

A STUDY ON THE METHODS OF ASSESSMENT AND STRATEGY OF KNOWLEDGE SHARING IN COMPUTER COURSE

Pat P. W. Chan

Hong Kong Community College, The Hong Kong Polytechnic University, Hong Kong SAR, China

ABSTRACT

With the advancement of information and communication technology, collaboration and knowledge sharing through technology is facilitated which enhances the learning process and improves the learning efficiency. The purpose of this paper is to review the methods of assessment and strategy of collaboration and knowledge sharing in a computer course, and find out how these approaches improve students' learning. The computer course is aimed at helping students to master knowledge, building their operational capability and equipping students with analytical skills in using and operating computers. While traditional evaluation model restrains students' learning interests and innovation, e-learning is introduced to support course delivery and enhance collaboration and knowledge sharing among students. Different assessment methods are discussed with respect to the impact of collaboration and knowledge sharing on students' learning. The assessment methods are carefully analysed and evaluated in order to find out how the collaboration and sharing of knowledge among students improves learning experience. Suggestions for improvement are made to increase the quality and quantity of collaboration and knowledge sharing in and beyond the classroom setting.

KEYWORDS

Knowledge sharing, assessment method, computer course.

1. INTRODUCTION

During the 21st century, the rapid development of Information and Communication Technology (ICT) has a strong impact on all walks of life all over the world (Weide, 2012). In Hong Kong, the wide adoption of ICT systems in both public and private sectors assures Hong Kong as one of the world's most advanced digital cities. In order to equip tertiary students with adequate skills in computer applications and increase their competitiveness in the job market, the study of information technology has probably become one of the compulsory modules in the curriculum offered at higher education institutions in Hong Kong.

Hong Kong Community College (HKCC) of the Hong Kong Polytechnic University (PolyU) is a self-financed post-secondary institution which offers Associate Degree (AD) and Higher Diploma (HD) programmes. HKCC offers IT course for all students to acquire basic computer knowledge. For instance, the course "Applied Computing" is a generic course for all year one students under the associate degree scheme in science and technology. The course objectives are outlining information technology and its applications, developing end-user computing skills and integrating end-user computing techniques into business applications. The course is aimed at helping students to master knowledge, building their operational capability and equipping students with analytical skills in using and operating computers. While traditional evaluation model restrains students' learning interests and innovation, e-learning is introduced to support course delivery and enhance collaboration and knowledge sharing among students.

In this paper, we are going to study the methods of assessment of the course "Applied Computing" and find out how students' engagement in collaboration and knowledge sharing can improve learning. Through analysing the methods of assessment, strategies for improving students' learning and classroom instruction will be formulated. This paper will start with a literature review of knowledge sharing and principle of assessment for learning. The methods of assessment of the course will be discussed, with a review of how knowledge sharing among students is conducted to improve learning and reach the purpose of Assessment

for Learning (AfL) (Berry, 2008). Suggestions on increasing the quality and quantity of knowledge sharing in the course will be stated and some concluding remarks will be given at the end.

2. LITERATURE REVIEW

2.1 Knowledge Sharing

Knowledge sharing, in the meantime, is a core component of and a challenge issue for knowledge management. Knowledge sharing takes place when an individual provides information and know-how to help others and collaborate with others to solve problems, develop new ideas, or implement policies and procedures (Wang & Noe, 2010). Knowledge sharing can occur via face-to-face communications or written correspondence through networking with other experts, or documenting, organising and capturing knowledge for others. The term differs from knowledge transfer and knowledge exchange, where knowledge transfer refers to the movement of knowledge between the knowledge source and the recipient, and knowledge exchange includes both knowledge sharing and knowledge seeking.

Technologies are crucial to the sharing of information, which provide an efficient and automated means to track data over time, interact with others, post information, and share discoveries (Petrides & Nodine, 2003). With the advent of powerful and sophisticated hardware and software tools, the collection, storage, and distribution of knowledge can be better supported and easily performed with a few clicks. At the same time, it is important to look beyond technical capabilities and focus on other factors that influence knowledge sharing, for example, organisational context, interpersonal and team characteristics, cultural characteristics, individual characteristics, and motivational factors (Wang & Noe, 2010).

In the field of education, traditional education model is arranged such that teacher always acts as a repository and transmits knowledge to students in classrooms. The incorporation of state-of-the-art technology assures learning is moving towards practice-based, interactive-based learning. The latest Web 2.0 technologies offer platform for creating collaborative learning environments which foster meaningful learning (O'Reilly, 2007) and allow knowledge sharing on a globe scale (Tarik & Karim, 2011). Web 2.0 helps students not only in receiving information, but stimulates them in brainstorming, collaborating and learning through knowledge sharing. In higher education institutions, learning management system is sometimes adopted as a knowledge management system to elicit and support the sharing of knowledge among students. By means of an appropriate mix of e-learning and traditional classroom learning, blended learning extends the student learning continuum through the e-learning components and activities outside classroom (Lam et al., 2011; Lam, Hung, Chan, Yan, & Woo, 2011). By implementing Web 2.0 technologies and appropriate strategy of knowledge sharing, students' collaboration in and beyond the classroom setting can be enhanced and strengthened. As a consequence, learning is better supported in the new era.

2.2 Assessment for Learning

The concept of assessment for learning gives a general direction of where assessment should go. Ten assessment principles for assessment for learning have been developed, presented within the framework of Assessment of Learning (AoL), Assessment for Learning (AfL), and Assessment as Learning (AaL), as stated in Berry, 2008. The core features of AoL, AfL, and AaL are on product of learning, process for learning, and learner taking control respectively, which are closely related to learning in numerous ways. Teacher, students, and system can all contribute to making assessment effective. The ten guiding principles listed below will be of help when actions are being considered.

1. Aligning assessment to teaching and learning
2. Exploring the use of multidimensional assessment methods
3. Selecting those assessment methods which are susceptible to learning
4. Considering drawing on joint efforts among colleagues
5. Assessing students continuously throughout the learning processes
6. Allowing students to take part in the assessment process
7. Using assessment to uncover students' learning

8. Making marking criteria accessible for students
9. Providing feedback to facilitate students' learning
10. Analysing and reporting students' results

The fundamental principle of assessment for learning illustrates how assessment and learning are closely related. Assessment plans should be carefully designed to promote, induce and reinforce learning. Students are actively involved in their own learning, with the ability to assess themselves and understand how to improve. Teachers are responsible for monitoring the assessment results to give timely feedback and adjust teaching where appropriate. Within the parameters of assessment for learning, students' involvement in the assessment activities is taken seriously, as they are the key players of learning. Teaching, learning and assessment have to come together and work together if we are to raise students' standards of achievement and help students achieve deep learning (Berry, 2008). In the next section, the methods of assessment and strategy of collaboration and knowledge sharing are discussed and evaluated based on the abovementioned assessment principles.

3. THE METHODS OF ASSESSMENT AND STRATEGY OF KNOWLEDGE SHARING IN COMPUTER COURSE

The course "Applied Computing" is a generic course for all year one students under the associate degree scheme in science and technology. This year, around 900 students enrolled in the course and were placed in one of the nine classes being taught by five teachers. The course delivery was identical for all classes, with the same set of course materials and methods of assessment. The assessment components included two individual assignments, a group project, and an examination. Based on one of the classes of this course, this paper will examine the impact of collaboration and knowledge sharing on individual assignments and group project, and discuss how these methods of assessment help students improve learning.

3.1 Individual Assignments

The course included two individual assignments, i.e., a take-home programming assignment and an in-class practical exercise. For the programming assignment, students were asked to write computer programs in order to solve a given problem. For the practical exercise, students were asked to answer 15 multiple-choice questions during class. The course made use of an e-learning platform and an automated assessment system to construct a better learning environment for students (Berry, 2003).

3.1.1 e-Learning Platform

To engage students in the learning process, e-learning is adopted to improve their learning experience. An e-learning platform, which is a Moodle-based learning management system, is used for managing course materials and course activities. In this study, students were provided with lecture notes and reading materials in the course website. By making use of the assignment and quiz functions, both programming assignment and practical exercise were made available online. Students could make use of the discussion forum to post and discuss questions with teacher and other students. With the grading function, teacher could provide assessment feedback and grading to students easily, and monitor students' learning progress systematically. Other built-in functions of the e-learning platform, e.g., announcement, calendar, etc., were also applied in the course setting.

In the beginning, most students did not have much knowledge of writing computer programs and came up with lots of questions while working on the programming assignment. As such, students were encouraged to fully utilise the online discussion forum to post and discuss questions with other students. This helped students to share their knowledge with peers in different aspects, thus achieving active knowledge sharing among students. Besides, as students might have similar questions in mind, they could discuss their difficulties in the forum and work collaboratively to solve their problems. Teacher could monitor and guide the online discussion, as well as address their difficulties in class if needed. In brief, there were a number of advantages to use an e-learning platform (Slack, Beer, Armitt, & Green, 2003).

- *Efficient.* With e-learning platform, students can discuss problems or difficulties in the online forum which helps them to have more understanding on related topic through discussion and develop a habit of communicating with others through network. Thus, learning is no longer restricted to the classroom and contact hours, but knowledge sharing can occur anywhere and anytime. When students start discussion in the forum, teacher can monitor their discussion and offer guidance and timely feedback to facilitate their learning where appropriate. In this way, teacher can make sure students' learning is on the right track throughout the learning process, resulting in improved efficiency and effectiveness of learning. Teacher can also assess students' learning progress in a continuous manner and make necessary adjustment accordingly. That is, principle 5 and principle 9 of AfL are achieved.
- *Collaborative.* Students can learn from each other through discussion in the online forum. Students share their own knowledge and experience in the discussion. For programming exercise, one may come across different problems under different situations. Through discussion, highly capable students can help less capable ones in problem solving, and learn from their mistakes and have a deeper understanding of the topic simultaneously. This improves learning of all engaged students of the course and creates an inclusive learning environment.
- *Consistent.* Teacher can post announcement and make amendment on assignment conveniently and consistently via e-learning platform. For programming exercise, it is often necessary to make clarification and amendment from time to time. Meanwhile, assessment criteria can be posted and made accessible by students. This fulfills principle 8 of AfL. As a result, students understand clearly what is expected from the assessment task and are able to learn through assignment with clearer learning outcomes (Rust, Price, & O'Donovan, 2003).

3.1.2 Automated Assessment System

Computer technology can be used for assessment purposes at various levels ranging from management of assessment information to a fully automated assessment system. In this study, students submitted their programming assignment online where all submissions were marked by an automated assessment system. The assessment results were generated with statistical analysis for both students and teacher. With the automated assessment system, assessment information could be retrieved and presented in different ways to meet the needs of students, teachers, course organisers and external examiners. With the computer-based assessment, students' learning and knowledge sharing among students were improved and enhanced in the following ways.

- *Prompt Feedback and Report.* The computer-based assessment is programmed to provide assignment details to students, grade the submitted assignments, and return immediate results to corresponding students and teacher. In Hong Kong, students are result-oriented and urged to get assessment feedback within a few days. Through the computer-based assessment, students can get full report of the assessment within a short time period. For the programming assignment, teacher needs to test different cases during marking in order to reflect different errors in the programs. The computer-based assessment can provide correct answers immediately while identifying errors made by students. With the full marking report, students have a full picture of their performance and improvement can be made based on the feedback. This helps students to learn from their mistakes and achieve deeper learning ultimately. In general, an assignment alone is merely not enough or complete in the learning process. Without reflecting upon the assignment it may be forgotten quickly or its learning potential may be lost (Brady & Kennedy, 2005). As students may forget what they have done in an assignment after a period of time, a marking report provided promptly allows students to recall details of the assignment and learn from their mistakes more efficiently.
- *Adjust Teaching Strategy.* With automated assessment, assessment against each submission will be consistent, including scope, content, and presentation of the assessment report. It facilitates the setup of a comprehensive assessment. Teacher can further elaborate analysis of the assessment results and find out common mistakes made by students. Teaching strategies can be adjusted accordingly which improve students' learning and learning efficiency. Teacher can align learning outcomes with assessment in order to reinforce teaching and learning. Besides, teacher can upload more reference materials related to the assignment to enhance knowledge sharing of related topics with students.

3.2 Group Project

The course included one group project which students were asked to develop a webpage with a particular topic. Our analysis is based on how students learn through group work and the peer and self-assessment by means of computer technology.

3.2.1 Learn through Group Work

Group project is widely adopted as a teaching and learning activity. It provides useful information about students' understanding and knowledge of particular learning areas, their abilities to apply knowledge in particular investigations, and their abilities to communicate subject-specific information clearly (Chapman & King, 2005). Through this group project, students acquired understanding and technique by discussing with their group members. They shared knowledge, built up team spirit, and worked with each other to complete the group project enthusiastically. Teamwork is one of the key factors for knowledge sharing. With the ICT applications, group project supports students to learn more efficiently.

- *Independent Learning.* AfL is a source of motivation and a key element in the development of independent learner. For group project, students work in a team environment to discuss and set their learning goals and get a clear direction at first, which help them to understand the criteria clearly and answer the questions "Am I getting it?" and "How am I doing?" Besides, students need to search for reference materials to develop the project which helps them to learn a particular topic deeply and independently. As students need to apply the theory learnt in the project, this helps them to revise the course content. Technology is considered to be an important contribution since students can collaborate even without physical presence. In addition, technology can act as a facilitator to encourage and support knowledge sharing by making knowledge sharing easier and more effective (Riege, 2005). Team members can share their views and materials collected via e-learning platform which help them to perform their work more efficiently. Through the group work, students are trained to be active, independent learners whom take ownership of their learning.
- *Leadership.* Leadership development is also an important factor for knowledge sharing. Team leader facilitates knowledge sharing and engenders trust among group members which contribute to team effectiveness. Students working in a group need to build up team spirit and communicate with each other. Through discussion, each student takes turn to present their ideas and comment on others' work. The project can be sub-divided into several tasks such that each student leads one part of the project and works together for different parts of the project. Through the group work, students develop leadership skills and learn to work with each other to accomplish the group project.
- *Self-reflection and Peer Evaluation.* Group project can provide students with a valuable learning experience by combining talents of group members through contributing knowledge and ideas. Engagement and commitment are required to make the most of the contributions of all students. Self-reflection helps students to develop self-discipline and carry out self-evaluation, as well as identify strengths and seek assistance for overcoming weaknesses. Besides, peer assessment is not merely a means for awarding marks, but allows students to give valuable feedback to their group members to facilitate collaborative learning. It adds a valuable dimension to learning, i.e., the opportunity to talk, discuss, explain and challenge each other, which provides opportunities for students to evaluate and develop objectivity in making judgments about their own work and the work of others. In general, peer assessment helps students to develop self-regulation, which promotes independence in learning and assures students take some significant responsibility for setting their own project goals and evaluating progress against these goals (Nicol, 2010).

4. EVALUATION AND SUGGESTIONS FOR IMPROVEMENT

The methods of assessment of the course "Applied Computing" were designed to facilitate the sharing of knowledge among students and improve their learning experience. To evaluate the overall arrangement, interviews were conducted to obtain students' feedback and identify areas for improvement.

4.1 Results of Interviews with Students

In this study, semi-structured interviews were conducted with three students who studied this course. A set of questions were formulated to obtain students' feedback on assessment practices and how these assessments affect their learning experience.

The questions were classified into three categories, which included general questions, strengths and weaknesses of the methods of assessment. For general questions, we aimed at understanding students' general impression on knowledge sharing through e-learning platform. After that, some questions were prepared for collecting students' experience of strengths and weaknesses of the methods of assessment. Transcripts of the three interviews were consolidated and coded, which is shown in Table 1. Through analysing the interview transcripts and gathering research findings from similar studies, suggestions for improvement are summarised in the next section.

Table 1. Coded Transcripts of the Semi-Structured Interviews

Category	Transcripts	Coding
<i>General</i>	“We can download course materials easily.” (Henry)	e-Learning helps students to manage their study with ease.
	“We can get the notes whenever we want, and can reprint the notes easily.” (Alvin)	
	“The assessment criteria can be retrieved easily via e-learning platform.” (Simon)	
	“Discussion with classmates through e-learning platform helps us to better understand the assignment.” (Henry)	e-Learning helps students to communicate with teacher and peers.
	“Teacher responses to our questions quickly.” (Simon)	
	“Teacher would clarify the uncertain points quickly via e-learning platform or address them during class, which helps a lot.” (Simon)	Timely feedback is useful for improving students' learning.
	“More feedbacks are received through e-learning platform.” (Alvin)	
	“Students can improve their project after obtaining feedback from teacher and other students.” (Henry)	
<i>Strengths</i>	“Getting the assessment results of assignment timely helps us to better understand our learning.” (Alvin)	Automated assessment system helps students to improve learning.
	“Group project helps us to learn how to work together and work out the solution as a team.” (Henry)	Group work introduces another learning culture and practice and encourages collaboration.
	“Sometimes we can find out the solution through discussion.” (Simon)	Group work builds self-confidence and improves self-esteem.
	“We acquire computer skills through project implementation.” (Alvin)	
	“With self-reflection, we know what we have learnt in a better sense.” (Henry)	Peer and self-assessment engages students in reflecting upon their learning process.
	“Peer evaluation in group project is important to reflect our contributions.” (Simon)	

<i>Weaknesses</i>	“Some classmates may not join online discussion as they are not used to the e-learning mode.” (Henry)	Participation in online discussion is not sufficient.
	“Teacher may not answer all questions in e-learning platform.” (Alvin)	
	“Sometimes we may not have enough support on the use of e-learning technology.” (Henry)	Support on e-learning is to be strengthened.
	“Assessment results of assignment are expected to include more details.” (Alvin)	Automated assessment is to be enhanced with more feedback.

4.2 Suggestions for Improvement

4.2.1 Promote Participation in Online Discussion via e-Learning Platform

The e-learning platform is adopted as a communication channel outside classroom. Students make use of the discussion forum to post and discuss questions with other students. However, it is found that some students are not aware or do not check the discussion forum regularly. To promote participation in online discussion, teacher can highlight some of the posts in discussion forum during class and encourage students to check for details via e-learning platform. In addition, the sharing of knowledge through online discussion can be included as a form of assessment activities, where such assessment criteria can be based on quality (content) and quantity (number of posts) of knowledge sharing.

4.2.2 Provide More Feedback on Automated Assessment

Automated assessment is efficient and time saving, while ensuring consistency in the comments. However, the reports generated by automated assessment system may not be sufficient for students to understand their performance and learn from their mistakes. Teacher can clarify the assessment criteria and provide more feedback on automated assessment during class. Besides, related reference materials can be shared with students via e-learning platform.

4.2.3 Implement Self-Assessment in Assessing Individual Assignments

Self-assessment allows students to become more engaged in their own learning by reflecting on the quality of their work (Taylor & Nolen, 2005). Practice quizzes and written assignments are both examples of self-assessment. Implementing self-assessment helps students to develop self-regulation and evaluate their learning progress. It encourages students to identify strengths and seek assistance for overcoming weaknesses. By allowing multiple attempts to practice quiz and/or written assignment followed by additional instruction, benchmark measures can be identified for students to measure progress (Mehta & Xavier, 2007/8).

5. CONCLUSION

This paper has reviewed the methods of assessment of a computer course with the incorporation of computer technology and strategy of collaboration and knowledge sharing. e-Learning platform provides a channel for online discussion among students which reinforces their learning and promotes collaborative learning. Automated assessment assures consistency in the comments such that students can receive prompt feedback. Group project allows students to work in a team environment to study the project requirement, research on the topic, discuss on the findings and accomplish the project. Peer and self-assessment engages students in reflecting their own learning process and evaluating the work of others. Throughout the course delivery, knowledge sharing is incorporated into assessment in order to improve students' learning and achieve deeper learning.

To promote and enhance knowledge sharing in the course, a number of suggestions have been stated. In general, the scope of knowledge sharing can be expanded from students of the same class to all students of the course, and to a wider community. With the latest Web 2.0 technologies and appropriate strategy of knowledge sharing, quality and quantity of knowledge sharing in and beyond the classroom setting can be significantly increased. In other words, learning can be better supported and active learners can be benefited in the new era.

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