Recognising and measuring engagement in ICT-rich learning environments

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Engagement is being widely recognised as critical to the learning process. Either formally or informally this term arises during most discussions about learning, especially when ICT is being used to enhance learning environments. While suggestions abound for ways of using ICT in learning to increase engagement, few of these reports offer means for recognising and measuring engagement. This paper first defines engagement that is relevant to school learning environments and expands on three types of engagement: behavioural, cognitive and emotional. Engagement can be investigated on a number of levels, for example, student engagement with learning, student engagement with schooling and community engagement with the school. The focus in this paper will be on the first of these. Second, the significance of engagement in strategic ICT education policies and academic reports is highlighted. At a national level, engagement features strongly in the Australian online learning strategy. Third, some indicators of engagement are described as reported by teachers during a research project focussed on embedding ICT in learning. Finally, an engagement measurement plan applicable to the school learning environment is proposed.

INTRODUCTION

'Engagement' has been brought to centre stage in education. Students who are 'engaged and motivated' is proposed as one of the key returns on online curriculum content for economic sustainability by the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA, 2004, p.9). Advice provided on pedagogies in an online world expects teachers to select learning activities, tools and resources that 'motivate and engage' students and requires teachers to 'integrate ICT to engage students' in a variety of new dimensions such as thinking and working creatively, and creating new knowledge (MCEETYA, 2005, p. 4). Teachers need to be able to report on engagement to indicate that the 'return' on investment has been achieved. Although there is clear evidence linking engagement and achievement in a variety of research investigations, the strength of 'engagement' as a predictor of achievement varies (Russell, Ainley & Frydenberg, n.d.). This may be a consequence of engagement being defined differently from study to study.

Pedagogies that integrate information and communication technology (ICT) are claimed to have the potential to not just enhance but to transform learning (MCEETYA, 2005, p. 4). However, claims of engagement with learning are often based on informal observations rather than formal measurement. So what is needed is a manageable way for teachers to measure engagement with learning. For the purposes of this paper, any learning environment where learning is supported by ICT is defined as an ICT-rich learning environment. A professional review of research undertaken by the *British Education Research Association* (BERA) found that 'increasing pupils' motivation and engagement' was one of the three major contributions that the use of ICT made to learning (Higgins, 2003, p. 8). Although many of these research studies claimed benefits of using ICT for increasing student engagement, few of them provided measurable evidence of engagement. To justify use of ICT for learning teachers need to be able to measure the engagement when ICT has been used to support learning. This paper provides a working definition of engagement, considers both strategic and research perspectives on engagement and recommends indicators for measuring engagement.

DEFINING ENGAGEMENT

The Australian Department of Education, Employment and Workplace Relations (DEEWR) *Schooling Issues Digest* (Russell, Ainley & Frydenberg, n.d.) provides a good working definition of 'engagement' which evolves from a definition of 'motivation'. While motivation is not the focus of this paper, it does have a critical link to engagement and hence is essential to a better understanding of engagement. Motivation is described as being 'about energy and action' which places a focus on the reasons for behaviour, i.e., the psychological processes involved when students are in a learning situation (Russell, Ainley & Frydenberg, n.d.). An understanding of the concept of motivation can be informed by theories of drives, needs and rewards (both intrinsic and extrinsic). Motivation to learn was the focal point for each of Broadie's (2003, p. 4) eleven areas of added value from using 'ICT-for-learning'. Motivation is different from engagement but is often inferred from student engagement.

By contrast, engagement is defined as 'energy in action' focusing on the connection between the learner and the activity (Russell, Ainley & Frydenberg, n.d.). Broadly speaking this involves the connection between the learner and the school environment but more specifically refers to the attitudes, interest and self-efficacy in particular learning situations. Engagement is more likely than motivation to be affected by learning experiences and relationships with people involved with those experiences. It should be remembered that students who are motivated are not necessarily engaged and the challenge for teachers is to design learning environments that will engage students. A better understanding of engagement among teachers is essential for such design and to foster teachers' desire to measure and report on engagement.

Two studies help to provide a better understanding of the complexity of engagement. The first describes three types of engagement, while the second provides two different patterns of engagement. After an extensive review of published literature, Fredricks, Blumfeld and Paris (2004, p. 62-65) described three distinct types of engagement: behavioural, cognitive and emotional. *Behavioural engagement* involves: positive conduct, e.g., adhering to classroom norms, absence of non-disruptive behaviours; involvement in learning tasks, e.g., effort, persistence; and participation in school-related activities, e.g., athletics, governance. These behaviours may be academic or non-academic. *Emotional engagement* involves: affective reactions in the classroom, e.g., interest, happiness; affective reactions to the teacher, e.g., liking, respecting; and identification with school, e.g., belonging, valuing. These overlap with constructs used in motivational research. *Cognitive engagement* involves psychological investment in learning, e.g., desire to go beyond the requirements, preference for challenge; inner psychological investment, e.g., desire to learn, desire to master skills; and self-regulation, e.g., use of metacognitive strategies, evaluating cognition when accomplishing tasks. Although the three types of engagement were presented as distinct by Fredricks, Blumfeld and Paris (2004, p. 61), they warn that behaviour, emotion and cognition are 'dynamically interrelated within the individual'. Cleary, this can confuse the issue when indicators of each type of engagement are being developed.

Two different patterns of engagement, 'willing acceptance and relief' and 'delayed', were identified by Herrington, Oliver and Reeves (2002) when students were working with authentic tasks in online learning environments. The former means that the learner immediately engages, while the latter is the initial inability to accept a learning environment until the learner has resolved issues she or he has with the task involved. This indicates that some learners may not demonstrate engagement when first encountering a learning task and questions whether learners need to be engaged at all times in a scheduled learning task. Consequently, the time at which engagement is measured may impact on the measurement obtained and should be taken into consideration by teachers.

STRATEGIC POLICY PERSPECTIVE ON ENGAGEMENT

Before considering specific measures of engagement, consideration of strategic policies help to provide a context for teachers' interpretation of the engagement construct. While the Australian Government has included engagement as an integral component of learning in an online world (MCEETYA, 2005), advice about measurement of engagement (Russell, Ainley & Frydenberg, n.d.) provides types of measurement instruments, e.g., surveys, interviews and observations, but not specific indicators. However, the national focus on engagement has been reflected at the state level where some guidance is provided about possible indicators. For example, both NSW and QLD have included engagement in their guiding frameworks for teaching practice. In New South Wales the Quality Teaching Framework includes 'engagement' as one of the six elements in the 'Quality Learning Environment' dimension. Guidance provided for teachers in evaluating classroom practice (NSW DET, 2003, pp. 28-29) describes indicators of engagement in terms of on-task behaviours, e.g., sustained interest, individual focus; and taking initiative, e.g., to raise questions, to help peers. In Queensland the Productive Pedagogies Framework 'academic engagement' is one of the five pedagogies included under the banner of 'Supportive classroom environment' (QLD DETA, n.d.). Indicators of academic engagement are also described in terms of on-task behaviour and taking initiative. While these indicators provide clearer direction for teachers who want to measure engagement, the indicators described by both NSW and QLD place a strong emphasis on behavioural engagement and do not take into account emotional and cognitive engagement. With a national focus only providing information about types of measures and a state focus restricted to indicators of behavioural engagement, there is a need to raise awareness amongst teachers of the breadth of possibilities for measuring engagement.

RESEARCH PERSPECTIVE ON MEASURING ENGAGEMENT

Two important issues arise when measuring engagement. One is the indicators of engagement that are of interest and the other is the methods that will be used to measure those indicators. An increasing body of research studies can provide a broader perspective on suitable indicators for teachers to guide their measurement of engagement. Four of these are outlined now. Fredricks, Blumfeld and Paris (2004) reported on categories of indicators for each type of engagement. *Behavioural* engagement indicators fell into three categories: *conduct*, such as completing homework and complying with school rules; *work involvement*, such as effort, attention, persistence; and *participation*, such as class discussion, sport. *Emotional* engagement indicators fell into three categories: *relating to school* such as satisfaction; *relating to school-work* such as valuing work; and *relating to the people at school* such as liking the teacher. *Cognitive* engagement indicators were more difficult to categorise but included: *self-regulation*, such as metacognition, effort; *instructional discourse*, such as high-level evaluation, authentic questions; and *goal mastery*, such as goal-setting and task-focus.

Libby's (2004, p. 282) literature summary about 'student relationship to school' identifies nine academic papers that provide indicators of academic engagement. These indicators fell into six categories:

- *positive affect*, such as excitement, enjoyment;
- *negative affect*, such as frustration, anxiety;
- *school alienation*, such as loneliness, lack of friends;
- *classroom and school academic participation*, such as attendance, preparation;
- *identification with school*, such as student/teacher relationships, perceptions; and
- *self-regulated learning*, such as checking work, thinking about understanding.

Interestingly, there is a focus on Fredricks, Blumfeld and Paris's (2004) emotional engagement in these six categories. Behavioural engagement is only represented in the fourth category and cognitive engagement only in the sixth.

Together these studies provide a wealth of possible indicators but both studies were based on learning environments generally. There is only a limited amount of literature available on engagement in ICT-rich learning environments. One study on the link between engagement and participation in online communities involving more than 80000 tertiary students used 26 indicators of engagement (Zha & Kuh, 2004, pp. 133-134) were arranged into six key 'activities':

- *academic effort*, such as preparation time, study time;
- *higher order thinking skills required*, such as synthesis of ideas; application of concepts;
- *academic integration*, such as bringing ideas together, considering diverse perspectives;
- *active and collaborative learning*, such as asking questions, working with peers;
- *interaction with faculty members*, such as queried assessment, received prompt feedback; and
- *diversity-related experiences*, such as serious conversations with student of different ethnicity or religion.

These key activities have more of a cognitive engagement focus, highlighted by the second, third and fourth key activities. However, behavioural engagement and cognitive engagement are also represented. The terminology in some of these indicators suggests a more mature learner and may be less relevant for younger learners in ICT-rich learning environments.

One research study (Reading, 2007) challenged teachers who had designed ICT-rich learning environments for Primary school-aged (9 to 12 years old) to identify indicators of student engagement. Teachers from each school developed their own indicators after students had worked in ICT-rich environments. The teachers then came together to share and refine their ideas. Many of the indicators developed by the teachers included qualifiers, such as 'more', 'keenly', and 'increased'. In the process of sharing the indicators the teachers were also making comparisons to the student attributes when learning in learning environments that were not ICT-rich. Although teachers reported that these indicators showed engagement, the indicators were not used in the study to formally measure the engagement. These indicators help to bring a practicing teachers' perspective to the discussion on measuring engagement. Overall, the teachers reported more indicators of behavioural and cognitive engagement than emotional engagement. The following indicators are expressed in the teachers' own words and have been sorted by the researcher as behavioural, emotional or cognitive engagement.

Behavioural engagement

- took risks rather than asking for help;
- more confident in taking risks;
- keenly tutored peers;
- increased interaction between students;
- communicated more when using the computers;
- preparedness to show other students how to do things;
- improved attendance;
- brought parents into school to see work;
- worked in groups and then sought other opportunities to work together;
- initiated work without teacher direction;
- less behaviour problems with the negativeness of 'you're dumb' changing to 'let me help you';
- took independent behaviour from ICT to non-ICT activities; and
- wanted to use the equipment.

Emotional engagement

- showed enthusiasm with the expectation of computer use;
- learnt because they want things to happen;
- overcame their 'shame' feeling and were more confident when interviewing; and
- very proud when showing work, especially when parents contributed and watched.

Cognitive Engagement

- took responsibility for content;
- learnt new applications;
- liked the opportunity to create something meaningful;
- worked independently within groups;
- wanted to learn new skills;
- more concerned about the quality of their work;
- took on roles in learning situations;
- taught teachers how to use equipment;
- took more responsibility for own learning;
- saw ICT as part of learning; and
- viewed ICT as an option when solving problems or completing tasks.

The second issue, what methods to use to measure engagement, depends strongly on what indicators of engagement are to be the focus of the measurement. A variety tools have previously been used including questionnaire scales for self-perception, rating scales for teachers or observers to complete, interview responses, stimulated recall of learning experiences, and behavioural measures such as time spent on activity (Russell, Ainley & Frydenberg, n.d.). In their review of research literature, Fredricks, Blumfeld and Paris (2004, pp. 65-69) reported on a wide range of methods to measure engagement across their three defined types of engagement. Behavioural engagement measurement methods included teaching-rating, self-reporting and observation techniques. Although there are benefits in having an 'impartial' observer report there can be problems if that observer is not able to judge whether a student rated as 'on-task' is really thinking about the material. Emotional and cognitive engagement were mostly measured using self-report measures. The large-scale Zha & Kuh (2004) study involved students self-reporting on various indicators, which were mainly measuring cognitive engagement. While this is an efficient means of collecting such data, it is likely to be more reliable coming from tertiary-level students than from school-level students. A variety of measurement methods should be used but this is easier for behavioural engagement, than for emotional and cognitive engagement. Measurement that includes more than one perspective on the engagement, that is, from at least two of student, teacher and independent observer, will give a more reliable view of the engagement.

PROPOSED MEASUREMENT OF ENGAGEMENT

As long as there is a national expectation that there will be 'return' on investment when ICT is used for learning, there will be a need for researchers and teachers to contribute to reporting on that return. A wealth of indicators exists for measuring engagement and these can be used as a starting point for researchers and teachers to plan an approach to such measurement. Researchers have scope and flexibility for choosing indicators and relevant measurement methods, depending on the size of the study and the budgeting restrictions. Some teachers may be involved in such studies and thus be supported in formally measuring their students' engagement resulting from teaching in ICT-related learning environments. However, other teachers will need, or want, to measure engagement for evaluating their own teaching or for reporting to other teaching professionals. While teachers have provided informal observations of engagement in the past, there is now a need for more formal measurement of engagement to justify the investment in ICT-rich learning environments. To assist this measurement process these teachers should build into their teaching plans clear indicators to measure the engagement.

To help teachers make some sense of the wealth of possible indicators of engagement, an *Engagement Measurement Plan* is proposed. Firstly, teachers should view engagement as a multidimensional construct uniting the three components, behavioural, emotional and cognitive as described by Fredricks, Blumfeld and Paris (2004). To give more breadth to the measurement of engagement the teacher plan should include at least one indicator from each of the three components. Secondly, teachers should choose indicators that most closely align with relevant learning outcomes. The number

of indicators selected should reflect the magnitude of the learning activity and the purpose for which the engagement is being measured. Thirdly, a suitable measurement method should be chosen for each indicator. For more reliable conclusions about engagement more than one form of self-reporting, teacher-reporting and observational methods of measurement should be used. Lastly, teachers should remember that the level of engagement of a student may vary during the learning activity and so measurement of indicators should not be timing-dependent.

An example of an *Engagement Measurement Plan* that might be used when students are involved in a learning task integrating the use of Multimedia is proposed (Figure 1). This example has been created using a selection of indicators from those presented and is proposed to inspire teachers to develop their own plans to measure engagement. The next step for the teacher would then be to decide how to record the measurements of each indicator. For example, a Consensogram (www.iss.k12.nc.us/cao/consensogram.htm) could be used to record a class summary of individually reported confidence. This can be done before, during and after the learning task to allow the class to view the changing confidence and comparison of the three consensograms provides the teacher with a measure of engagement.

Type	*Indicator*	*Measurement method*
Behavioural		
• conduct • work involvement • participation	adhere to ICT-use rules attention to learning fulfil role in groupwork	teacher-reported student-reported observer
Emotional		
• relating to school-work • positive affect • positive affect	like to use ICT enthusiasm for using ICT confidence in ability	student-reported teacher-reported self-reported
Cognitive		
• self-regulation • higher-order thinking • instructional discourse	transition between activities synthesis of ideas asks authentic questions	teacher-reported student-reported observer

Figure 1. Engagement Measurement Plan: Multimedia Learning Activity

CONCLUSION

The author encourages teachers to take a fresh look at engagement and the issue of measuring engagement. Teachers need more than anecdotal observations to substantiate claims of engagement. Whenever an ICT-rich learning environment is planned for a teaching activity an *Engagement Measurement Plan* should be included. The challenge for teachers is to find relevant indicators and methods of measurement that are easily applied in the classroom. The challenge for researchers is to support teachers in their attempts to measure engagement and to continue research that informs the process of measuring engagement, including investigation of the robustness of measures of engagement. Both teachers and researchers can contribute, in fact should contribute, to fulfilling the need for reporting on engagement to inform the return on investment in ICT-rich learning environments.

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