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Developing Multidisciplinary Teams through Self-Assessment, Supported with Online Tools

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Abstract: Teamwork skills and the ability to effectively collaborate with peers continue to be hailed as essential skills by employers and higher education funding authorities, and many employers require new graduates to demonstrate these skills as part of the selection criteria. How then can we prepare graduates for this employment market that actively assesses teamwork and other generic skills such as communication, problem solving and leadership skills? This paper outlines an on-line learning environment that incorporates a self-assessment tool designed to assist students in developing understandings of themselves necessary in the selection of team roles and to provide a basis for planning, monitoring, and evaluating their performance within the team.

Introduction

There is a growing emphasis in higher education institutions that students should be developing content knowledge as well as professional skills that can be directly applied in industry such as teamwork skills, problem solving skills, decision-making skills, communication skills and information literacy skills (Australian National Training Authority, 1998; Bennett, Dunne, & Carre, 1999; Candy, Crebert, & O'Leary, 1994; Dearing, 1997; Department of Education, Science and Training, 2002). In Australia, the Graduate Skills Assessment (GSA) test has been designed to assess a set of valued and widely applicable generic skills that may be developed through the university experience that are relevant to university graduate work (Australian Council for Educational Research, 2002).

The GSA test grew out of increasing interest in generic skills related to the need for an adaptable workforce in modern economies from both employers and higher education institutions (Australian Council for Educational Research, 1999). The test is based on an assumption that certain generic skills, though taught within a particular context in higher education institutions, can be transferred to another context (industry). The skill domains chosen for assessment are: Written Communication, Critical Thinking, Problem Solving and Interpersonal Understandings.

This paper describes a learning environment that supports the development of teamwork skills through a cycle of planning, monitoring and evaluation. The initial component of this environment is a self-assessment tool, that allows learners to develop understandings of themselves to help inform their selection of team roles, and monitoring of their performance within the team, leading to reflection. The design of the tool is described as well as the context in which it will be implemented. The purpose of the tool is to assist learners in developing graduate attributes that are relevant to the interactive media development industry. At the same time, it is argued that the tool is flexible enough to be implemented as an initial step in any process that seeks to elicit the self-awareness necessary for promoting students' metacognitive development.

Professional Skills

Professional skills, or generic skills, currently have several synonyms including key, core, life, competencies, work, employment, transferable, personal and many others. However, all these terms usually refer to "skills that are common to more than one work site, more than one occupation or more than one field of knowledge" (Australian Council for Educational Research, 2002). To develop these skills learners have to engage in tasks that will enable them to practise and then reflect on their progress.

Contemporary educational theory suggests that using self-regulation and self/peer assessment strategies in the learning settings are important elements needed to develop these skills (Boekaerts, 1997; Jonassen, 1996). These strategies in conjunction with online asynchronous communication tools can provide ideal settings to help promote learning as well as professional skill development. This is in contrast to traditional teaching practices, characterised by passive, surface approaches to learning whereby students seek to meet the demands of decontextualised and irrelevant assessment systems (Gibbs, 1992; Hicks, Reid, & George, 1999; Ramsden, 1992).

The move to more collaborative learning settings can come at a cost. Many learners experience difficulty in team settings and often the environments pose difficulties for both teachers and learners in terms of inequitable workloads and rewards for those whose participation is minimal. Both self and peer assessment can be used in the design of learning environments to make teamwork more equitable. They are alternative forms of assessment that involve individuals deciding what value their own, and each of their colleagues has contributed to a process or project. How can this form of assessment be integrated into the regular curriculum? In Australia, there are legal issues involved in allowing peers to determine the final mark of other students, so it's important that the tutor makes all the decisions on how marks are re-allocated.

It is proposed that a suite of on-line tools can be implemented that support the development of professional skills in team-based projects. Key to this process is the role of self-assessment as a means of providing the basis for team development and supporting learners' metacognitive development. The design of such a self-assessment will be described here, as well as its potential to support further explorations in team development, management and evaluation.

Context and Design of the Learning Environment

At Edith Cowan University, the School of Communications and Contemporary Arts (<http://www.scca.ecu.edu.au/>) offers a major stream in Interactive Multimedia. Students in the final year of this course come from a variety of disciplines including graphic design, programming, business, public relations, advertising, photomedia, film and television, media studies etc. When teams are formed, students are encouraged to select team roles they want to develop skills in and nurture with a view of gaining employment at the end of their studies. They are required to complete two units, IMM3228 'Project Management Methods' in semester 1, and IMM3330 "Industry Project" in semester 2. Skills learnt in the first semester are then applied in the following semester with industry clients. Both units are designed to encourage the development of graduate skills, as shown by the units' learning outcomes:

- "Apply a range of project management and generic skills appropriate to the development of multimedia projects including time management, collaboration, communication, self-assessment, peer-assessment, task management, problem solving, information management and learning to learn skills"; and
- "Make a significant contribution to a team-based multimedia development project".

Project work is integral in both of these units and students liaise with clients to scope, design, develop, evaluate, cost, schedule and track projects, reporting on discrepancies and developing documentation that has direct relevance in the industry. The final product and documentation is hosted on a university server for students to use as an electronic CV to enhance employment opportunities (<http://studentprojects.scam.ecu.edu.au>). The web site contains the project name, description, team members, their roles, web site URL, and documentation (project proposal, design specifications, metrics, evaluation and post-mortem).

Teamwork is carefully structured to allocate clear and concise responsibilities in a fashion that supports the development of important professional skills (Collis, 1997; Klemm & Snell, 1996; English & Yazdani, 1999). Students are encouraged to select own teams and roles based on their skills and aspirations for future employment, and are required to negotiate:

- *Team role* - each team requires a project manager, graphics designer, programmer and instructional designer. Roles could also be shared, combined or created (e.g. media designer, content developer, evaluator and tester). These details were negotiated and finalised in the first two weeks of the semester; and
- *Project topic* - selected by students to enhance their skills, though considered for suitability by tutors i.e. team roles, client, clearly achievable objectives value of final product;
- *Clients* - team members considered how to approach clients and establish what commitment and input they would give the project. The client was requested to pass comment on the quality of the final product.

The key design goal of the learning environment is to develop and promote an authentic context that provides real and tangible benefits for the students. Students create an authentic CV item, and also have an opportunity to identify their strengths/interests as part of a multimedia development team. To help make the teamwork fair and equitable, the environment is designed using reflective practice (self, peer and tutor assessment) and along with activities that allow self-regulation. The result is that the teamwork is carefully integrated with negotiated assessment to help students and tutors make informed decisions about peer contributions and rewards. The tools that will be used to achieve this integrate self-assessment, the development of a team operational plan and student contract, and on-going monitoring and evaluation through reflection on the data generated within the environment. This, along with structured tutor support will be used to help students gain an understanding of how their team will be configured, and responsibilities allocated. The on-line environment will contain the following five modules:

- 1 *Self-assessment questionnaire* with feedback for student skills and attributes. This will help students formulate their own skill deficiencies and strengths;
- 2 *Team operational plan* will be based on the results of the self-assessment questionnaire, as well as students' career aspirations. The operational plan will outline the operating rules of the team as well as the negotiated performance criteria for each allocated macro tasks;
- 3 *Student Contract*. Outlines the main (macro) responsibilities individual students will have in the team. This will be tied into the unit's assessment criteria and allows students to clearly state what major roles and responsibilities they will take;
- 4 *Monitoring*. Each week, students enter their actual progress/performance (time, percent complete, quality and comments). This is compared to their estimated progress and performance as stated in the contract. This information is summarised and presented in graphical and tabular format to show how their roles and contributions within the team are evolving. This section concentrates on micro tasks that are related to macro tasks outlined in the student contract; and
- 5 *Overall Evaluation & Reflection*. Is completed at the end of semester, and shows summarised data such as comments, personal reflections and rationales for changes in estimations that evolved during the semester. The emphasis here is for the students to explain *why* some tasks went off track, and why others were successful i.e. lessons learnt, skills that need enhancing and also areas of strength that can be carried forward in career options. These will map back to unit outcomes and indicate the level of achievement obtained against those outcomes (low, medium or high) i.e. Performance criteria against unit learning outcomes.

The self-assessment module is the first of these to be developed and will be implemented by the time of publication to assist learners in forming teams and developing an operational plan.

The role of self-assessment

Boud (1992), has expressed the defining characteristics of self-assessment as: "*The involvement of students in identifying standards and/or criteria to apply to their work and making judgements about the extent to which they have met these criteria.*" (p. 5). The practical outcome of effective self-assessment should therefore be the creation of a team that integrates the range of disciplines required for the completion of an interactive media development project and a set of criteria by which the success of this team can be judged.

In an educational setting, however, such pragmatic concerns are also supported by philosophical ones that relate to the generic skills of the participants. These broader metacognitive goals find their home in definitions of self-assessment that refer to people being involved in making judgements about their own learning and progress, which in turn contributes to the development of autonomous, responsible and reflective individuals (Sambell, McDowell, & Brown, 1998; Schon, 1987). The focus of this tool therefore is on individuals' developing understandings of themselves as well as the creation of effective teams. Dirkes (1988) defines key processes in the development of metacognition as:

- Connecting new information to former knowledge;
- Selecting thinking strategies deliberately; and
- Planning, monitoring, and evaluating thinking processes

The first of these has a role in self-assessment in that previous experiences can be elicited through self-analysis, which can then be used to formulate future plans. The second process demonstrates the explicit nature of metacognitive processing. While many teams in educational settings are formed in an adhoc manner, making deliberate decisions about roles to be adopted within a team and tasks to be completed can help to inform the strategies used in their successful completion. The final set of processes is somewhat general. Monitoring, for example can integrate the process of linking new information with previous information, while planning can be evidenced in the selection of strategies. The suite of tools proposed closely follows these processes. The selection of team roles and negotiation of a student contract is a planning activity, while matching of planned progress with actual progress and revision of plans involve monitoring. Final reflection on performance is evaluation. However to suggest that this is a purely linear process would be to deny the organic and iterative nature of metacognitive development. Instead, this paper argues that planning should be informed by evaluation.

Evidence for the use of self-assessment as a planning tool can be found in the ubiquitous examples of learning styles questionnaires available both in academic journals and on the Internet. The E-Learning Centre in the UK, for example, lists fifteen separate approaches to eliciting learning styles (The E-Learning Centre, 2005). Whether Jungian in nature such as the Myers/Briggs personality test (The Myers Briggs Foundation, 2005) or Cognitive such as tests based on Howard Gardner's theory of multiple intelligences (Gardner, 1983; Learning Disabilities Resources Community, 2005) they all attempt to offer a lens from which to view oneself and develop more successful approaches to study and relationships.

The Self-Assessment tool proposed in this paper has been designed to accommodate multiple dimensions and provide support for learners to develop plans for learning based upon the completion of a questionnaire that asks users to agree or disagree to statements that represent those dimensions. Primarily it will be used in this context to assess and provide feedback to students on the extent to which they demonstrate an orientation to one or other of the roles within an interactive media production team. As will be shown, however, the tool is flexible enough to be used in assessing any psychological dimension that can be represented through the articulation of statements and can be measured by analysing the extent to which respondents agree or disagree to these.

Designing the Online Tool

The development of the self-assessment tool is based on the standard Internet technologies of PHP/MySQL, which enables the storing and accessing of items from a database, and can be integrated into a wide variety of learning management systems. The two roles of setting up questionnaires, and responding to questionnaires are organised around two modes of administrator and user. The tool consists of the following four components, as illustrated in Figure 1:

1. Dimensions
2. Statements
3. Rules; and
4. Feedback

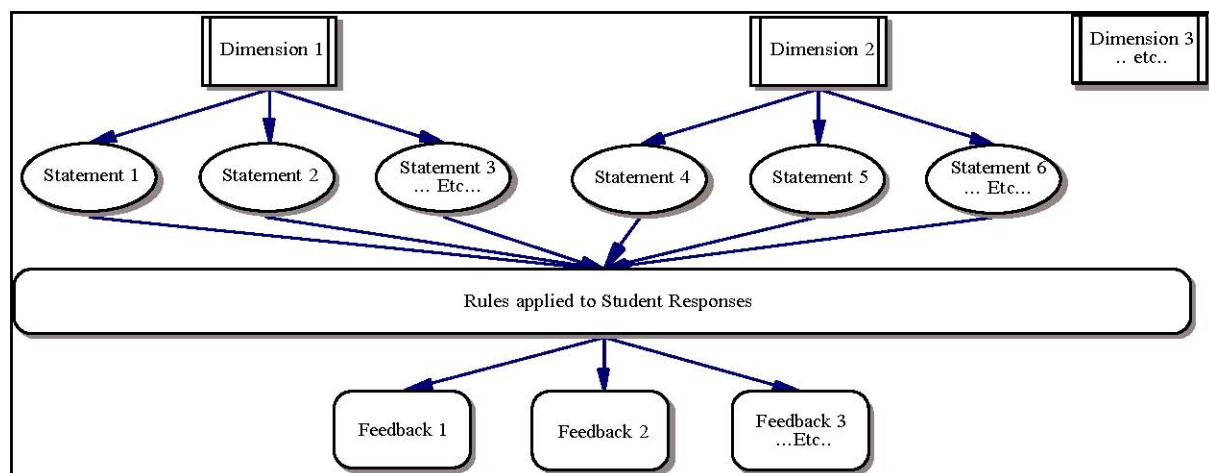


Figure 1: Self-Assessment tool overview

Administrators will have the ability to create and edit required dimensions, statements, rules and feedback through two broad processes. The first involves setting up the dimensions and statements, while the second involves creating the means to assess those statements, particular with regard to the feedback provided to users and the rules that govern the provision of that feedback. The following example demonstrates a typical process an administrator may go through in setting up a questionnaire:

Create/edit dimensions

This step is interchangeable with the creation of statements as the two are essentially closely related. As has already been discussed, dimensions can represent a range of attributes. They can be psychological traits, or as is the case here, roles and skills that are relevant to interactive media development.

Create/edit statements

Statements are created that provide evidence to support certain dimension. A statement such as ‘I have strong leadership qualities’ for example may be used to support a dimension such as project management. Such statements are developed by using existing validated and reliable instruments or in this case, by validating the statements using experts. The association of a dimension to a statement is what forms the basis of the assessment of statements.

Create/edit rules

Rules are used to judge the extent to which responses support the dimensions that are being tested. For example, if a user strongly agrees to several statements indicating an orientation to project management but strongly disagrees to statements that indicate the dimension of graphic design, then a rule can be set up to measure this divergence. Rules are created by mathematical and logical functions, comparing how much a user scores on one dimension to how much a user scores on another, whether the user scores particularly strongly on a single dimension, and so on.

Create/edit feedback

As with the relationship between dimensions and statements, the relationship between rules and feedback is an integral one. In this section of the tool, the administrator can create several forms of feedback that can be given to the end user following the questionnaire

Attach/edit feedback

Often the process of creating a rule, creating the feedback, and attaching it is a sequential one, however the tool is flexible enough from a bank of rules and feedback that have been created. An administrator can then select the feedback to be given based on a certain rule and attach it within this section.

Use of the On-line Tool

For the end user, use of the self-assessment tool will merely involve responding to series of statements according to a 5 point likert scale, identifying the extent to which they agree or disagree to each. Once complete, the rule function will calculate the statement scores according to the dimensions that they assess and provide the user with the feedback that has been attached to them.

For example, the student who scored highly on the dimension of project management but poorly on the dimension of media development may receive the following feedback:

You appear to be much more interested in Project Management and Instructional Design rather than Graphics or Media Development. You may wish to take on roles in this project that require you to work with the content expert, assist in developing team roles and conduct paper-based analysis and design documentation rather than actual computer-based development.

From Self-Assessment to Team Selection, Student Contracts and Self-Evaluation

The feedback from the self-assessment tool can be used as a basis for metacognitive planning. This can be done through follow up activities within the classroom, but as discussed earlier, self-assessment is one component of a suite of tools. The overall learning environment will use the data from the self-assessment tool to inform further stages of team planning, student contract, monitoring and portfolio evaluation. Variables from each tool will be carried into the other. For example, dimensions set within the self-assessment tool can be used directly or indirectly to inform the development of team roles. The portfolio will contain all of the responses within both tools and can be used as a means of self-evaluation. This means that students will be able to review their initial self-assessments and identify ways in which their understandings of themselves have evolved through the duration of the project.

Conclusion

Developing transferable professional skills for students in higher education institutions is a difficult but worthy task that has gained much attention and resources from both industry and government sectors. This study is attempting to help build professional skills through the design of learning environment that encourages students to continually practice using skills in a scaffolded cycle of planning, monitoring and evaluating. The environment will enable students to complete a self-assessment questionnaire that helps expose to them their preferences and orientations, which then form the basis of a student contract and operational plan that outlines roles and responsibilities for each team member. These tasks will be monitored and evaluated to help students reflect on how successful each of them has been within the team.

At the time of publishing the article at the conference, the self-assessment tool will have been implemented with a class of students, and some data collected to help assess it's effectiveness. It is hoped that the tool and cycle of planning, monitoring and evaluation will indeed help students reflect on how they performed within the team and use this knowledge to refine and develop their professional skills.

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