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Abstract

Information systems and technology are critical to today's business, especially in current ebusiness environment. The information systems curriculum, IS2002, not only places emphasis on technical discipline-specific knowledge, it also stresses the importance to train students in an authentic context. Authentic learning employs authentic context reflecting the way knowledge is used in real world situations. However students often encounter difficulty in achieving desired learning outcome in this type of real world problem-based learning environment. This paper describes the design of a series of learning scaffoldings to make authentic learning and group work effective.

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AUTHENTIC LEARNING: LEARNING SCAFFOLDING FOR STUDENTS

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ABSTRACT

Information systems and technology are critical to today's business, especially in current e-business environment. The information systems curriculum, IS2002, not only places emphasis on technical discipline-specific knowledge, it also stresses the importance to train students in an authentic context. Authentic learning employs authentic context reflecting the way knowledge is used in real world situations. However students often encounter difficulty in achieving desired learning outcome in this type of real world problem-based learning environment. This paper describes the design of a series of learning scaffoldings to make authentic learning and group work effective.

Keywords: Authentic learning, learning scaffolding

INTRODUCTION

Information systems and technology are critical to today's business, especially in current e-business environment. The information systems (IS) curriculum, IS2002, not only places emphasis on technical discipline-specific knowledge, it also stresses the importance to train students to possess skills that are required in real world situations such as effective oral and written communications, team work, problem solving and critical thinking [1]. However, this type of soft skills are generally not explicitly taught and critically assessed compare to that required of discipline-specific knowledge.

This paper describes the use of authentic learning in an information system development subject. We also describe a series of learning scaffoldings to support authentic learning and group work. The information systems development subject teaches systems development and prototyping process by evaluating and choosing an appropriate system development methodology. The subject emphasises effective communication with users

and team members and all those associated with development and maintenance of the system.

We apply authentic learning principles through a shared scenario and role play to enable students to immerse in the complexities of authentic systems development tasks. The goal is to intentionally use a complex real-world scenario to bring about authentic learning outcomes to enable students to gain authentic experience working in different roles as would-be IS professionals. This way students can immerse in the complexities of authentic system development environment that reflect the way IS professionals perform systems development tasks and activities and to provide authentic context that reflect the way knowledge is used in real-life.

Students are expected to identify, use and tailor an appropriate methodology to suit the client's development circumstances. Thus the ability to gather and analyse information during project development is a skill that students are expected to gain at the completion of the subject. As part of learning outcomes, students are expected to liaise with users and have an understanding of how systems may need to evolve to match changing organisational environment. In this paper, we will discuss strategies that have been used in this subject to help students to manage their projects and to achieve better learning outcomes in problem-based learning situations.

The rest of the paper is organised as follows. Section 2 describes principles of authentic learning, section 3 presents authentic activities, and section 4 discusses scaffolding strategies that have been planned to support authentic learning environment. We present lessons learned in section 5 and concludes the paper in section 6.

AUTHENTIC LEARNING

Learning by doing is the approach that was designed for this subject. An assessment task which provides authentic learning experience for students as they explore evolutionary prototyping in the project is introduced.

Authentic learning focuses on real-world problems using role-playing exercises, problem-based activities and participation in virtue communities of practice [3, 5].

Information and communication technology has changed rapidly in the last decade. The nature of this rapidly changing discipline means the professional context in which the IS graduates perform their tasks also changes rapidly. Authentic learning, which entails learning environment that is similar to real world, is an appropriate learning approach in such a rapidly changing technological world. Herrington, Oliver and Reeves [2] identify ten characteristics of authentic learning activities. The ten characteristics are problems:

- have real world relevance,
- are ill-defined,
- comprise complex tasks,
- require examination of tasks from multiple perspectives and roles,
- require collaboration,
- provide opportunity to reflect,
- are integrated and applied across subject areas,
- are seamlessly integrated with assessment,
- create polished product, and
- allow competing solutions and diverse outcomes.

In addition, Herrington [3] describes authentic learning environment having the following characteristics: an authentic context that reflects the ways knowledge is used in real world, authentic activities, access to expert performances and modelling of process, multiple roles and perspectives, collaborative construction of knowledge, reflection, articulation, coaching and scaffolding and authentic assessment.

AUTHENTIC ACTIVITIES

The IS professionals design and implement information technology solutions for business processes in organisations by modelling organisational data and processes, define and implement technical and process solutions. In IS courses, students are motivated to learn by doing that involve real-world problems. Thus authentic learning which involves authentic activities that mirror real-world activities is designed.

The assessment of this subject is based on a major system development project using evolutionary prototyping approach. The assessment consists of four milestones representing four iterations of prototypes. Two case scenarios for two small and medium-sized companies are presented to the students. The first company specializes in placing contract and casual employees; the second company is a supplier of high quality clothing company. The students are required to develop a computer-based information system to handle day-to-day business operations. User requirements for each of the cases are intentionally vague and ill-defined to reflect the authentic context of real world situation to allow role playing and user requirement gathering to be performed in a more complex manner. The assessment criteria include analysis and design components of the system, correct modelling technique as well as accurate representation of the system based on user requirement.

The project involves group work. Students are required to form a group consisting of four individual students. Within each group, the students are further divided into two subgroups which we call team (i.e. team 1 and 2). Thus each team consists of two students. There is a dual-role playing in this assignment: the system development role and the user role. To illustrate how it works, consider an example of a group with team members A, B, C and D. Team members A and B are assigned to team 1 and C and D are assigned to team 2. In this example, team 1 takes the role of user for the first company (recruitment consultant) while team 2 acts in the role of system developer for this company. In a similar manner, team 2 takes the role of user for the second company (clothing company) while team 1 operates as the system developer.

This arrangement of dual-role playing allows the students to investigate the learning environment from more than more perspective. The role playing of user provides an opportunity for the students to act in a role that does not normally take place in their day-to-day work. When the students are in the user role, they are required to study the case scenario and describe to the system developer what the broad requirements of the system are. Students are being told that the case scenario given is intentionally vague and they are required to define the system objectives and communicate

their system requirements to the system developer. Similarly students who act in the system developer role are required to consult the users on the requirement of the system and develop the new system based on the requirements as specified by the users.

SCAFFOLDING STRATEGIES

By employing authentic learning philosophy without cultivating skills that help students to achieve learning outcome is undesirable. This section describes several learning scaffolding strategies to help students in achieving the desired learning outcomes. Lombardi [5] has explained that students want to be let in on teacher's thinking process, for example why the assessment was designed in this manner, what the teacher is trying to accomplish, why the

learning activities are relevant, and what the criteria are for assessment. By providing learning scaffolds in the form of templates as shown below, we aim to help students to understand the assessment and learning process.

Firstly, we develop a project timeline to help students to manage their project. Figure 1 gives an example of broad project timeline when the students take the system development role. The project timeline is an important guide to help students to manage their project. The timeline has been spelt out in a specific manner to help students to clarify the achievable goals set out in each stage. We have also prepared a series of templates to teach students explicit skills in project management, records keeping and user evaluations.

Stage	Meeting	Template and Outcome Documents	By when
Decide/plan	Project initiation meeting	Initiation meeting template	
	Follow up meeting, online		
	Present key decisions	Submit initiation meeting documents	
Build	Technical specification meeting	Standard meeting template	
	Follow up meeting, online		
	Present specification meeting	Submit meeting minutes and specification	
	Build progress meeting	Standard meeting template	
	Finalise draft system meeting	Standard meeting template, submitting draft system for evaluation template	
Evaluate	Evaluation of draft system	Evaluation template	
	Follow up meeting, review user evaluation report	Evaluation report	
	Revisions progress meeting	Standard meeting template	
Revise	Report meeting, work on project documentation	Report template	
	Demonstration of revised system and prepare report submission.	Report	

Figure 1: Sample project timeline

Figure 2 shows a template of project initiation record, Figure 3 shows a template of group/team meeting record, and Figure 4 shows sample guidelines on evaluation of the system when the students are in the user role. We have introduced the template of project initiation meeting record to help students to identify individual role in the team and to manage

expectation and contribution within the team. This strategy helps to “set the scene” when students meet for the first time.

Although these templates seem to be simple, it is important to provide this type of templates to students. We aim to use these templates as

learning scaffolding to provide clear direction to students and to reduce student's confusion to explain what a student must do to meet expectation and to keep students on task by providing structures and to reduce uncertainty, confusion, frustration and time to eliminate difficulties in embarking on group work in authentic learning situations [6].

In modern work environment, working in group is inevitable. To provide authentic learning experience, team work is indispensable [5]. Collaborations and team work are desired attributes of IS graduates. Industry and employers express desire for IS graduates to have improved skills in individual and group interactions [1]. Collaborations and team work entail communication, co-operations, negotiation, organization, leadership and delegation [4].

One of the problems often cited by students working in group is organising meeting times. To support collaborations and working in virtual space, online discussion space is set up for each team and group in the subject e-learning website. The online discussion space not only enables students to conduct their meetings and communications in virtual space, beyond time

and space boundary, it also functions as project repository. Meeting records, user requirements, system prototypes, comment, feedback and evaluation reports are stored in the discussion space. This provides project memory for all team members and allows sharing of group resources and acts as an inventory for all reports and prototypes.

The online discussion space also allows the subject coordinator to monitor project progress. Due to the nature of group and team assignment in the assessment, we have taken the following approach in designing online discussion space. Recall that each team consists of two individual students and each group consequently consists of two individual teams. In taking into consideration of private and public information sharing at two levels: team- and group-levels, we have created two discussion spaces for each team: a private team-based discussion space and a public group-based discussion space. The team-based discussion space is only opened to the two team members, whereas the public group-based discussion space is opened for all four team members within the group. This allows intra- and inter-team communications and project repository.

1. Meeting date.
2. In attendance (names).
3. Apologies (names).
4. Key decision 1: Preliminary understanding of user requirements as outlined in the assignment document.
5. Key decision 2: Preliminary ideas on scope of project and prepare preliminary project plan.
6. Key decision 3: How you will allocate project tasks. If using Role-based task allocation, list below each role and the name of the person allocated to it. If you are using Modular task allocation list below the name and description of each module and who is responsible for it.
7. Key decision 4: List below dates, times and locations for remaining face-to-face meetings.

Figure 2: Project initiation meeting record

1. Project name.
2. Meeting date.
3. In attendance (names).
4. Apologies (names).
5. Status/stage of project.
6. Issues discussed.
 - Actions
 - Who will do it?
 - By when?
 - Date done.

Figure 3: Group/team project meeting record

Overall	
1. Has the system developed based on your user requirement? Comment	Yes/No
2. Has the system developed based on agreed project plan? Comment	Yes/No
3. Do you understand the how the system is used? Comment	Yes/No
4. Does the system consistent in design? Comment	Yes/No
5. Has the system addressed the requirement you specified in the previous meeting with the system developers. Comment	Yes/No
6. What are the strengths of the system at this iteration, and what are its weaknesses? Comment	
7. Which aspect of the current system you want to improve or enhance? Comment	
8. What are your expectations of the system in the next iteration? Comment	
Screen design	
9. Is the screen uncluttered, clear and easy to follow? Comment	Yes/No
10. Do you know where you are at all times, i.e. clear navigation? Comment	Yes/No
11. Does the screen provide any help function or error messages to help you to navigate the system? Comment	Yes/No
Error prevention and correction	
12. Does the error message describe what action is necessary? Comment	Yes/No
13. Does error occur unnecessarily? Comment	Yes/No

Figure 4: Guidelines on user evaluation

Authentic learning enables students to reflect on their learning, individually and as a team. Each student is asked to submit a reflective report. It provides an opportunity for students to reflect

on the choices they have made in the assessment task as well as outcomes that meet their expectations. Figure 5 shows a template for reflective report.

- | | |
|----|---|
| 1. | Briefly describe the aims of your project. |
| 2. | Discussion of the system. |
| 3. | Describe the difficulties you faced developing this project, and how your team overcame them. |
| 4. | Briefly describe the outcomes of the project. |
| 5. | Do you think the project was a success? Give your reasons. |

Figure 5: Template for reflective report

Students are required to complete a peer-assessment report at the end of the project. The purpose of this report is to provide a mechanism for each team member to evaluate contribution of the other team member. Another important milestone in the assessment is to have two face-to-face meetings between the groups and the subject coordinator. These meetings are scheduled during the early stages of the project. This is to ensure any problem or conflict the students may encounter in the group can be resolved earlier and to assess work-in-progress.

LESSONS LEARNED

There were twenty students enrolled in the subject, forming five groups. The students have used the templates provided on project timelines, initiation meeting record, project meeting record and guidelines on user evaluation in this subject. Students have provided feedback in the final report that the templates have helped to assist them in planning and managing the project.

As indicated in the previous section, online discussion space has been set up for each group to enable students to communicate as well as serving as a function of project repository. We have found that students have not used the online discussion space as a mean to communicate (except one team has used it regularly as a mean of communication). On the other hand, students had mainly use the space as project repository. Comments from students have indicated that they prefer to use text messages, emails as well as online chat to communicate. In addition, as all students are enrolled in the same class, attending the same lecture and tutorial group, it is not necessary to use the online discussion space as was originally intended. However they have found the space as a project repository is the most useful.

We have found that students have focussed on their role as system developers and not the user role. They have also focussed on system development tasks. The role of the user only becomes dominant during the user evaluation phase. In this case students have not made serious attempts in specifying user requirement when they are asked to take the user role, and they have relied on the broad requirements as outlined in the assignment document.

The strategy of monitoring progress of students by having two face-to-face meetings at the early stage of the semester has been the most useful. To assist students to learn better in a group and to ensure equity in group work contribution, this strategy has helped to resolve distribution of work within the group as well as to manage expectation of team members within the group.

Our teaching evaluation results have indicated marked improvement in the area of “The teacher is well prepared for the subject”, “The teacher simulates me to think”, and “The teacher appears to be interested in assisting me to learn”.

CONCLUSIONS

This paper describes several learning scaffoldings that have been developed to assist students to achieve better learning outcome in authentic learning environment. From the teaching perspective, making authentic learning meaningful and achievable is important to help students to work together. Anecdotal evidence from students has showed that the templates have helped them in managing the project. It has also helped students to become aware of the progress they need to make each week. Team working relationships are also easier to manage.

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