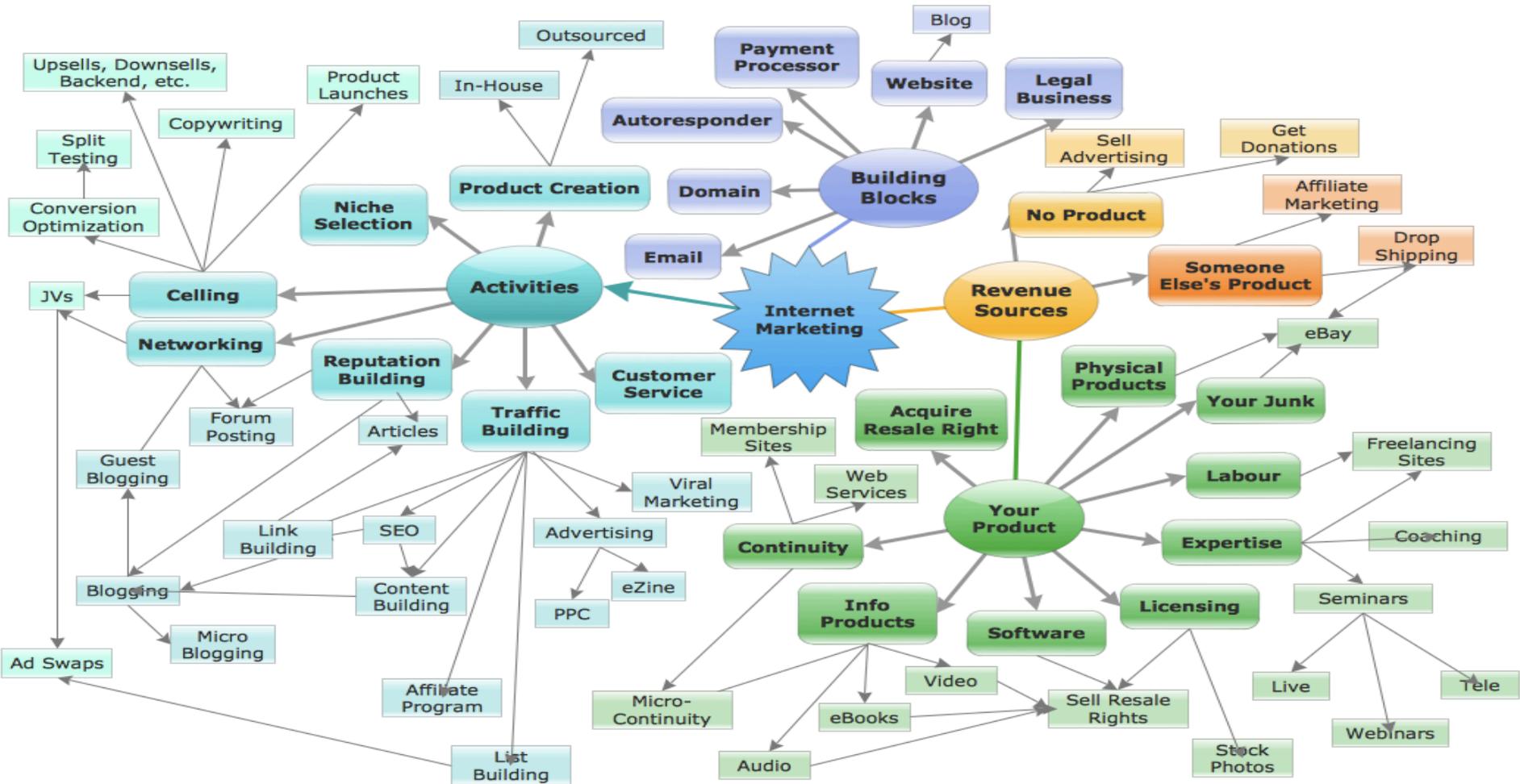
Concept mapping supports the self-directed, experimental, and networked learning that characterizes flexible learning approaches (Bates 2011, & Davidson 2009).

Course content structured as a concept map that contains assignment profiles and self-diagnostic tests, will allow students to repeatedly test their comprehension. The benefits if this type of instruction is supported by Sayers (2011).

Hagemans' (2013) investigation of inquiry-based learning found that students who had access to a concept map were more likely to re-study for an assignment they had completed incorrectly, than those students in a control group with no concept map.



Internet Marketing Concept Map



Research Context

Learning analytics is the use of intelligent data, learner-produced data, and analysis models to discover information and social connections for predicting and advising people's learning.

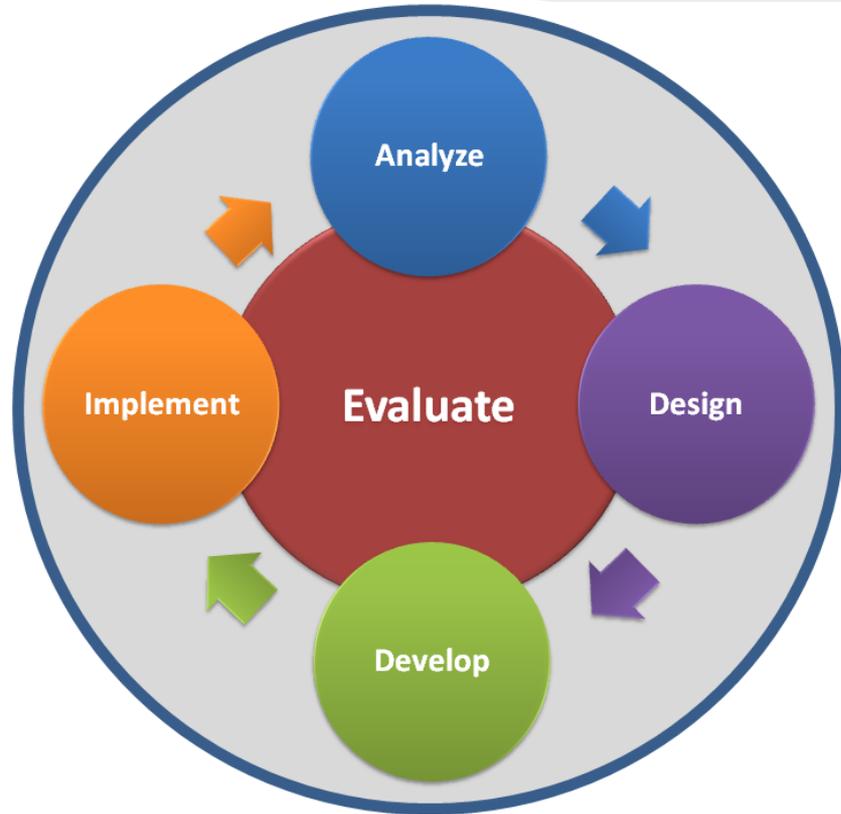
Learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs.

Learning analytics is concerned with action, curriculum mapping, personalization and adaptation, prediction, intervention, and competency determination (Siemens, 2010).

Research Questions

1. How effective is a concept-mapping model as a strategy that supports student directed learning in a virtual, self-directed learning environment?
2. How effective is the inclusion of learning analytics when embedded in a virtual, self-directed learning environment modeled on concept-mapping?
3. How will embedded learning analytics influence the instructional design and development of online course materials and educational software?
4. What other online tools and strategies can be beneficial for students in a virtual learning environment.

Instructional Design



Instructional Design

Analyze:

The co-investigators will determine the course content to be carried on the Concept Navigator and will begin the instructional design process.

Two students, preferably one from Education and one in Computer Science, will be hired as student research assistants (RAs) using the research funding. The RAs will be employed over one or two terms as project researchers and instructional designers/developers. The Education RA will work with the co-investigators to undertake an instructional analysis of the content, determining any subordinate objectives that also need to be taught.

The plan at this stage is to construct the content into the form of a concept map.

Instructional Design

Design:

The co-investigators and RA will use the instructional analysis to build the content into the form of a concept map. This will be done on paper or large format whiteboard and the GRA will assess the effectiveness of this mock-up by acting as “test students” going through this learning activity, tracking where there are errors or where any information is unclear. Revisions will be made based upon these assessments.

Instructional Design

Development:

After the completed design mock-up is deemed satisfactory the software development activities will begin. The Computer Science RA undertake the program development work. Rather than introducing new technology (hardware), the Concept Navigator will be implemented in existing mobile computing platforms, such as smart phones and iPads, which many students and instructors already use.

Instructional Design

Implementation:

Concept Navigator will be implemented in an undergraduate course Computer Science 121. The software will be introduced as a supplementary tool designed to improve student learning.

Instructional Design/Research Design

Evaluation:

To assess the effectiveness of the Concept Navigator as well as the inclusion of embedded analytics the students who agree to participate in this study will be administered a pretest to assess their content knowledge prior to instruction. Subjects (students in a first year computer science course) will then be randomly divided into a control group and an experimental group. The control group will learn the assigned content through traditional lecture. The experimental groups will learn the assigned content using the Concept Navigator. After the instruction is complete both groups will be administered a post-test. Additionally the experimental group will be asked to complete an online questionnaire that will assess their perceptions of learning, access, motivation and engagement to learning through a concept-mapping model.

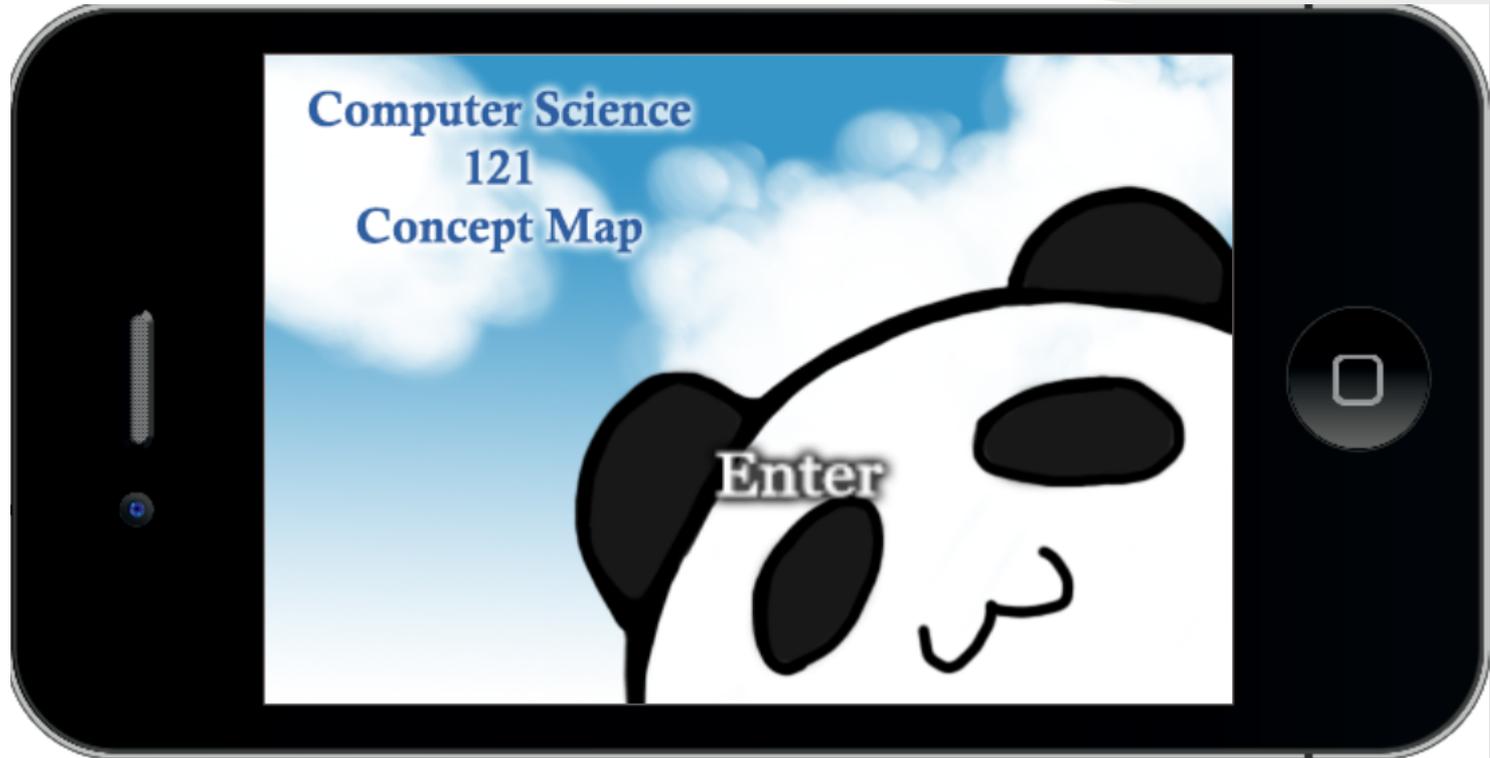
The results of this implementation will be assessed using blended quantitative and qualitative methods.

Research Testing

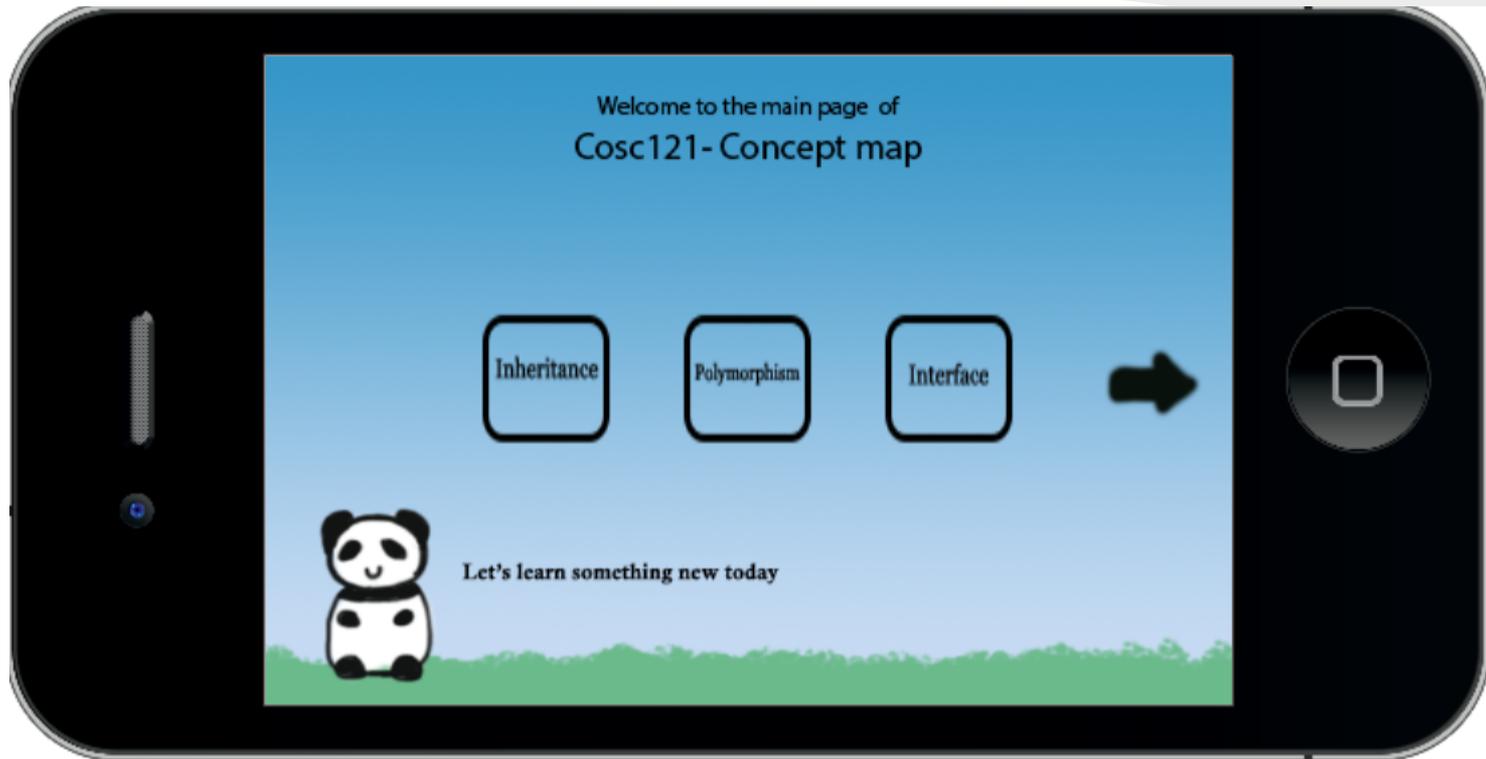
Pre-Test Post/Test

Experimental Group Questionnaire

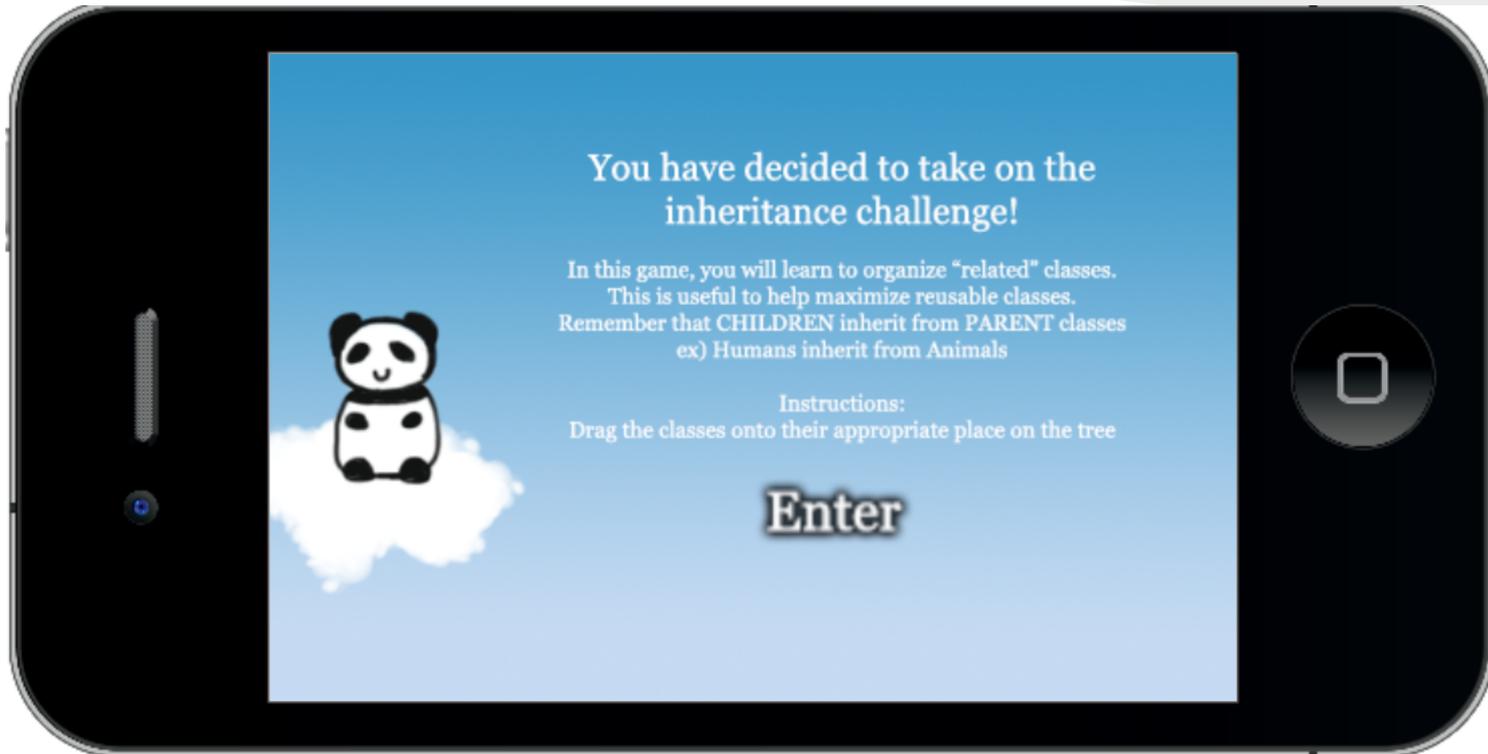
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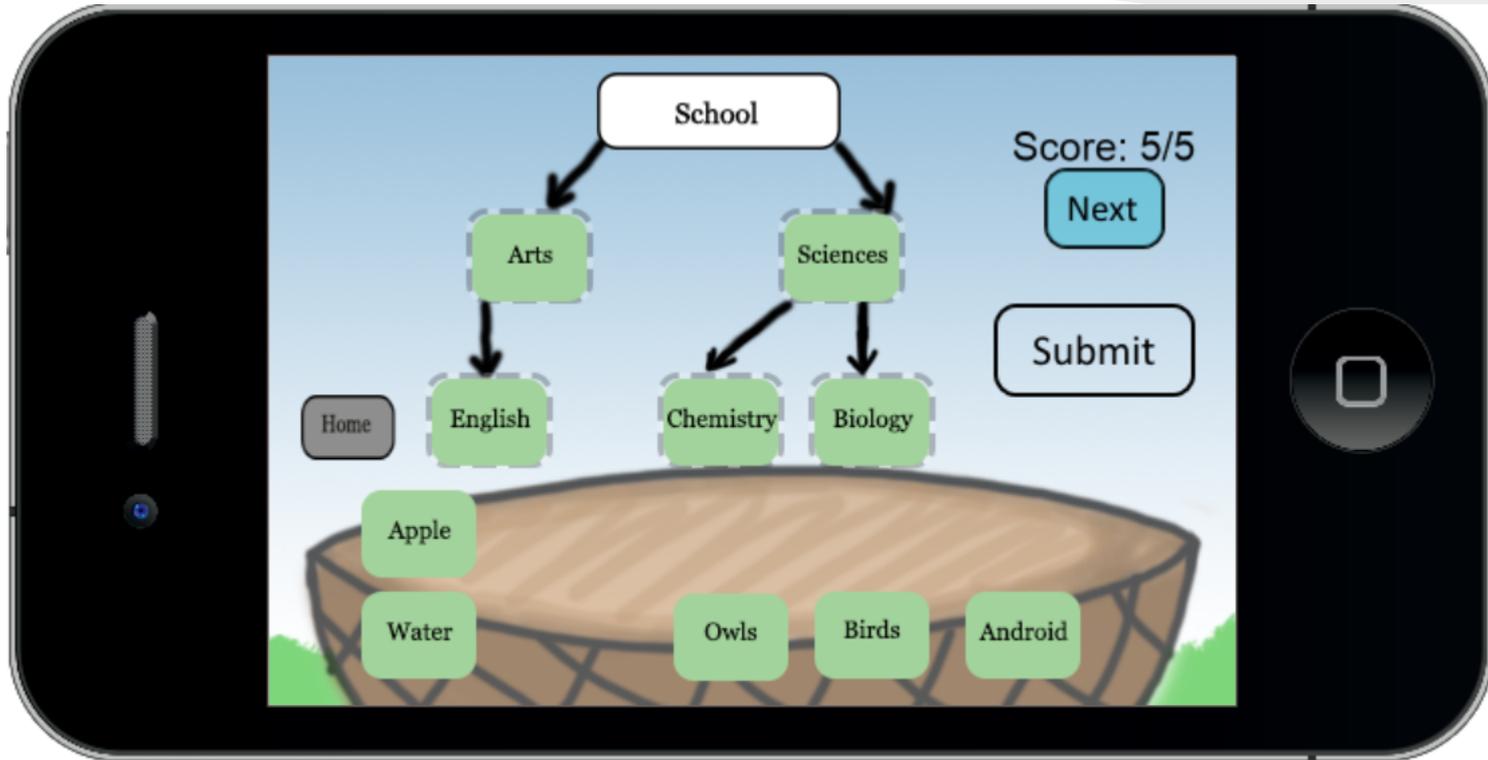
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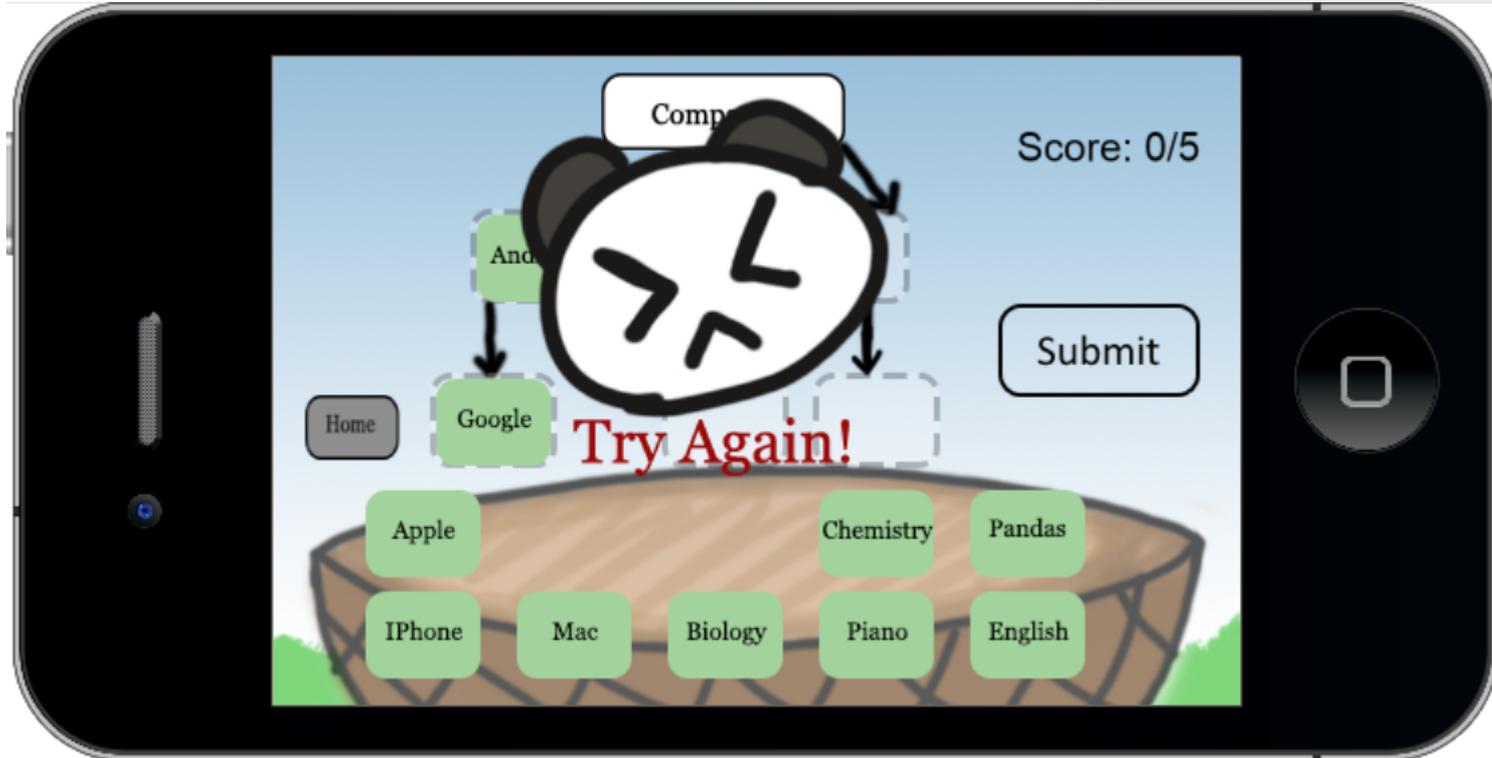
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