Thyme room
3.05-3.30pm

How students approach ill-structured problems: Investigations in a life sciences module

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The ability to apply content knowledge in a rational and relevant manner to solve authentic problems is an important attribute that graduates should possess for them to contribute productively to society. Real world problems are often ill-structured problems that have ambiguous information and no standard solutions (Jonassen, 1997). University students therefore need opportunities to develop problem-solving skills while in a relatively safe university environment.

However, intentional design of ill-structured problems is not a routine teaching practice among instructors. Moreover, the skills to execute the various steps of problem solving are not inherent in many students, given their limited exposure to ill-structured problems. Unlike experts, novices generally do not have the skills to apply domain-general problem-solving strategies in relation to domain-specific knowledge to solve an ill-structured problem (Glaser, 1995). As solving ill-structured problems is not an intuitive process, students who are novices at solving such problems can benefit from having a framework (Jonassen, 1997) to help them conceptualise the problem-solving process and develop problem solving skills.

In a third-year module titled "Molecular Basis of Human Diseases" at the National University of Singapore (NUS), ill-structured problems designed based on Jonassen's framework (Jonassen, 1997) were introduced to understand how students solved problems. Based on previous studies, asynchronous online discussion forums (AODFs) have been found to be effective for students learning in a collaborative manner (Hrastinski, 2009). We therefore organised our students into groups of three to work collaboratively on ill-structured problems at AODFs. After the semester, we used thematic analysis of students' posts at the AODFs to evaluate students' problem-solving skills and approaches. Different steps in students' problem-solving process were coded and descriptive statistics generated for analysis.

A grounded approach was taken in the initial analysis of students' AODF posts after Academic Year (AY) 2014/15. The data revealed that students' main issue was a deficiency in properly defining the problem space. This consequently affected students' ability to solve problems effectively. However, students responded well to summative feedback provided and were able to improve their solution. We incorporated scaffolds and feedback to students to improve their problem-solving skills in the subsequent semester in AY2015/16. For instance, we illustrated the problem-solving process by introducing a problem-solving framework. Students could also gain from feedback (Hattie & Timperley, 2007) provided during problem-solving that might help refine their skills. Hence, in addition to merely providing summative feedback, scaffolds such as question prompts or message labels were used separately in two different problem-solving assignments. An ill-structured problem was incorporated in the end-of-semester summative assessment to assess if students were able to solve the problem on an individual basis. Student interviews were conducted at the end of the semester to evaluate if they retain the ability to solve ill-structured problems as well as to gather their feedback on the scaffolds and activities used in relation to solving ill-structured problems.

In this paper, we hope to show that examination of students' posts at AODFs can focus the instructor's attention on the weaknesses of students' problem-solving approaches. Moreover, further insights can be gained by the instructor into the possible effectiveness of her scaffolds to help students solve ill-structured problems, such as evaluating which type of scaffold would improve students' performance at solving ill-structured problems. Students' perspectives provided at one-to-one interviews could also be a useful source of information for developing better activities surrounding ill-structured problems. Thus, systematic interrogation of students' work and instructor's teaching practices can help improve instructional design and scaffolds to support student learning.

Keywords

Problem-solving; ill-structured problems; scaffolds; feedback; asynchronous online discussion forums

References

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