A Social Networking Analysis Approach for Early Prediction of Assessment Results

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Presentation agenda

1. Research Motivation & Research Questions
2. Literature Review & Related Works
3. System Development
4. Case Study: Microbiology
5. Discussions & Implications
6. Conclusion and Contribution
Chinese and Western Wisdom

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Birds of a feather flock together
Early detection and provision of feedback on learners’ performance are essential mechanisms to allow learners to take prompt action to improve their approach to learning.

Mid-term quiz provides an indicator but somewhat do not reflect achievements of comprehensive skills and knowledge that are expected in university study.

“Assessment should be more than this!”
Undergraduate students are generally digital natives (Prensky, 2001). Using IT and web-based learning resources is the natural way of learning.

Collaborative work is easily facilitated by Web 2.0 platform and social media.

Can we analyze patterns in web-based collaboration to evaluate student performance and hence provide feedback quickly?
Objectives of prototype development

1. Evaluate learner contributions in collaborative work
2. Analyse learner engagement in the process during online activities
3. Predict learner performance at the end of the course through visual presentation of diagrams
4. Alert teaching faculty to take action early for learners who may encounter learning challenges
Possible Solution

Analysing students’ interactions on blogs, discussion boards, wikis etc. provides a clue on how students form social networks, i.e., who they interact with and what they collaborate on.

Continuous assessment becomes difficult for instructors especially on providing individual in-depth formative feedback (Cole and Spence, 2012).

Large class (often more than 100 students) always makes analysis difficult.
Action Design Research (Sein, 2011) is adopted in order to provide an agile solution that solves a practical problem with extensive user input, especially stakeholders who have dual roles as technologists and educators.
Stage 1: Problem Formulation

Large class size (often more than 100 students) leads to many problems:
• Timely delivery of in-depth feedback to individual students becomes difficult
• Monitoring individual students’ learning progress is extremely difficult

IT can help
• Developing a prototype tool to predict students’ examination achievements
• Easy to use by users of non-technical background
Stage 2: Building, Intervention and Evaluation

**Extensive user input to deliver good functionalities and good user experience**
- Subject specific requirements
- User interface

**Iterative development on carefully taking user feedback**
- Metrics for evaluating social networking strength

**Evaluation of prototype**
- User feedback
Stage 3: Reflection and Learning

Concurrently taking place with other stages

Generalize the solution to other context
- Prototype testing on actual student data
- Improve system performance through user feedback

Lesson learnt becomes input for the new version of prototype development
- User interface, graphical presentation etc. have been improved progressively
Stage 4: Formalization of Learning

Solution delivery
- Prototype that can be fitted into similar courses that include similar teaching and learning activities;

Sharing in formal and informal sessions, institutionally and externally

Presentation of research findings in conferences and journals
- CSEDU 2013 in Aachen
The developed prototype was initially applied on an undergraduate microbiology course (enrollment size: 77) in spring 2012.

Continuous assessment (20%) includes a discovery-embedded task: Microbiology in Daily Life. Students were required to post discoveries on a class blog and reply to other discoveries.

Content and interaction on the continuous assessment were analysed.
Microbiology and daily life

**Let's enjoy swimming!**

 Posted by Hiu Fung LO at Sunday, October 7, 2012 11:51:35 PM HKT

When we swimming, it is very easy to realize that the pool water smell bad. We all know the pool water is sterilized by adding chlorine. Otherwise, swimming pool will become a good breeding site for bacteria.

Have you ever think that how chlorine kill the germs in water? When chlorine dissolves in water, hypochlorous acid (HOCI) and hypochlorite ion (OCI) form. They break down the cell walls and enzymes inside the bacterial cells.

However, chlorine is irritating to human skin and eyes. Thus, the concentration of chlorine added must be under control to a suitable level.

Apart from using chlorine to sterilize the pool water, ozone is also an alternative. Ozone can kill bacterial spores, virus and fungi etc. Due to its strong oxidizing ability, it can also prevent the generation and accumulation of compounds that emit odor. Ozone decompose to oxygen easily, it will not make harm to human.

Students posted the discoveries on a class blog.

Feedback from peers
Interaction between students are presented interactively and visually.
Intensity of student participation is presented interactively and visually.
Accuracy of the tool

As an exploratory analysis this prototype was used to predict the students’ examination performance in this microbiology course. 37.8% (14 out of 37) “at risk” students were successfully identified.
We must stress that the goal of this prototype is to provide early diagnosis for students who are less engaged and are potentially “at risk”.

Instead of solely predicting the final assessment results, instructors should proactively make use of this tool to provide formative and timely feedback to those students, and to help them to overcome difficulties encountered in learning.
There are some possibilities to fine-tune the prototype to provide more comprehensive analysis.

Investigating the frequency and pattern of postings would help as active learners generally post steadily and continuously (vs. many posts in one shot).

In addition, the quality and nature of post should be taken into account (e.g., “thank you” should be discarded).
Generalizing the OUTPUT

Automate the manual data input process
- Currently the process is manual
- Development of API can greatly improve the efficiency

But, working on different learning management systems can be a challenge!

Customize the metrics
- Different instructor may have different preferences over the interaction patterns
Conclusions

• It is always difficult to monitor progress and provide in-depth feedback to individual students in a large class.

• Social network analysis provides a useful clue on predicting students’ academic performance.

• The ultimate goal is to give early assistance to less engaged students.
References

