Combining a Collaborative Learning Framework with an E-Learning Tool to Improve Learning and Professional Development in Blended Learning Environments

Keith Willey
Associate Professor
Faculty of Engineering and Information Technologies
The University of Sydney
Sydney, Australia
keith.willey@sydney.edu.au

***Abstract*—This demonstration reports applying research in learning dispositions, orientations, agency, identity and collaborative learning to develop a suite of online software tools and resources. These tools have been specifically designed to assist educators to help students take advantage of the affordances of blended learning environments as well recognize, plan and manage the ongoing learning opportunities provided within their professional practice.**

Keywords—collaborative learning; professional development; flipped/blended learning

I. INTRODUCTION

While the increased adoption of blended learning designs, such as flipped instruction, by STEM academics has brought learning benefits for many students, it relies heavily on students being able to take more responsibility for their own learning than is required in a traditional lecture-based approach.

Recent studies [1 - 4] in different engineering majors have shown that students who perform poorly in flipped learning environments typically do not demonstrate the agency and self-efficacy necessary to take responsibility for their own learning and hence have difficulty achieving the cognitive changes required to demonstrate the learning outcomes.

As more academics adopt blended learning environments, these students are at greater risk of not successfully completing units/courses of study nor developing the professional skills required for successful practice.

Buckingham Shum & Crick [5] report "Theoretical and empirical evidence in the learning sciences substantiates the view that deep engagement in learning is a function of a complex combination of learners' identities, dispositions, values, attitudes and skills. When these are fragile, learners struggle to achieve their potential in conventional assessments, and critically, are not prepared for the novelty and complexity of the challenges they will meet in the workplace, and the many other spheres of life which require personal qualities such as resilience, critical thinking and collaboration skills."

Often students who struggle in flipped/blended learning environments do not engage in a number of specific behaviours including:

- Not asking questions in 'lecture' sessions or in tutorials or during non-one-on-one academic consultation times,
- Not being able to transfer application of concepts/learning from one type of problem and/or context to another, and
- Having a dominant dependent learning style relying heavily on procedural learning facilitated through repetition and practice that often results in being able to mimic but unable to demonstrate learning in varying contexts.

Thomas [6] found that "...students often experience stress, uncertainty and use ineffective learning strategies when they are not supported to understand how to direct their own learning... findings suggest that learners can demonstrate increases to cognitive and metacognitive functioning, as well as self-efficacy through engagement with a program to support self-regulated learning...".

In this demonstration we report a conceptual framework and e-learning tools to guide the design and facilitation of collaborative activities to assist students to learn and develop and practice their metacognition, self-efficacy, agency and their professional skills.

II. COLLABORATIVE LEARNING FRAMEWORK

Blended learning sessions are designed using the collaborative learning activity framework shown in Figure 1 [7]. These activities begin with individual work usually undertaken before class, for example some pre-reading/investigation accompanied by multiple choice or short answer questions to evaluate understanding. In class students' work in groups comparing their answers (in SPARK^{PLUS} see below) and discussing differences to identify what they don't yet understand. The instructor then discusses and clarifies these misunderstandings or misconceptions before varying the

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problem for students to apply, practice and evaluate what they have learnt. Variation may involve changing the context of the problem or some other parameter that requires students to apply their learning and/or approach the problem in a different way. This develops student's understanding and ability to apply their knowledge in different contexts while discouraging procedural approaches to learning that often mimic learning without building understanding. While the groups are working together the instructor moves between groups answering questions, providing feedback or providing additional variation in the problem/activity, depending on each group's progress

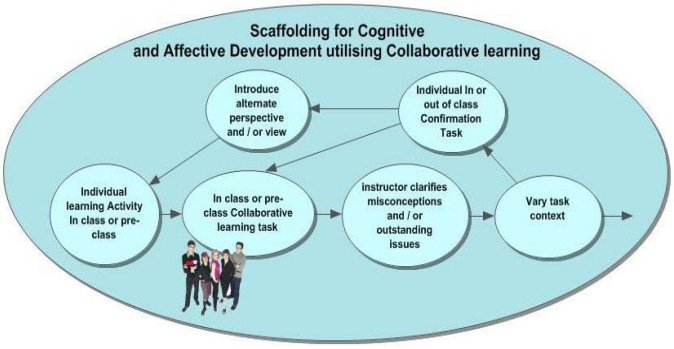

Fig. 1. Collaborative Learning Activity Framework

III. SPARK[PLUS] PROVIDING POWER TO LEARN

SPARK[plus] is a software tool developed at the University of Technology Sydney (UTS). It has several modes to facilitate collaborative learning activities for use within blended learning environments. The tool also promotes the development of a range of professional skills including judgments and critical evaluation. For example, the tool allows students to record their judgments answers and/or reasoning during individual out of class activities. Prior to class or in class, SPARK[plus] allows students to compare their responses to those of their peers. Subsequently SPARK[plus] provides a shared workspace to allow students to reflect on their understandings and to collaboratively re take the original activity and/or subsequently undertake a variation of the activity designed to provide an opportunity for students to apply, practice and evaluate their learning. SPARK[plus] provides several different methods of feedback many of which are suitable for students to upload to their e-portfolios allowing them to monitor and/or track both their learning and professional development.

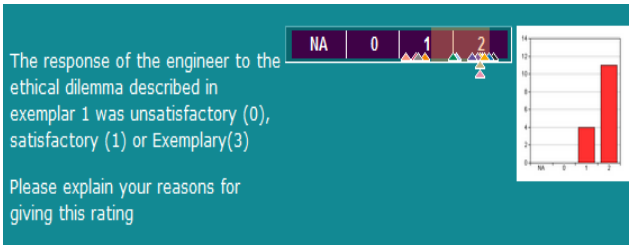

Fig. 2. Multiple assessor mode showing the variation in judgements among student peers

IV. SPARK[PLUS] DEMONSTRATION

In this demonstration the audience will be introduced to the multiple modes of SPARK[plus] with examples provided of how they can be integrated to improve learning, professional development and both the effectiveness and efficiency of blended learning environments.

V. PRESENTERS BIBLIOGRAPHY

Associate Professor Keith Willey, an Australian Learning and Teaching Council Fellow, is the Professor in Engineering Education Research and Leadership at the University of Sydney. He began his academic career in 2002 after 20 years in industry. In the area of education, Keith's research interests include the learning and assessment associated with working collaboratively and in teams, the social construction of meaning and standards, the impact on student learning and professional development (affective and cognitive) of self and peer review, collaboration, feed-forward, learning activities and assessment design. His commitment to developing high quality teaching and learning practices is supported by his educational research published in journal articles and peer reviewed papers. Keith is the Project Manager and lead developer of the collaborative learning and self and peer assessment software tool known as SPARK[PLUS] currently being used by faculty at over 20 Australian and International Universities.

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