Title: Knowledge creation processes of students as producers of audio learning objects
Author: Lee, Mark J.W.
Author: McLoughlin, Catherine
Author: Chan, Anthony
Email: malee@csu.edu.au
Email: c.mcloughlin@signadou.acu.edu.au
Email: achan@csu.edu.au
In: ALT-C 2007: Beyond control: learning technology for the social network generation
URL: http://www.alt.ac.uk/docs/altc2007_research_proceedings.pdf
Conference Name: 14th Association for Learning Technology Conference
Conference Location: Nottingham, United Kingdom
Conference Year: 2007
Conference Editor: Wheeler, Steve; Whitton, Nicola
Year: 2007
Pages: pp116-128
Publisher Place: Oxford, United Kingdom
Publisher: Association for Learning Technology
Abstract: This paper reports on a study aimed at investigating the learning and knowledge construction processes of volunteer university students tasked with producing short, talkback radio-style educational audio learning objects (Middleton and McCarter, 2006; Cebeci and Tekdal, 2006), to be distributed to cohorts of other students through podcasting technology. The study used focus group interviewing to analyse the cognitive and social interaction that occurred as students engaged in developing the joint objects of activity. The findings indicate that both individual and collective advances were achieved through collaborative dialogue and peer-to-peer interaction. In addition, the metacognitive processes of planning, self-monitoring and reflection were evidenced in the student-producers’ discourse.
Subject: Educational podcasting, students as producers, digital audio learning objects, knowledge building, knowledge creation metaphor of learning
ISBN: 9780954587062
Knowledge creation processes of students as producers of audio learning objects

Authors: Mark J W Lee
Catherine McLoughlin
Anthony Chan

Address for correspondence: Mark J W Lee
School of Education
Charles Sturt University
Locked Bag 588
Wagga Wagga, NSW 2678
Australia
Email: malee@csu.edu.au

Catherine McLoughlin
School of Education (ACT)
Australian Catholic University
PO Box 256
Dickson, ACT 2602
Australia
Email: c.mcloughlin@signadou.acu.edu.au

Anthony Chan
School of Computing and Mathematics
Charles Sturt University
Locked Bag 588
Wagga Wagga, NSW 2678
Australia
Email: achan@csu.edu.au
Knowledge creation processes of students as producers of audio learning objects

Abstract
This paper reports on a study aimed at investigating the learning and knowledge construction processes of volunteer university students tasked with producing short, talkback radio-style educational audio learning objects (Middleton and McCarter, 2006; Cebeci and Tekdal, 2006), to be distributed to cohorts of other students through podcasting technology. The study used focus group interviewing to analyse the cognitive and social interaction that occurred as students engaged in developing the joint objects of activity. The findings indicate that both individual and collective advances were achieved through collaborative dialogue and peer-to-peer interaction. In addition, the metacognitive processes of planning, self-monitoring and reflection were evidenced in the student-producers’ discourse.

Background and introduction
Podcasting (Curry, 2004) allows audio content from one or more user selected feeds (channels) to be automatically downloaded to one’s computer as it becomes available, and later transferred to a portable player for consumption at a convenient time and place. There has been significant uptake of portable music players and podcasting, both in mainstream society as well as in all sectors of the education industry. In addition to myriad possibilities for flexible and distance education, podcasting can enhance learning in face-to-face and blended environments by engaging students in the material and adding yet another modality of learning (Carson, 2006).

Schlosser (2006) reminds us that “[t]he use of audio in education is not new, but is experiencing a renaissance fuelled by the ubiquity of portable audio players, broadband Internet, and software tools that allow the relatively easy creation and distribution of audio files” (sec. 2, para. 1). While many existing uses of podcasting in higher education focus on the use of the technology to deliver instructional content such as lectures, the authors of the present paper believe its potential lies in its collaborative and team building value through encouraging dialogue and interaction amongst learners, and its use as a vehicle for disseminating content generated by the learners themselves. This view is echoed by both Miller (2006) and Atkinson (2006), the latter of who believes that podcasting has limited impact as a mere method of distribution and that “The emerging developmental and research direction seems… to be learning through creating podcasts and similar, in contrast to learning from podcasts” (p. 21, emphasis in original).

The authors’ own foray into educational podcasting first began as an attempt to use pre-class listening material to address the anxiety and preconceptions of students studying an undergraduate information technology unit at the Wagga Wagga campus of Charles Sturt University (CSU) (Chan and Lee, 2005). The scope of the project has since expanded dramatically to encompass other units, involving undergraduate and postgraduate students in both IT as well as other disciplines, studying at one of CSU’s regional campuses as well as off-campus in various locations around Australia and overseas.

The authors’ podcasting approach is centred around 3 to 5 minute talkback radio-style “shows”, in which two or more students participate in informal discussions on pertinent issues related to the relevant unit and its content. The podcast production process is driven entirely by a group of volunteer students, with minimal intervention from their lecturer. The
study described in the present paper sought to investigate the knowledge building and construction processes that these student-producers engaged in as they worked individually as well as collaboratively as a team, in addition to examining the levels of reflection and metacognition that occurred as a result of their participation in the exercise. The study is an example of how tangible learning outcomes are resulting from the growing adoption of Web 2.0 (O’Reilly, 2005) applications in university teaching and learning across Australia. The views and experiences of the student-listeners, and the impact of the podcasts on these students, form the topic of a number of other publications (for example, see Lee, Chan and McLoughlin, 2006; Lee and Chan, 2007; McLoughlin, Lee and Chan, 2007).

Digital Audio Learning Objects (DALOs)
The design of the podcasts in the present study is consistent with the Digital Audio Learning Objects (DALO) (Middleton and McCarter, 2006) concept, which combines reusable learning object theory with theory pertaining to the pedagogically sound use of digital audio to enhance e-learning. Learning objects have been the subject of much discussion and research for a number of years (Wiley, 2002). Although much effort has been expended in the development of learning object standards, implementations and applications, the volume of learning object content remains limited. Because of its relative simplicity when compared with other forms of multimedia, digital audio offers great promise for producing and enriching learning objects. Cebeci and Tekdal (2006) also advocate using podcasts as learning objects, and propose the development of measures to allow them to be easily used in conjunction with existing learning management systems and learning object repositories.

A DALO is defined as “A digital audio file that can be used, and reused, in various learning situations and that supports a distinct learning objective using an appropriate and engaging method” (Middleton and McCarter, 2006, p. 7). The key features of a well-designed DALO are: simple to produce, immediate, educationally focussed, reusable and engaging (Digital Audio Learning Objects, 2007).

The student-producers: Teamwork and production processes
At the time of the study, the student-producers team consisted of eight volunteer members, of which five (three females and two males) participated in the research data collection process. Three of the participants were enrolled in the Bachelor of Information Technology degree, while the remaining two were enrolled in double degrees combining the Bachelor of Information Technology with a Bachelor of Business and a Bachelor of Teaching (Secondary), respectively.

Most of the team members were recruited at the end of their first semester at the university. They expressed an interest in participating, following an announcement and brief overview of the project by their lecturer in class. During each semester, the group met on a weekly basis, which was reduced to a frequency of once a fortnight as the semester progressed and their own study workload increased. The meetings were structured though relaxed, lasting for a duration of approximately one and a half hours each.

The student-producers brought to the team varying levels of knowledge and skill, and different sets of backgrounds and experiences. They were not provided with any formal training, but rather were introduced to the script writing, editing and presentation process by means of examples. They gradually developed competence in the various facets of the process through undergoing a number of practice runs, with decreasing levels of guidance and scaffolding, as well as through their interactions with one another. Many of them also
familiarised themselves with digital audio recording and editing tools, as well as web technology as it applies to podcasting, through self-directed research and reading in their own time.

**Podcast production process**

The podcast production process followed by the student-producers consisted of four stages, described below.

**Scriptwriting and editing**

The student-producers were proactive and self-regulated in their work. They brainstormed, discussed and debated ideas for the podcast scripts during their meetings, with the lecturer providing advice and guidance only upon request. A member of the team was responsible for documenting ideas for later follow-up. One or two members would typically take “ownership” of a particular script idea by agreeing to undertake the necessary research and to produce a draft script. Draft scripts were circulated amongst the group to provide opportunity for input from all members.

**Presentation**

Like the script writing and editing process, the casting of roles for each podcast episode was a team effort, with decisions made in a democratic manner. Members were familiar with one another’s strengths and weaknesses, and through their participation in the many recording sessions, each was able to develop his/her own unique podcast “persona”.

In preparing for a recording session, the presenter(s) had access to the full script. The team typically conducted one or more informal rehearsals, during which the script was tested and appropriate modifications made. Minor changes to wording and even swapping of roles often occurred as a result of this testing, as did variations in logistics such as seating configurations and equipment setup. For the earlier episodes the rehearsals were also especially important as a confidence building exercise for the presenters.

During a recording session, scripts were used as a guide and were often subject to impromptu variation and improvisation at the discretion of the presenter(s), who tried to avoid simply reading the scripts verbatim so as to provide a more relaxed, natural feel.

**Audio recording and editing**

The presentations were recorded in waveform (WAV) format using basic recording equipment. Editing tasks included splicing or cutting out mistakes in the presentation, reducing the length of pauses or periods of silence and reducing the sound file size while maintaining an acceptable level of sound quality. The file was then exported into MP3 format for podcasting. Approximately 20 minutes of editing resulted in the production of one minute of finished audio.

**Publishing and distribution**

The platform used for publishing and distributing the finished podcasts was Charles Sturt University’s proprietary Flexible Publishing system (Charles Sturt University, n. d.). To facilitate the project, the system was extended to allow MP3 files containing podcasts, along with their associated RSS 2.0 files (specifying the contents of the podcast feed), to be uploaded. This allowed members of the student audience to subscribe to the feeds using aggregator software to automate the downloading of new content, or alternatively to
Knowledge building and creation

In today’s knowledge society (Bereiter, 2002) there is a premium on the processes of creation, innovation and discovery, as these are the means by which social and cultural capital are increased. The concept of knowledge has attained increasingly complex meanings, combining expertise, concepts and skilled performance. This complexity is illustrated through the proliferation of concepts distinguishing between knowledge types, for example, situated and abstract forms of knowledge, and semantic, logical, empirical, systemic, procedural metacognitive and conditional knowledge. The multiplicities of knowledge are also reflected in an ever-broadening view of attributes and skills required of graduates, ranging from generic skills to domain knowledge coupled with a demand for hard core entrepreneurship and innovation (McLoughlin and Luca, 2006).

In planning for the educational application of technology, besides technical and social infrastructure, educators and designers need to consider the epistemological foundations of learning. Extant theories and models help to explain the role of different agents (for example, individuals, communities, networks) in knowledge creation, the mechanisms of knowledge advancement (for instance, how new ideas are generated and advanced), and processes of inquiry (such as the role of questions and activities to promote learning). Comparing models of knowledge construction and knowledge building communities affords a better understanding of the processes by which new knowledge is created in technology-supported learning environments. In order to provide theoretical and pedagogical grounding for research into podcasting and knowledge building, it is essential to consider current frameworks and metaphors of knowledge and learning.

Choosing a metaphor to describe learning through student-generated podcasts

Sfard (1998) distinguished between two metaphors of learning, the acquisition metaphor and the participation metaphor. The former represents the traditional view according to which learning is mainly a process of acquiring chunks of information, usually delivered by a teacher. This metaphor implies that learning is a matter of individual construction and acquisition; successful learning is characterised by a person’s capability to use and apply knowledge in new situations. An alternative model, according to Sfard, is the participation metaphor of learning that perceives learning as a process of participating in various shared activities and practices. According to this metaphor, the focus is on activities, i.e., on learning to learn, and not so much on outcomes or products, i.e., on “knowledge” in the traditional sense. Knowledge does not exist in individual minds but is an aspect of participation in cultural practices (Brown, Collins and Duguid, 1989). Cognition and knowing are distributed over both individuals and their environments, and learning is situated in these relations and the activities undertaken by networks of distributed individuals. Within the participation metaphor, learning is a matter of participation in a social process of knowledge construction, often referred to as “enculturation”, “guided participation” or “legitimate peripheral participation”, all of which are based on the tenets of sociocultural theory (Vygotsky, 1978).

In order to develop a framework that would help one to understand innovative knowledge communities that are emerging in the knowledge society, it appears to be necessary to go beyond the acquisition and participation dichotomy. The present investigation utilises the knowledge creation metaphor of learning (Paavola and Hakkarainen, 2005), which builds on common elements of Bereiter’s (2002) theory of knowledge building, Engeström’s (1987,
1999) theory of expansive learning, and Nonaka and Takeuchi’s (1995) model of knowledge creation. The knowledge creation metaphor appears to help to overcome the separation of the cognitive (the acquisition metaphor) and the situative (the participation metaphor) perspectives. Knowledge creation means that knowledge is emphasised, as in the acquisition and participation metaphor, but the processes involved are different: They are not merely dependent on situated action alone, but require participation in social interaction, knowledge building dialogue, and a focus on developing and creating knowledge. Learners and the social processes they engage in are foregrounded, as they are active participants in the creation of knowledge. They are not there to simply participate in activity and acquire skills, but also to produce shared outcomes and advance the intellectual capital of the group.

Recent research acknowledges the power and relevance of the knowledge creation metaphor in a knowledge-based society. The notion of creating shared knowledge objects through participation is precisely what Web 2.0-based learning is all about, and the expressions “user-generated content”, “peers produce knowledge” and “users add value” are reminders that the social software tools in Web 2.0 can be used to facilitate knowledge creation activities that draw on the users and their knowledge, enabling collaboration and the creation of shared artefacts (e.g. audio learning objects / podcasts for sharing knowledge).

The study

Research aims/questions

The study sought to address the following research questions:

1. What indicators of metacognitive and self-reflective processes are present in the student-producers’ discourse, when they discuss their experiences of creating audio learning objects for other students?

2. What knowledge building features and processes are evident in student-producers’ reflective discourse?

Data collection procedures

Two focus group interviews were conducted over the course of 2006 to elicit the views and experiences of the student-producers, for the purpose of better understanding their knowledge creation processes. The first session was conducted immediately after the first series of podcasts was produced in order to elicit levels of metacognitive activity and awareness resulting from the team’s experience. A list of questions was developed for the focus group session (Table 1). These questions were to be used as a guide; they were not intended to be followed to the letter.

<table>
<thead>
<tr>
<th>No.</th>
<th>Question</th>
<th>Metacognitive element (White, 1999)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>What are the major incentives / sources of motivation driving your interest in the project, especially given the fact that your participation is not rewarded through formal academic credit?</td>
<td>Self knowledge, self monitoring, understanding one’s own motivation for involvement in the tasks</td>
</tr>
<tr>
<td>2</td>
<td>How did being involved in the scriptwriting, editing and presentation of the podcasts to support the topics in the unit of study benefit you? What did you learn from a subject content point of view? How about other generic knowledge and skills?</td>
<td>Task knowledge: Understanding the demands of the task and how engagement with tasks develops personal skills and knowledge</td>
</tr>
</tbody>
</table>
3 What lessons have you learnt from the project, that might form the basis of advice / recommendations for other educators and groups of student-producers pursuing similar projects? | Strategic knowledge: ability to see how strategies used in podcasting might benefit others

4 Do you have any further suggestions on how to make this a really good experience for all those involved (student-producers, lecturers, student-listeners)? | Knowledge of plans and goals; capacity to plan and project ideas, assess benefits for self and others and refine the task itself

In the second focus group, which took place after the conclusion of the academic year, questions and discussion centred around the outcomes and processes of the podcasting experience, and the student-producers’ perceptions of the task in relation to knowledge building and creation.

Data analysis procedures
The content analysis of all focus group data collected for the study was conducted in four steps. Complete transcripts were first made from the audio tape recordings of each of the focus group sessions. To ensure anonymity, participants’ real names were replaced with aliases during the transcription process. The next stage was to agree on a protocol for identifying and categorising the target variables, and training coders to use this protocol. In this case, two of the researchers undertook the coding task. The transcripts, in the form of text files, were searched for verbal indicators of the themes and variables of interest. The unit of analysis chosen was the sentence or phrase. The instances found were collated, classified and then counted. Following independent coding, the two coders’ decisions were compared to establish interrater reliability. The final stage was to combine the results of the coding process and report on the incidence of the target variables.

Analysis frameworks used and results

Research question 1: Metacognitive knowledge evidenced in discourse

Analysis framework. Metacognition is a learner’s knowledge about his or her processes of cognition and the ability to control and monitor those processes as a function of the feedback the learner receives via outcomes of learning (cf. Metcalfe & Shimamura, 1994; Schraw 1998). Metacognitive knowledge refers to what the learner understands and believes about a subject matter or a task, and the judgments he or she makes in allocating cognitive resources as a result of that knowledge. White (1999) identified four categories of metacognitive knowledge, listed below, which are particularly useful in targeting the first research question:

1. **Self knowledge** – Self knowledge entails the individual’s capacity to recognise his/her strengths and weaknesses and to him/herself;
2. **Task knowledge** – This involves understanding the demands of tasks and what they require;
3. **Strategic knowledge** – This refers to the learner’s knowledge of the usefulness of strategies available for achieving learning goals;
4. **Knowledge of plans and goals** – This refers to the learner’s capacity to set and maintain goals and to record what he/she intends to do through his/her learning.

There is considerable debate about the relative strengths of the different approaches to assessing metacognition (Shraw and Impara, 2005). While there are several instruments that measure metacognition, each of these was deemed to have limitations, rendering them unsuitable for the present study. For example, the *Index of Reading Awareness* (IRA) is used...
to measure metacognitive awareness specifically in the domain of reading comprehension, and was therefore inappropriate. Another well known test is the Learning and Study Strategies Inventory (LASSI) which asks students to self report on attitude, motivation and testing strategies, and correlates these with measures of cognitive performance (Weinstein, Zimmerman and Palmer, 1988). However, it is uncertain whether the instrument measures metacognition per se, or cognitive skills that are mediated by metacognitive strategies. A third measure is the Metacognitive Assessment Inventory (MAI) which measures knowledge and regulation of cognition, but it remains a paper and pencil inventory, with limited applicability to a broad range of contexts. Yet another approach to assessing metacognitive knowledge involves the use of think aloud protocols while students are concurrently engaged in completing a task. This has been criticised for placing undue cognitive load on students, as the think aloud process competes for limited resources that are needed for task performance.

In view of the controversy and lack of evidence for paper and pencil tests and for think aloud approaches, the authors decided on retrospective self-report data from participants. Self-reports include retrospective verbal reports, concurrent verbal reports, written reports and self-estimates. The approach adopted in the present study was to analyse transcripts of the focus group discussions (retrospective verbal reports) for metacognitive processes and indicators. As adult learners, the student-producers demonstrated a high level of awareness during the scripting and editing of the podcasts, and were expected to be responsive to the self-report approach as it was administered shortly after completion of the tasks. As further support for this approach to measuring metacognition, the weight of evidence seems to favour such an approach because: “… relative to other formats for assessing metacognition or self-regulation such as think aloud or interviews, self report questionnaires are easy for teachers and students to use and can provide information about a large number of students in a practical and efficient manner” (Pintrich, Wolters and Baxter, 2002, p. 66).

**Results.** A total of 24 message units relating to metacognition were found in the focus group discussion transcripts, where students reflected on learning processes, skills developed, control and awareness of their learning strategies. Each major category had a number of subcategories, or related metacognitive skills (based on the research of White, 1999, Table 2). A summary of results is found in Table 2 below.

<table>
<thead>
<tr>
<th>Metacognitive variable</th>
<th>Subcomponents</th>
<th>No. of message units</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self knowledge</td>
<td>• Self-evaluation</td>
<td>4</td>
<td>16.67</td>
</tr>
<tr>
<td></td>
<td>• Awareness of effort needed</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Awareness of learning achieved</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task knowledge</td>
<td>• Task demands</td>
<td>4</td>
<td>16.67</td>
</tr>
<tr>
<td></td>
<td>• Degree of task success</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Strategies applied to task</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategic knowledge</td>
<td>• Self management</td>
<td>8</td>
<td>33.33</td>
</tr>
<tr>
<td></td>
<td>• Resource management</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Peer group learning/support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge of plans and goals</td>
<td>• Plans established</td>
<td>8</td>
<td>33.3</td>
</tr>
<tr>
<td></td>
<td>• Scheduling</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Persistence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td></td>
<td>24</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Research question 2: Knowledge building processes

Analysis framework. As a result of the relatively high levels of metacognition found in the initial data set from the first focus group, the researchers found sufficient evidence in the self-reports to probe further and to investigate students’ perceptions of knowledge creation processes. The analysis framework for the second data set adopted the categories developed by van Aalst and Chan (2001), who adapted four of Scardamalia’s (2000) 12 knowledge building principles, for use as analytical tool to assess knowledge building in a design experiment involving teacher education students. The four categories are depicted in Table 3, along with exemplars of actual utterances of the student-producers who participated in the focus groups in this study.

Table 3. Four knowledge building categories with exemplars from student-producers’ reflective discourse (adapted from van Aalst and Chan, 2001)

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Corresponding KB principle in Scardamalia (2000)</th>
<th>Exemplars from student-producers’ discourse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working at the cutting edge</td>
<td>Students pursue solutions to problems that transcend the mere fulfilment of personal interest, to advance the knowledge of the learning community</td>
<td>Epistemic agency</td>
<td>… even though I don’t like structure, I’m aware that other people around me… either love it or hate it, or are in-between, so I am quite able to adapt to other people and make it work as a group.</td>
</tr>
<tr>
<td>Progressive problem solving</td>
<td>Students develop ideas and tackle problems at progressively deeper levels, with a knowledge advance possibly leading to new questions to be answered</td>
<td>Improvable ideas</td>
<td>During that process, we’d then decide, well, if we want this to come into the script, can we get this to sound better…? (On collaborative editing) … you still keep what you want but make it better…</td>
</tr>
<tr>
<td>Collaborative effort</td>
<td>Students assist one another in advancing their understanding, for example, by asking questions and providing constructive criticism of one another’s contributions</td>
<td>Community knowledge, collective responsibility</td>
<td>… the other thing with that is, it helps out other students as well. That was probably one of the main goals that I got into it for… … it’s about wanting to give back… [to the university community and the podcasting group] ” … we all get together and ‘nut out’ a script…</td>
</tr>
<tr>
<td>Identifying high points in the discourse</td>
<td>Students are able to identify what they believe to be their best contributions to the knowledge building discourse. Here, the emphasis is on the student’s own learning trajectory rather than on the development of an idea</td>
<td>Knowledge building discourse</td>
<td>You want to get your words right. Like your sentence structure, the way you put things together…</td>
</tr>
</tbody>
</table>

In order for a student to be able to identify his/her significant contributions or “high points” and critically evaluate his/her individual learning from the knowledge building process,
he/she must exercise self-reflective and metacognitive skills. Results of analysis of the first data set showed that participants were operating at a high level of meta-awareness, and it was predicted that knowledge building processes would be evidenced in the second data set.

**Results.** The transcripts of the data from focus group 2 was examined using the four categories, following a preliminary analysis of the participants’ dialogue. The results are summarised in Table 4. A rating was given for the strength or evidence of each principle, using a five-point scale. A rating of 1 indicated that there was little evidence provided by the student of this principle, while a score of 5 indicated that there was strong evidence of occurrence supported by the discursive features described in Table 3.

**Table 4.** Indicators of knowledge building discourse features in focus group 2 as a percentage of total discourse

<table>
<thead>
<tr>
<th></th>
<th>Working at the cutting edge</th>
<th>Progressive problem solving</th>
<th>Collaborative effort</th>
<th>Identifying high points in the discourse</th>
<th>Percentage of KB features as % of total discourse*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant S1</td>
<td>2 (3) = 6</td>
<td>2 (2) = 4</td>
<td>2 (2) = 4</td>
<td>2 (2) = 4</td>
<td>8.0%</td>
</tr>
<tr>
<td>Participant S2</td>
<td>4 (4) = 16</td>
<td>4 (3) = 12</td>
<td>5 (2) = 10</td>
<td>4 (2) = 10</td>
<td>17.0%</td>
</tr>
<tr>
<td>Participant S3</td>
<td>4 (2) = 8</td>
<td>1 (4) = 4</td>
<td>3 (2) = 6</td>
<td>4 (2) = 10</td>
<td>12.0%</td>
</tr>
<tr>
<td>Participant S4</td>
<td>2 (3) = 6</td>
<td>2 (3) = 6</td>
<td>3 (3) = 9</td>
<td>4 (3) = 12</td>
<td>11.0%</td>
</tr>
<tr>
<td>Participant S5</td>
<td>4 (4) = 16</td>
<td>4 (2) = 8</td>
<td>5 (3) = 15</td>
<td>3 (2) = 6</td>
<td>16.0%</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>15</td>
<td>21</td>
<td>19</td>
<td>64.0%</td>
</tr>
<tr>
<td>Mean</td>
<td>3.25</td>
<td>2.7</td>
<td>2.4</td>
<td>2.1</td>
<td>12.8%</td>
</tr>
</tbody>
</table>

* Rating 1-5: for strength of each principle (1=weakest, 5=strongest)

Example: S1 showed 2 instances of “working at the cutting edge”, and each was rated as 3 (medium level of evidence) on the scale, giving a score of 6 points. A total of 8% of knowledge building features were found in her contributions to the focus group.

S2 displayed the highest KB discourse, S1 the least.

Although the authors acknowledge that data set may be too small to make bold claims about knowledge building and the cognitive benefits of podcasts, the preliminary observations are very positive. While not many discourse elements were rated as level 5, there was certainly evidence of knowledge building among students. The category **collaborative effort** was the most salient and strongest knowledge building feature that emerged from the dialogue. This was not surprising, as the entire podcasting process was conducted in groups, and students participated and worked well as a team, sharing ideas and commenting on one another’s scripts. A total of 64% of the discourse in the focus group was found to have features indicating knowledge building, with each participant having a mean of 12.8% of their dialogue showing knowledge building features.

**Discussion**

In this paper the authors have described a project in which a team of students generated educational podcasts to assist other student cohorts, and in doing so engaged in an intensive process of teamwork, scriptwriting, editing and presentation, which immersed them in an extensive range of cognitive and metacognitive processes. Through collaboration and peer review of scripts created for this purpose, the student-producers engaged in knowledge creation processes. The results suggest that peer learning and the creation of audio learning objects for podcasting that enable student-producers to conceptualise content are powerful.

CSU Research Output. www.csu.edu.au
ways of both creating and consolidating new knowledge. The results suggest that the production of podcasts by students for an intended peer audience is likely to engage them in knowledge building discourse and increased metacognitive activity, which can result in improved learning outcomes. Currently, much use is made of podcasting technology as a distribution mechanism that may in fact undermine face-to-face teaching, or to augment online lectures by simply disseminating instructional content to learners. This replicates the traditional metaphor of learning as acquisition, which positions students as consumers of pre-packaged content and inert information. In adopting the epistemological stance of learning as knowledge creation, the authors facilitated a project in which students were given high level of agency in the creation of audio learning objects, and in which the social processes of team work, dialogue and progressive problem solving were incorporated into the production activities surrounding the creation of the podcasts. While the products (podcasts in the form of DALOs) were indicators of success for students, their actual dialogic and social processes were the focus of the researchers’ study. Without the tangible outcomes of shared activity (scripts and audio files) achieved through teamwork and joint articulation of goals, students may not have engaged in the processes of collaborative dialogue and metacognitive inquiry.

Two different but related frameworks were used to analyse data and inform the design of the study. The first framework was intended to assess the level of metacognitive activity in the recall protocols of students, using content analysis based on four key types of metacognitive knowledge. Results showed high levels of strategic knowledge (self and team management) and task knowledge (ability to plan and set goals). The second analytic framework employed Scardamalia’s (2000) knowledge building principles, four of which were used to evaluate the extent to which participants showed evidence of knowledge building. The results indicate that students value collective cognitive responsibility and shared participation in the activity, and each student contributed to the improvement of ideas as they worked closely as a team. The two sets of results are interrelated and show that the strength of the group were in teamwork processes and collective problem solving and planning, with each participant as an active contributor. The results also showed the there was knowledge building at an individual and collective level.

Conclusion
The authors believe that group scaffolding in the form a shared activity or goal (in this case DALO creation) can facilitate both metacognition and certain collective knowledge building processes. Similarly, in the focus group discussion, the researchers’ adoption of a structured set of questions for focus group discussion served to focus student dialogue so that they engaged in more intentional discourse, and reflective inquiry. There are several implications of the research for educators interested in using podcasting to support learning. First, the authors emphasise the centrality of student agency in the creation of podcasts as shared learning objects. In other words, the creation of the podcasts can serve as a catalyst of student engagement, if creation of the scripts and audio files is undertaken as a team effort. Secondly, supporting and encouraging knowledge building discourse can be achieved by instructors in variety of ways, through task design supported by a variety of Web 2.0 or social software tools to promote high levels of self-regulation, collaborative inquiry and peer-to-peer dialogue. Finally, in contrast to other studies conducted on podcasting to support learning in higher education, the authors believe that the collective agency of students is the keystone of knowledge building.

References


CSU Research Output. www.csu.edu.au


