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Abstract

National and international research has been undertaken on the effects of oneto- one (1:1) laptop programs in education, however, there is minimal literature available on the impacts of such a program on students' achievements of learning outcomes in the Australian primary school setting. Therefore, this paper reports on the findings of an honours inquiry, which investigated whether a 1:1 laptop program could allow students to engage in higher-order thinking when participating in the laptop-based tasks designed by their teachers during a COGS unit of work. Through exploring the findings of this research study, an understanding can develop about the use of laptops as tools for learning in the educational context and allow an insight into whether laptops can enable quality teaching and learning to occur in Australian primary school classrooms. It is imperative that teachers develop quality teaching and learning experiences that allow their students to actively participate in their learning and engage in higher-order thinking. Thus, this paper draws on a number of sources such as the New South Wales Quality Teaching Model and the New South Wales Professional Teaching Standards to highlight the complexity of teachers' work and the importance of planning for learning in a 21st century digital society.

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Quality teaching and learning in the educational context: Teacher pedagogy to support learners of a modern digital society

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National and international research has been undertaken on the effects of one-to-one (1:1) laptop programs in education, however, there is minimal literature available on the impacts of such a program on students' achievements of learning outcomes in the Australian primary school setting. Therefore, this paper reports on the findings of an honours inquiry, which investigated whether a 1:1 laptop program could allow students to engage in higher-order thinking when participating in the laptop-based tasks designed by their teachers during a COGS unit of work. Through exploring the findings of this research study, an understanding can develop about the use of laptops as tools for learning in the educational context and allow an insight into whether laptops can enable quality teaching and learning to occur in Australian primary school classrooms. It is imperative that teachers develop quality teaching and learning experiences that allow their students to actively participate in their learning and engage in higher-order thinking. Thus, this paper draws on a number of sources such as the New South Wales Quality Teaching Model and the New South Wales Professional Teaching Standards to highlight the complexity of teachers' work and the importance of planning for learning in a 21st century digital society.

Keywords: educational technology; quality teaching and learning; student learning outcomes; 21st century learning; one-to-one laptop program; laptops

This paper presents the findings of an honours inquiry into a Stage Three, Year Six primary school classroom with a one-to-one laptop program, in order to address the effects of such a program on students' participation in higher-order thinking. Through exploring this research, an understanding will develop about the effects of teacher instruction and pedagogy on student learning outcomes, when technology has been used as a resource for learning. To support the findings of this research, the New South Wales Professional Teaching Standards (NSW PTS) and the New South Wales Quality Teaching Model (NSW QTM) will be used to provide examples that illustrate the principles of quality teaching and learning that teachers need to address to ensure their students are able to successfully participate in higher-order thinking and develop technological skills and understandings. Therefore, this paper reflects upon a number of sources, to provide a comprehensive understanding about the nature of teachers' work and the responsibilities they have in developing high-quality learning experiences that allow students to engage in higher-order thinking.

Background

In the educational context, there is a focus on quality teaching and learning and students must be provided with opportunities to achieve learning outcomes and develop the knowledge, skills and understandings that are essential to all areas of the curriculum. One resource that has the potential to enhance student learning outcomes is technology, in the form of 1:1 laptop programs. National and international research has been undertaken on the use of 1:1 laptop programs in the field of education (Bebell & O'Dwyer, 2010; Grimes & Warschauer, 2008; Holcomb, 2009; Inan & Lowther, 2010; Kessell, 2002). Although the effects of such a program are highlighted in recent large-scale initiatives, such as the Digital Education Revolution, research conducted on a single New South Wales Australian primary school has showed the added benefits of a 1:1 laptop program on students' learning. From an analysis of the current literature that exists on 1:1 laptop programs, three main themes have surfaced: teacher attitudes and perceptions of 1:1 laptop programs (Bebell & O'Dwyer, 2010; Kessell, 2002; Mouza, 2008; Penuel, 2006); the impact of 1:1 laptop programs on student learning outcomes (Bebell & Kay, 2010; Bebell & O'Dwyer, 2010; Grimes & Warschauer, 2008); and the cost and maintenance of 1:1 laptop programs (Inan & Lowther, 2010; Lei & Zhao, 2008; Mouza 2008). The findings of this research have debated that careful planning, whole school support, professional development, reliable hardware and software and commitment are fundamental to the success of 1:1 laptop programs. Therefore, to contribute to the current literature that exists on laptop programs and their abilities to foster quality teaching and learning experiences, the findings of a research study on 1:1 laptop program in a New South Wales Australian primary school will be explored.

Methodology

In order to address the extent to which students engage in higher-order thinking when completing laptop-based activities developed by their teachers, the research study was underpinned by the theoretical framework of Bloom's taxonomy (Bloom, 1956). Bloom's taxonomy, focuses on evaluating the degree to which students engage in higher-order thinking (Anderson *et al*., 2000). Learning in the higher domains (analysis, synthesis and evaluation) of thinking requires students to develop their skills in the lower domains (application, comprehension and knowledge) (Bloom, 1956). Therefore, students must continually participate in the three top domains of Bloom's taxonomy to be engaged in higher-order thinking. An outline of these three domains and classroom examples are provided in Table 1.

The qualitative research approach was used during the honours inquiry to investigate the 1:1 laptop program. This research was undertaken in a single Stage Three, Year Six classroom and a total of 26 students, one classroom teacher and a pre-service teacher participated in the study. A Connected Outcomes Group (COGs) unit of work was used to provide a framework for the teaching and learning experiences that occurred in the classroom.

Table 1: Bloom's taxonomy (extracted from Gigliotti, 2011)

Bloom's Taxonomy	Student examples	Teacher examples
1. Create/Synthesis (Bloom 1956)	–Creates plans to solve problems –Actively participates in classroom activities –Puts forward ideas –Participates in making, designing and creating	–Facilitates learning –Involved in analysing and evaluating students' work –Promotes learning through providing additional comments to students' responses or questions
2. Evaluate (Bloom 1956)	–Students compare and contrast ideas –Actively participates in classroom activities –Asks the teacher questions –Makes judgements –Puts forward arguments –Participates in assessing	–Acts as a guide –Accepts and clarifies information students provide during discussions
3. Analyse (Bloom 1956)	–Participates in discussions –Puts forward arguments –Examines content that has been provided –Asks the teacher questions –Is involved in investigations –Actively participates in classroom activities	–Acts as a guide –Participates in observing and evaluating students during classroom activities –Asks students questions and probes for understandings –Well organised and prepared for activities

Findings

In order to present a thorough discussion about the benefits of 1:1 laptop programs as tools for enhancing learning, the findings of the honours research are presented. This study found that higher-order thinking was evident during laptop-based activities when:

- Teachers provided feedback and evaluation on their students' work
- The strategy of questioning was used during whole class discussions to enable the development of deep understandings
- Students were given the opportunity to take ownership of their work
- Teacher difficulties enabled students to actively engage in the learning process. (Gigliotti, 2011)

Discussion

In order to address the impact that laptop programs have on students' learning outcomes in the educational setting, one of the findings of the honours research will be further explored to provide a deeper understanding of the positive outcomes associated with the use of laptops in the classroom. This finding is students' ownership of work allowed engagement in higher-order thinking (Gigliotti, 2011). From analysing the literature available on 1:1 laptop programs and the data that emerged from the honours project, it is clear that teachers need to plan for effective laptop integration, through combining their knowledge of content, pedagogy and technology (Mishra & Koehler, 2009). Two pedagogical strategies that teachers can use are 'student autonomy' and 'student learning'. Giving students an active role in their learning allows engagement in higher-order thinking, as students must have a good understanding of the requirements of the task, the applications available on their laptops and use these understandings to devise a plan that will help them to successfully complete the task.

Teachers should plan for the successful integration of laptops into the teaching and learning process. Planning, however, not only requires teachers to have an understanding about how they integrate technology, pedagogy and content, but also a deep understanding of "their students and how they learn" (NSWIT, 2005, p.5), school policies, curriculum content and updated literature, so they can develop authentic learning experiences that have relevance and meaning to their students' lives (Groundwater-Smith, Le Cornu & Ewing, 2007; Hinde-McLeod & Reynolds, 2006; Killen 2003). For example, in the classroom, teachers must communicate with their students in order to gain an understanding about their students' interests and consider these when developing programs. As reinforced by element three of the NSW PTS, teachers must "plan, assess and report for effective learning" (NSWIT, 2005, pp.7), through continued reflection and evaluation of their practices, so they are able to identify their students' strengths and weaknesses and develop effective learning resources that enable students to successfully achieve learning outcomes in a safe and equitable environment (NSWIT, 2005).

Findings from research conducted by Kessell (2002) and Penuel (2006) highlight that the philosophical beliefs of teachers and their experiences in using technology have an enormous effect on their ability to successfully incorporate this technological tool into classroom teaching and learning experiences. Although technology has had a significant impact on teaching and learning in the 21st Century, there are a number of additional factors affecting teachers' roles and responsibilities in the schooling context. These include developing inclusive classroom environments, making learning experiences relevant and meaningful to students' lives and reviewing curriculum documents to develop a deep understanding about the knowledge and skills required to teach Key Learning Areas (Groundwater-Smith, Le Cornu & Ewing, 2007; Marsh, 2010).

Theory and research relating to the use of technology

The TPCK model (Mishra & Koehler, 2009) and the NSW PTS (NSWIT, 2005) highlight that quality teaching and learning can only be achieved once teachers successfully combine their knowledge about content, pedagogy and technology.

Through promoting student engagement in higher-order thinking, student independence and utilising resources such as laptops and interactive whiteboards, teachers can ensure they develop learners who are able to function independently in a 21st century digital environment. As reinforced by the dimension of Intellectual Quality of the NSW QTM, it is when students actively develop their knowledge that they are able to construct deep understandings about Key Learning Areas (NSW DET, 2003).

The education field has developed over time due to national and international research, changing community attitudes, technological advancements and new government legislation. It is imperative that teachers immerse themselves within professional development opportunities, as outlined in element six of the NSW PTS (NSWIT, 2005), to develop their knowledge and skills about how students can reach their full potential in an inclusive classroom-learning environment accepting diversity and promoting equality. This will ensure that teachers are able to evaluate their use of laptops in the classroom and modify their teaching and learning to suit the needs and learning styles of their students.

Summary

Although technology has had a significant impact on teaching and learning in the 21st Century, there are a number of additional factors affecting teachers' roles and responsibilities in the schooling context. These include developing inclusive classroom environments, making learning experiences relevant and meaningful to students' lives and reviewing curriculum documents to develop a deep understanding about the knowledge and skills required to teach Key Learning Areas (Groundwater-Smith, Le Cornu & Ewing, 2007; Marsh, 2010). In order for teachers to provide a holistic education, which includes quality teaching and learning practices, they must take into consideration all the factors highlighted above during the planning and evaluating of learning experiences. This will allow students to strive for independence in their learning and allow them to engage in higher-order thinking, problem solving and authentic discussions (Bloom, 1956; Groenewald, 2010).

Conclusion

The nature of teachers' work is very complex, as they must take on many roles and responsibilities in the education context. Through acknowledging the best methods for teaching and learning, teachers are able to develop quality teaching and learning experiences that will allow their students to achieve desired learning outcomes and engage in higher-order thinking, authentic discussions and problem solving. It is by incorporating laptops as tools for learning in primary school classrooms that teachers can allow students to engage in higher-order thinking and develop the technological skills and abilities that are essential to a digital world. As a result, teachers need to continually reflect upon and evaluate their pedagogical practices, through engaging in national and international research, academic literature and curriculum documents to ensure the learning experiences they develop are meaningful and relevant to the lives of the students in their classrooms.

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