Exploring the Development of Students’ Generic Skills Development in Higher Education Using A Web-based Learning Environment

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Abstract: This paper reports on a study undertaken in Australia where the practice and development of generic skills was studied in the context of a Web-based learning environment. The results showed that students perceived the learning environment provided many opportunities for them to practice the generic skills being explored. Furthermore the results showed high levels of student perception of development of these generic skills. We conclude that Web-based learning environments offer many opportunities for teachers wishing to develop students’ generic skills and this is yet another advantage of using this technology for program delivery.

Introduction
Education is often viewed by teachers and students as collections of courses and units, with units being comprised of learning objectives linked to domain specific outcomes. Increasingly we are becoming aware that effective university teaching and learning extends far beyond the development of skills and knowledge in specific subject domains (eg. Dearing Report, 1997). An holistic view of education suggest other forms of skills and knowledge that are important outcomes of university education. These holistic skills are often common to all courses and units irrespective of their subject domain and are often referred to as generic or key skills. The generic skills are those that students need, to become successful learners and successful practitioners in their fields of study and work and in other aspects of their life. In a society where change is rapid and where knowledge and information are now marketable commodities, this extended set of outcomes in curriculum and teaching are gaining prominence in all sectors of education.

One of the main factors causing the emergence of generic skills as a required outcome of formal education is the growing use of technology in all facets of life. Many of the generic skills that are defined and described relate to students’ abilities to make meaningful use of technology. The influence of technology as the subject of generic skills coupled with emerging opportunities for students learning with technology appears to create a powerful synergy for generic skills development. The use of technology in teaching and learning already has been shown to provide many opportunities to teachers and learners. These opportunities include among other things, increased access to learning, increased flexibility for learners and enhanced learning outcomes in domain specific knowledge outcomes. If it can be shown that particular forms of technology use can also provide opportunities for learners’ generic skills development, teachers and institutions can be guided by these findings into modifications and changes to their technology-based learning environments to provide even greater returns on their investments and efforts.

Defining Key Skills and Competencies
Defining the full range of generic and transferable skills that are useful (or essential) for university students is an exhaustive process. It is as almost as exhaustive as finding agreement in the terms which might best be used to describe the set. In the context of this paper we use the term generic skills to describe the full range of domain independent skills that are considered to be essential life skills for people both in and out of the workforce. There has been interest in key skills as outcomes of education for many years now. In
different countries, different sets of skills are listed, all with similarity and consistency to each other. The 1993 New Zealand Curriculum Framework, for example, proposed 8 essential skills as important outcomes of New Zealand Schooling. These were: communication skills; information skills; self-management and competitive skills; physical skills, numeracy skills, problem solving skills and co-operative skills, work and study skills. In the United Kingdom, The Qualifications and Curriculum Authority have developed a set of key skills that the government and much of industry consider as essential for successful lifelong learning and a flexible workforce. The QCA key skills comprised 6 areas; communication; information technology; application of number; improving learning and performance and problem solving.

The conceptualisation of generic skills is problematic in many ways. Bennett, Dunne & Carre (1999) describe a number of synonyms including personal, transferable, generic, common, work and employment related skills. Are they skills or are they competencies, capabilities or learning outcomes? The skills that are reported as important outcomes of schooling tend to be broad and extensive. In university teaching, the skills set is often narrowed to focus on those that are not, or cannot, be taught as discrete components of coursework. At the same time, the generic skills sought by university education assume learners are numerate and literate as a consequence of the requirements of university entrance. The key skills included in the mission statements of most universities tend to include higher level aims relating to critical thinking, inquiry and a capacity for lifelong learning. Typical generic skills described for graduates include:

- skills that students need to develop to becoming successful and self-sufficient learners. For example, information literacy, metacognitive skills (eg. Candy, 1994);
- intellectual and imaginative powers, understanding and judgement, problem solving and critical thinking skills and an ability to see relationships (eg. Squires, 1990; Ramsden, 1992);
- personal and interpersonal skills needed for communication, cooperative and collaborative teamwork, and leadership (eg. Ashcroft & Foreman-Peck, 1994; Gibbs et al. 1994).
- skills required for successful work practices including time management, task management leadership and self evaluation (eg. Gibbs et al. 1992; Blumhof et al. 1996).

<table>
<thead>
<tr>
<th>Management of Self</th>
<th>Management of Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manage time effectively</td>
<td>Carry out agreed tasks</td>
</tr>
<tr>
<td>Set objectives, priorities and standards</td>
<td>Respect the views and values of others</td>
</tr>
<tr>
<td>Take responsibility for own learning</td>
<td>Work productively in a cooperative context</td>
</tr>
<tr>
<td>Listen actively with purpose</td>
<td>Adapt to the needs of the group</td>
</tr>
<tr>
<td>Use a range of academic skills</td>
<td>Defend/justify views and actions</td>
</tr>
<tr>
<td>Develop and adapt learning strategies</td>
<td>Take initiative and lead others</td>
</tr>
<tr>
<td>Show intellectual flexibility</td>
<td>Delegate and stand back</td>
</tr>
<tr>
<td>Use learning in new or different situations</td>
<td>Negotiate</td>
</tr>
<tr>
<td>Plan/work towards long-term goals</td>
<td>Offer constructive criticism</td>
</tr>
<tr>
<td>Purposefully reflect on own learning</td>
<td>Take the role of chairperson</td>
</tr>
<tr>
<td>Clarify with criticism constructively</td>
<td>Learn in a collaborative context</td>
</tr>
<tr>
<td>Cope with stress</td>
<td>Assist/support others in learning</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Management of Information</th>
<th>Management of Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use appropriate sources of information</td>
<td>Identify key features</td>
</tr>
<tr>
<td>Use appropriate technologies</td>
<td>Conceptualise ideas</td>
</tr>
<tr>
<td>Use appropriate media</td>
<td>Set and maintain priorities</td>
</tr>
<tr>
<td>Handle large amounts of information</td>
<td>Identify strategic options</td>
</tr>
<tr>
<td>Use appropriate language and form</td>
<td>Plan/implement a course of action</td>
</tr>
<tr>
<td>Interpret a variety of information forms</td>
<td>Organise sub-tasks</td>
</tr>
<tr>
<td>Present information competently</td>
<td>Use and develop appropriate strategies</td>
</tr>
<tr>
<td>Respond to different purposes/contexts and audiences</td>
<td>Assess outcomes</td>
</tr>
<tr>
<td>Use information critically</td>
<td></td>
</tr>
<tr>
<td>Use information in innovative and creative ways</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: A framework for the development of key skills (Bennett, Dunne & Carre, 1999)
Bennett, Dunne & Carre (1999) offer an elegant model (Table 1) to conceptualise key skills in the higher education sector by suggesting a framework comprising 4 broad managerial skills. These authors argue that the important key skills are fundamentally those associated with being able to manage self, others, information & task. They contend that the bulk of all generic skills can be embraced within the four categories of this framework and they propose that this model can be applied “to any discipline, to any course and to the workplace and indeed to any other context” (p. 77).

Developing Keys Skills

The provision of generic skills and competencies can be undertaken through a variety of forms. Traditionally it has been attempted through 3 main types of learning activity: integrated approaches, stand-alone approaches or approaches where key skills are developed in parallel with the conventional curriculum. (eg Drummond et al. 1997 cited in Bennett, Dunne & Carre, 1999). Many writers question whether it is really possible for the learning taking place in university settings to be transferable to vocations and the work place. One school of thought suggests that through situating learning in meaningful contexts, this transfer can be facilitated (eg. Brown, Collins & Duguid, 1989). Contemporary thinking is that university learning can be significantly strengthened through workplace-based practica and applications (eg. Seagraves, Kemp & Osborne, 1996).

On-line problem-based learning

We have been using the WWW in our university teaching for several years now and recognise that one of the major benefits of the use of this technology is the facility it provides to incorporate learning activities which help to develop students’ generic and transferable skills (eg. Herrington & Oliver, 1997; Oliver, Omari & Stoney, 1999). In the introductory multimedia course in our undergraduate program, we have embraced a Web-supported problem-based learning environment with which the students engage and interact with the course content. The system involves learners working in collaborative groups to explore the solutions to open ended and ill-defined problems. From these activities we have sensed learners developing a raft of generic skills through their interactions and activities in the Web-based course.

The on-line system we have been using is a database driven Web-based learning system designed to support a form of problem-based learning. The database elements enable the system to record, manage and support the interactions of a large number of students and a large number of tutors. The system supports problem-based learning by providing a means for students to collaborate on set problems, to share resources, to post solutions and to compare and review answers from other groups. The system was designed with a degree of flexibility in mind to enable it to be used in a variety of ways in a variety of units and courses. Typical use of the system in a course of study is expected to revolve around the following activities which were characteristic of our initial implementations and trials. The system is Web-based and all the following activities are undertaken using on-line technologies:

- Each week a problem is presented to students, the purpose of which is to contextualise and authenticate the weekly content of the course.
- Students are required to work within groups of 3 or 4 to explore the topic, locate relevant information and resources, consider the various options and outcomes and to create a response which is informed and well argued.
- The group post this solution to the bulletin board, an action which then reveals to them the solutions of the other groups in their cohort. Each group is asked to review the solutions of the others and through their feedback, the solutions are given a peer-assessed grade. Each tutor also reads the solutions and gives a mark which is added to the peer-assessed grade to give an overall mark for the solution.
- Students are able to view the marks achieved each week in a number of ways and this mark accumulates throughout the semester as each new problem is solved.

The nature of the learning involves high degrees of self-regulation on the part of the students. There is very little support or help provided and students have to judge when and where their research will stop and when and where their summarising and reviewing will stop. At first glance, this learning environment appears to provide many opportunities for students to practice and develop their generic skills. It was our impression from observing the students’ learning activities and levels of engagement in the problem solving tasks that students had many opportunities to practice a large number of the generic skills shown in Table 1. What was not clear though was the extent to which these skills were being practised and the influence of this
practise on actually developing and extending students’ existing levels of these skills. The aim of this study became to explore the generic skills which the problem-based learning environment caused learners to practise and the extent to which this developed, or had the potential to develop, the particular skills.

**Method**

The learning environment was implemented in a first year university course with an enrolment of 90 students. The theoretical component of the course was well suited to problem-based learning and the system was used to support students’ problem solving activities through weekly problems for 10 weeks of the course. A questionnaire was administered to students in the 8th week of the course after they had completed 7 problem solving activities. The questionnaire provided students with a list of the generic skills described by Bennett, Dunne & Carre (1999) and students were asked to reflect on:

1. the level of practice that the problem-based learning environment encouraged; and
2. the extent to which this practice contributed to their development of the discrete skills.

The instrument used a Likert Scale to enable learners to show their responses. The questionnaire took 15 minutes to administer and was completed by the students in their class settings. After the questionnaire had been given, a small number of students were interviewed to gather some first had data on the strategies employed in the problem solving processes. It was clear that students were using a range of different approaches in creating their weekly problem solutions and the different strategies were likely to influence their practice and development of the generic skills.

**Results**

a. Practising Generic Skills

To explore the level of practice encouraged by the problem-based learning environment, the questionnaire showed each of the generic skills listed in Table 1 and asked students: *How often did you practise the following during the problem solving activities?* Responses were made using a Likert scale with the options: never, a little and regularly. Table 2 below shows the students responses as a percentage of the options chosen. A weighted index was calculated to determine the relative amount of practice each skill received on a scale from 0 to 2, with 0 representing no practice and 2 representing regular practice.

<table>
<thead>
<tr>
<th>Generic Skill</th>
<th>never %</th>
<th>a little %</th>
<th>regularly %</th>
<th>Weighted Index (0-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management of Self</td>
<td>3</td>
<td>57</td>
<td>40</td>
<td>1.37</td>
</tr>
<tr>
<td>Management of Other</td>
<td>15</td>
<td>47</td>
<td>38</td>
<td>1.31</td>
</tr>
<tr>
<td>Management of Task</td>
<td>4</td>
<td>52</td>
<td>44</td>
<td>1.39</td>
</tr>
<tr>
<td>Management of Information</td>
<td>1</td>
<td>44</td>
<td>55</td>
<td>1.55</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>6%</td>
<td>50%</td>
<td>44%</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Students’ Perceptions of the Relative Levels of Practice of Generic Skills

The striking outcome from this first dataset was the extent to which students perceived the learning environment encouraged them to practise the generic skills. There is insufficient space to show the discrete scores achieved for the 40 individual skills listed in the table but the summary data conveys the overall information quite clearly. For example, in terms of practising generic skills associated with self-management, the sample of students perceived that they failed to practise any the listed generic skills only 3% of the time. In the sample of 32 students, there were only 10 instances when students felt that their learning activities did not practise one of the 12 generic skills listed for self-management.

The summary data shows that students perceived that overall their learning activities involved a little practice of the generic skills 50% of the time and regular practice of the generic skills 44% of the time. Among the 4 categories, the one category that seemed to be least practised was that of management of others. When we say least practised, there were more instances in this category than the others where students perceived they were practising these skills least but the overall practice level still remained quite high. The skills in this category related to working with others and practising the skills associated with
delegation, negotiation, collaboration etc. It was clear that the way we had structured the approach limited students’ opportunities to continually practise some of these skills. The students remained in the same group throughout the semester and from one week to the next, some members assumed roles within the group and this led to a lessening of their practise of such tasks as delegation, chairmanship, etc. The category that students appeared to practise the most was that of information management. The use of the Internet and WWW as a resource base was a fundamental component of the Web-based activity and each of the problems involved many skills associated with access, reading, reflecting and using information. It is difficult to imagine another learning environment where more practice was possible.

b. Development of Generic Skills
The study also sought to establish students’ perceptions on how much skills development was associated with the practice they were doing. Although we often associate practice with skills development, it is useful to explore whether this is the students’ perception and to explore whether or not students feel that their skills are being developed through their learning activities. Table 3 shows the results of students’ responses to the question: *How much did the problem solving tasks help you to develop these skills?* against each of the 4 generic skills categories. To explore this area in more detail, students were given a 5 point Likert scale on which to record their results, the scale ranging from *not at all*, through to *very much*.

Once again, the results were very positive and showed that the students perceived that the learning environment helped them in more than minor ways to develop the various generic skills. There were only a small number of instances where students felt that the learning environment did not contribute to the development of particular generic skills. The value of 6%, as an average of those perceiving no learning at all, in Table 3 is indicative of a very small number of students and an even smaller number of discrete skills. The perceived levels of skills development correlate highly with students perceived levels of practice and if we assume that students can tell when they are developing skills, then the amount of practice is a metric which can be used to reflect skills development. Interviews with the students tended to support this assumption. In interviews, the students gave examples of their increased abilities to seek and use information, to work with others and to manage open-ended tasks, all examples of the skills in Table 1.

<table>
<thead>
<tr>
<th>Generic Skill</th>
<th>not at all</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>very much</th>
<th>weighted index (0-4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management of Self</td>
<td>3</td>
<td>21</td>
<td>37</td>
<td>31</td>
<td>8</td>
<td>2.12</td>
</tr>
<tr>
<td>Management of Other</td>
<td>12</td>
<td>20</td>
<td>31</td>
<td>26</td>
<td>11</td>
<td>2.00</td>
</tr>
<tr>
<td>Management of Task</td>
<td>5</td>
<td>20</td>
<td>33</td>
<td>31</td>
<td>11</td>
<td>2.23</td>
</tr>
<tr>
<td>Management of Information</td>
<td>4</td>
<td>9</td>
<td>31</td>
<td>38</td>
<td>18</td>
<td>2.50</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>6%</strong></td>
<td><strong>18%</strong></td>
<td><strong>33%</strong></td>
<td><strong>31%</strong></td>
<td><strong>12%</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Students’ Perceptions of the Relative Levels of Generic Skills Development

Table 3 provides an indication of the relative levels of skills development between the 4 categories and once again, the weighted index provides a measure by which this can be compared. Once again students perceived the management of others to be the skills which developed to the least extent and the management of information to the skill which they developed the most. In all cases however, both the results and the student interviews suggested that the students felt that had developed skills across all 4 categories. The weighted indices were all equal or greater than 2.00, the middle value of the scale. Once again, the discrete data for each of the 40 skills provides some interesting material for discussion and highlights particular skills which a small minority of students felt were less developed than others.

Summary and Conclusions
The results from this study have provided strong confirmation of our expectations that the Web-based learning environment helps students to practise and develop their generic skills. The study shows that the students’ perceptions are that there were few generic skills in the framework described by Bennett, Dunne & Carre (1999) that were not practised in the process of learning through the Web-based learning environment which we had developed. Likewise, the results showed that the students found few instances where their learning activities did not also contribute to the development of the generic skills listed. While
there were some small differences observed in the perceived levels of practice and development across the
4 categories, the results were very positive for them all.

It is our intention now to create our own set of generic skills based on the needs and demands of our course
and programs and to use the data from this study to see which skills might need to be intentionally
considered in modifications we will make to the learning environment. We sense that it will be possible to
modify the learning environment in a number of ways to address those skills which we are particularly
interested in developing and to reduce the levels of practice of students in skills which are of lesser
importance. One limitation with this paper has been its reliance on student perceptions as its measure of
the amount of practice and level of skills development. For the purpose of this exploration, we feel that our
results still have validity and we base this feeling on substantiating evidence from student interviews and
the consistency of the data that was gathered. We suspect that in our future work we will need to explore
ways in which we might find more empirical measures on which to base assumptions about generic skills
development and plan to make this an integral part of our future work.

Note: An earlier version of this paper was presented at ASCILITE'99 held in December, 1999 in Brisbane,
Australia.

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