

Pedagoogy! iPadology! Netbookology! Learning with Mobile Devices

Abstract

This paper explores two different schools' approaches to implementing an iPad program and a Netbook program to a year level of students. The aim of the study was to determine how these mobile devices were being used in the classroom and whether they enhanced teaching and learning. The experiences of students and parents were obtained through questionnaires and the teacher's reflections were obtained through interviews. The data were triangulated to determine how iPads and Netbooks were utilised in the classroom, and if there were any concerns about the use of each device. The research findings are presented in a thematic style, and provide an insight into how each device is used in a variety of subjects and at home. The paper concludes with some recommendations to inform school principals and leaders about the effectiveness of these devices as an educational tool.

INTRODUCTION

Since the introduction of computers into educational environments in the 1980s, many attempts have been made to facilitate their integration in the curriculum. There has been a trend towards a ratio of one computer to one student, (often referred to as one-to-one (1:1) programs) which have been introduced to enhance student learning. Recently, mobile devices such as iPads and Netbooks have begun to replace Notebooks. While 1:1 programs have many benefits for students, particularly through increased student engagement, there is little research on what students do with these devices in class on a daily basis. For the preceding reasons the research questions in this study are: 'How is each of these devices (Netbook and iPad) used in the classroom?' And secondly, 'how do these devices support teaching and learning?'

Related Literature

The advent of mobile devices such as iPads and Netbooks brings with it the ability to deliver information to students whenever and wherever they want (Johnson et al., 2011; Pohio & Falloon, 2010). According to the 2011 Horizon Report (Johnston, Adams, & Haywood, 2011), mobile devices have been embraced by schools for 1:1 programs due to their affordability and ease of internet connectivity as well as their wireless capability which reduces reliance on expensive network infrastructure (Morgan, 2010; Schachter, 2009).

In 2007, the Australian Government made funding available to improve computer to student ratios in secondary schools. According to Rudd, Smith and Conroy (2007) 'Australian students need greater access to, and more sophisticated use of, information and communications technology. They need a digital education that prepares them for the jobs of tomorrow.' While schools have found it easier to provide computers to students, access alone does not guarantee that a 1:1 program will be successful. Effective implementation requires 'leadership and planning, supportive school culture, training and professional development, robust infrastructures and technical support, and access to digital content and instructional resources' (Shapley, Sheehan, Maloney, & Caranikas-Walker, 2010, p. 10).

Suhr, Hernandez, Grimes & Warschauer (2010) found that students used Notebooks in their classes 'to conduct Internet research, create presentations, write with

a word processor, and to complete a test or quiz (p. 29)'. Further research reported that student engagement using mobile devices had a positive impact in the classroom (Bebell & O'Dwyer, 2010; Suhr, et al., 2010). It was found that 'student engagement increased dramatically in response to the enhanced educational access and opportunities afforded by 1:1 computing' (Bebell & Kay, 2010, p. 21). Kukulka-Hulme and Traxler (2007) reported that the use of mobile devices had 'considerable pedagogic potential, and in some cases, unique pedagogic potential' (p. 187).

Teachers play an important role in the implementation of 1:1 programs because the 'onus of responsibility for implementation often falls to the teachers' (Shapley, et al., 2010, p. 8). Shapley noted that teachers who used mobile devices themselves more readily saw their potential to 'enable, engage and empower learning' (Project Tomorrow, 2011, p. 8). Conversely, a lack of teacher professional development was seen as an obstacle for effective implementation. (Drayton, Falk, Stroud, Hobbs, & Hammerman, 2010).

The research reported in this paper investigated iPad and Netbook implementation in two suburban schools in Melbourne to determine their level of acceptance by teachers and parents and how each device was used by students in class and at home.

The next section presents a justification for the mixed methodology used as well as data analysis techniques. The findings are presented thematically according to each school. The final discussion focuses on engagement of students and staff, pedagogical and curricula issues as well as strategic plans for the future as determined from each of the stakeholder groups.

Research Method

The study explored how iPads and Netbooks were used in two schools. The aim of the research was to obtain perspectives from students, parents and teachers as well as to evaluate how each of these devices was deployed. A mixed methodology was employed comprising qualitative interview data and questionnaires to provide quantitative responses. This enabled an exploration of the effect of the iPad or Netbook on student engagement as reported by teachers, parents and the students themselves, as well as the exploration of a range of related issues, such as the value students and parents place on the role of Information Technology for teaching and learning as well as issues about the implementation of the new programs.

The analysis was guided by the following overarching research questions that emerged out of the issues presented in the introduction:

1. How is each device (Netbook and iPad) used in the classroom?
2. How does each device support teaching and learning in the classroom?



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Selection of Schools and Data Collection and Analysis Techniques

The two schools in the sample were selected because they had implemented a Netbook or iPad across a year level in 2011. Both schools are in the Catholic Education system and located in Melbourne. One school is co-educational (School N), the other a single-sex boys school (School I). Data was collected from three sources at each school - parents, teachers and students - to get a holistic view of the 1:1 implementation. All students from Year 9 in School N (Netbook) and from Year 7 in School I (iPad), were invited to participate in the study.

Participants were recruited by letters sent home to parents outlining the nature of the study and seeking parental permission from both the parents and the students to participate. Students were given access to an on-line survey once permission was received. Parents were sent hard-copy survey forms once they agreed to participate. The Principal and selected teaching staff were interviewed on the school premises.

This resulted in three categories of data:

- 14 interviews with teachers and members of the school leadership teams, School N (4 male, 4 female) and School I (6 male)
- 51 completed questionnaires from students, School N (13 female, 17 male) and School I (25 male)
- 55 completed questionnaires from parents, School N (19 female, 11 male) and School I (16 female, 9 male)

Interviews were digitally recorded to allow for data validation and sharing between researchers. The research team met and discussed the analysis of data several times to ensure internal validity of the process and agreement about the interpretation.

The survey consisted of a number of questions rated on a 5-point Likert Scale where 5 represented strongly agree through to 1 strongly disagree and an option was given to provide further comments. Entries to survey tick data were compiled to provide quantitative data. Free text entries and interview responses were read repeatedly to enable the coding and categorisation of responses, then counted to enable quantitative comparisons. This qualitative data analysis method was informed by the work of Boyatzis (1998), and Bogdan and Bicklen (2007).

The interviews in this study were semi-structured interviews (Wellington, 2000) which ensured that aspects of the investigation which came up during the interviews could be explored, allowing the researcher to appreciate the perspective of the interviewee (Patton 2002).

FINDINGS

School N: Strategies and Motivation for Program

In 2010, School N initiated a plan to commence a 1:1 Netbook program in 2011 for their Year 9 cohort of 210 students. The School was able to fund this initiative through the Australian Government's Digital Education Revolution (DER) – National Secondary School Computer Fund, whose purpose was to achieve a ratio of one computer to one student by the end of 2011 (DEEWR, 2008).

Historically, School N had relied on the provision of computer labs to fulfil the Information Technology needs of the students. Often the computers were kept in operation for 5 years. The DER funding was eagerly embraced to replace aging hardware as well as to provide notebooks on trolleys in a variety of configurations.

Year 9 students were targeted because they were embarking on a new educational program in 2011. The school was keen to adhere to the DER guidelines, of approximately \$1000 per computer. Netbooks were selected due to their size, weight and affordability. In 2010, the Principal, Assistant Principal (Teaching & Learning), E-Learning Coordinator and Network Manager met frequently to plan this initiative. As there was

uncertainty whether this initiative would continue through to other year levels in the future, the College did not formulate a master implementation strategy for other year levels but more of a 'wish-list', which would be reliant on available funds.

School I: Strategies and Motivation for Program

School I had experienced a doubling of student numbers in the last 12 years associated with a growth in the number of students with learning challenges. The Principal reported that 10% of the school population received funding support from the government related to their learning or physical disability. He investigated several aspects of implementing the 1:1 funding in the school, and, as an early adopter himself, was enamoured by the possibilities of the iPad as:

a device that by necessity requires teachers to change pedagogy ... teachers give up on being expert ... students are the technical experts in devices ... teachers the experts in teaching and learning.

After trialling with six members of the school's executive group the decision was made to implement iPads with the Year 7 intake in 2011. The school already had a laptop program for senior school students and if the 1:1 funding had been used to expand the program to junior school over \$300,000 would have been needed to upgrade electricity supply throughout the campus.

For these pedagogical and infrastructure reasons, School I considered iPads as the way forward for cost and portability as they were cheaper than most laptops and small enough for Year 7 boys to carry around all day. The ten-hour battery life was also an advantage. This school had an integrated cross-curriculum learning project with the Year 7s, linking Science, Art and Information and Communication Technology (ICT) as well as an outdoor environmental component. The portability of the iPad complemented this curricular initiative.

Parents purchased each device through the school and a strategy was devised to reduce booklist costs through bulk purchasing of electronic texts to be installed on the iPad. The school also updated wireless access throughout the campus. The College's Executive group developed a strategy to expand the adoption to Year 8 students in 2013 and were in discussion whether to continue with iPads in Year 9 or move students to laptops.

General Use of Devices

Students from School N used their Netbooks at school for their scheduled classes and were permitted to take them home to continue working on them. At home, most had access to both a home wireless network and the Internet. Students from School I owned their iPads so used them at school and at home as they wished.

School N & I: Use in Subjects

Although School N Netbooks had a large number of subject specific software applications pre-installed, students predominately used the MS Office suite for their school work. Students reported using Netbooks for assignments, research, presentations, emailing, writing essays and typing up science practicals. Less often, the Netbook was used for watching videos, worksheets or writing study notes.

The iPads in School I also came with pre-loaded general-

purpose applications (apps) such as Keynote, Pages and Safari. Students reported using the iPad mainly for research (internet), emailing, presentations and assignments. Many subjects also used a variety of subject specific apps. In History/Geography the iPad was reported to be used for looking up information on the Internet and taking notes. The iPad was occasionally used for Science practicals, games and social activities such as Skype, Facebook and online tests.

Table 1 shows the uses of the Netbooks and iPads as reported by students for the key subjects across Year 9 and Year 7 from Schools N and I. The distribution of iPad usage across the various subject areas appears to be broader than that of the Netbook usage. In addition there appears to be some differences in the types of uses of each device with the iPad being used for more interactive tasks such as virtual experiments, and the Netbook being used for more transactional tasks such as submission of work and online tests. Whilst this might suggest that the iPad is a device with the greatest potential for innovation and increased student engagement, the link to the level of teacher motivation and enthusiasm for the iPad/Netbook projects is evident. This factor will be addressed in the later section of this paper.

	English	Maths	Science/Tech	Materials/Art	LOTE	Hist/Geog
Essays	P N				P	P
Presentations	P N		P N		P	P N
Email	P N		P		P	P
Assignments	P N		P N		P	P N
Research	P N		P N		P	P N
Worksheets	N	P N	N			P N
Accessing teachers resources	N		N			N
Accessing online resources			P			P
Tests						N
Virtual experiments			P			
uTube videos		P	N			N
Maps						P N
Submission of work	N		N			N
Textbook		N	N			N
Dictionary	P N				P	
Calculator		P				
Notetaking			P N			P N
Games		P				
Not Used		P		P		

Table 1: Uses of Netbooks (N) and iPads (P) for key subjects

Student attitudes to each device

Figures 1 and 2 indicate how beneficial the students rated the Netbooks and iPads in each of the subjects they studied. The results suggest that students using Netbooks generally regarded the device as having a positive impact in all subjects where the device was used. There appeared to be much stronger support for the use of iPad in certain subjects such as LOTE, History/Geography and RE. Whilst this high level of support may be linked to the nature of these subject areas, it may also be a result of the motivation and enthusiasm of the particular teachers involved in these subjects.

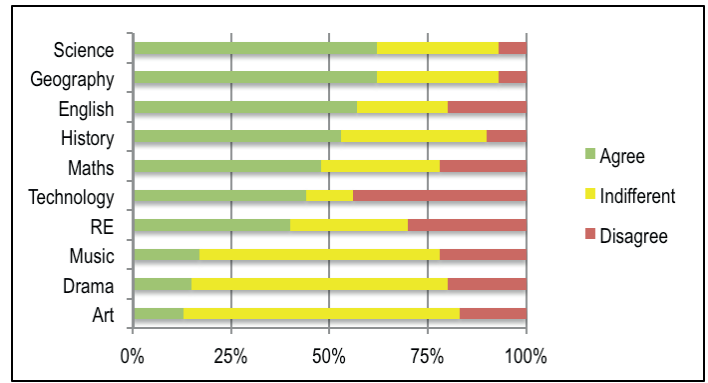


Figure 1: Indicates how beneficial students rated the use of Netbooks in each of their subjects

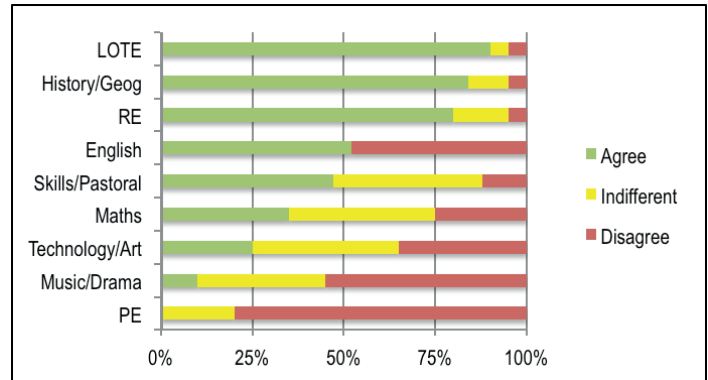


Figure 2: Indicates how beneficial students rated the use of iPads in each of their subjects

Open-ended questions in the survey allowed students to elaborate on their responses. The following comments were typical of how students used the devices:

[in English] 'I am able to write essays longer and faster because I find that when I type things down the thoughts in my head flow out into my words much quicker.' (School N).

'in Japanese we use it to help us learn to write Hiragana and Katakana, we also use some apps to help us learn to pronounce the words properly.' (School I).

Not all responses were positive however,

'I normally use the Netbook to simply type up my information - it does not benefit myself in any way. (It just makes my work look a lot neater)' and 'I use it to write up my essays, apart from that it does not seem to have many uses in the subject of English.' (School N)

Teacher Effects

This study found that teachers are influential and important leaders in adoption of technologies in the classroom. Students were asked their opinion regarding how their teachers used the devices to support learning (Figures 3 and 4).

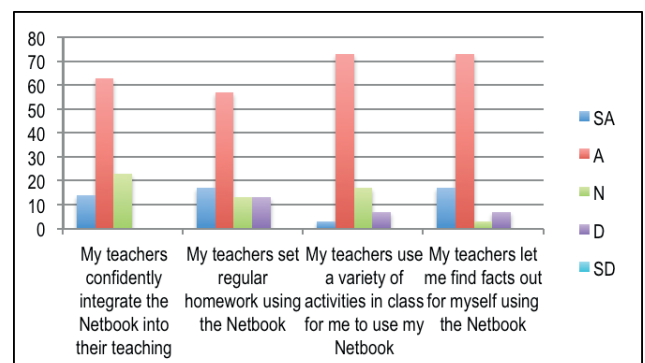


Figure 3: School N student perceptions regarding teachers use of the Netbook in teaching

Figure 3 suggests that in general students at School N were satisfied with their teachers' ability to use the Netbooks in classes with 90% of students reporting that teachers encouraged them to search facts for themselves using the Netbooks. 77% of students believed their teachers could confidently integrate the Netbook in their classroom while slightly fewer (76%) students agreed that teachers used a variety of activities using their Netbook. 70% of students were confident in their teachers' ability to use technology to improve their classroom experience and 70% believed they knew the expectation and quality of work their teacher expected when using the Netbook. In terms of homework, 74% of students stated that their teachers set regular homework using the Netbook, however only 20% of parents thought this was the case.

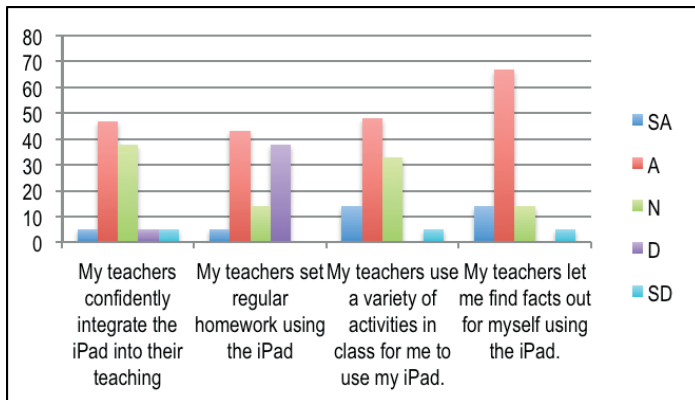


Figure 4: School I student perceptions regarding teachers use of the iPad in teaching

Students at School I were satisfied with their teachers' ability to use the iPads in their classes (Figure 4). 81% of teachers encouraged students to search facts for themselves using the iPad. The results indicated that 52% of students believed that their teachers could confidently integrate the iPad in their classroom while slightly more (62%) reported that teachers used a variety of activities using their iPad. 63% of students were confident in their teachers' ability to use technology to improve their classroom experience and 66% of students believed they knew the expectation and quality of work their teacher expected when using the iPad. In terms of homework, 48% of students stated that their teachers set regular homework using the iPad and interestingly, their parents also agreed (48%).

In terms of the motivating influence of the devices most responses were positive, with 90% of School I students reported experiencing success with their iPad in class, compared to 76% of School N students. Confidence ratings for School N students around device use to organise their information was 70%, compared to 80% of School I students. School I students also reported that they were more willing to do their homework on their iPad (81%) compared to a 43% positive response to the same question from School N students.

Teacher interview results: Pedagogical/Curriculum Change

Teachers in both schools emphasised the need for individual professional development to ensure that they could successfully introduce new pedagogies into their curriculum and take full advantage of the mobile devices, as they often did not have the hours to spend each night exploring different uses and features of each device.

Consistent with the engagement objectives of the special Year 9 Program at School N, teachers reported a positive change in student attitudes and approaches to learning, especially in the subjects where there was extensive use of the Netbooks. Several teachers reported that the implementation of Netbooks provided an opportunity to create an authentic student directed learning environment where the teacher took on the role of facilitator. Several teachers also noted that the Netbook program resulted in a greater level of collaboration and team-teaching for those teachers in the program.

The pedagogical imperative of the learner-centred classroom was definitely being realised in the language classes of the iPad school. Students were rewarded for finding and demonstrating new 'apps' that would complement the curricula. One implication of this kind of collaboration was the comment from School I that students were getting through the curriculum quicker because of the use of the iPad, and this had consequences for future year levels.

To emphasize how the iPad had changed teaching and learning pedagogies, the Principal of School I retold this story about one of his teachers:

Mr X is a very traditional teacher, very structured, conservative and organised. He has thirty years experience. His need for structure and organisation means he is an excellent teacher for working with students with disabilities. Mr X was given the iPad to take home over summer break. Twelve months later he is using the iPad to deliver the type of information that was on the multiple whiteboards around his classroom. He enjoys the ability to communicate personally with his students via the iPad and to teach in different and innovative ways. Mr X was often a cynical voice in staff meetings when new strategies were being discussed, saying 'we tried that years ago' when ideas were suggested. Now he is energised and enthused about using the iPad in his room and linking it to the electronic whiteboard.

This view was supported by one teacher who saw them as integral to developing a better curriculum and 'great for project based learning'. However, not all the teachers at School I had the same reaction. One perceived the iPad as a consumption device rather than a creative device and was hoping that the school will consider limiting iPads to Year 7. Another teacher said that it created more drafting and extended staff and student working hours.

School I teachers reported that the iPad increased student engagement and even that it had improved student literacy. This device complemented a change in classroom structure and delivery of work (Learning Enhancement Acquisition Program) that encouraged problem-based learning as well as cross-discipline curricula. Access to information and resources for students with the iPad was reported by staff to be 'seamless and instantaneous... it allowed students to experiment and improves student literacy through scaffolding their writing skills'. It was reported that the visual aspect of the device engaged students more readily than textbooks and the ability to link to the Interactive White Boards enabled concepts to be explored in a group environment.

The iPad and Netbook seem to have both influenced and enthused teachers and students, allowing more student-centred pedagogies to be developed, improving communication and literacy of students as well as improving collaboration between staff. As was to be expected, time for professional development was always at a premium and dedicated teachers needed and wanted more of this.

Conclusion

The study examined the use of iPad and Netbook devices in classrooms, in particular how the devices supported learning and teaching. An analysis of survey results and interviews provided insights into the perceptions of students, parents, teachers and school leaders regarding the

utility and value of each device. The most significant observation is that the importance of the actual digital device is not as critical as the presence of a dedicated curriculum program, however they evidently acted as a motivating influence for students to do their homework (the iPad slightly more than the Netbook). In the two case studies it was observed that the new pedagogical strategies that were developed in support of broader programs such as the Year 9 Program (School N) and the Year 7 Program (School I) were the key drivers for change. The adoption of a digital tool was only seen to be a means to an end, i.e. the tool was adopted to enable learner-led engagement, rather than the goal of the program. This finding concurs with Kukulska-Hulme and Traxler (2007) in terms of devices such as iPads and Netbooks having pedagogical potential. In addition, it was established that student engagement was highly related to the enthusiasm of the individual subject teacher rather than the type of device. The proposition that a particular device suited particular subjects was not supported.

In both schools, the core teaching staff members of the 1:1 programs were carefully selected to support the use of iPads and Netbooks, reaffirming the importance of having well prepared teachers who had adequate professional training. Most were fully committed to both the 1:1 program, and the use of the mobile digital tool.

The key success factor for any Netbook or iPad program is not necessarily the selection of the device but rather is the use of devices by engaged, supportive and prepared teachers within the context of a broader pedagogical change program.

References

- Bebell, D., & Kay, R. (2010). One to One Computing: A Summary of the Quantitative Results from the Berkshire Wireless Learning Initiative. *The journal of technology, learning, and assessment*, 9(2), 1.
- Bebell, D., & O'Dwyer, L., M. (2010). Educational Outcomes and Research from 1:1 Computing Settings. *The journal of technology, learning, and assessment*, 9(1), 1.
- Bogdan, R., & Biklen, S. K. (2007). *Qualitative research for education : an introduction to theory and methods* / Robert C. Bogdan, Sari Knopp Biklen (5th ed.): Boston : Pearson/Allyn and Bacon.
- Boyatzis, R. E. (1998). *Transforming qualitative information : thematic analysis and code development* / Richard E. Boyatzis: Thousand Oaks, CA : Sage Publications.
- DEEWR. (2008). *Success Through Partnership. Achieving a National Vision for ICT in Schools. Strategic Plan to Guide the Implementation of the Digital Education Revolution Initiative and Related Initiatives*. Retrieved from <http://foi.deewr.gov.au/node/255>.
- Drayton, B., Falk, J. F., Stroud, R., Hobbs, K., & Hammerman, J. (2010). After Installation: Ubiquitous Computing and High School Science in Three Experienced, High-Technology Schools. *The journal of technology, learning, and assessment*, 9(3), 1.

Johnson, L., Smith, R., Willis, H., Levine, A., Haywood, K., New Media, C., et al. (2011). *The 2011 Horizon Report* (No. 978-0-9828-2905-9): New Media Consortium.

Johnston, L. F., Adams, S., & Haywood, K. (2011). *The NMC Horizon Report: 2011 K-12 Edition*. Austin, Texas: The New Media Consortium.

Kukulska-Hulme, A., & Traxler, J. (2007). Designing for mobile and wireless learning. In H. Beetham & R. Sharpe (Eds.), *Rethinking Pedagogy for a Digital Age : Designing and Delivering E-Learning* (1 ed., pp. 180-193). Hoboken: Routledge.

Morgan, H. (2010). Using handheld wireless technologies in school: advantageous or disadvantageous?(Technology in the Classroom)(Report). *Childhood Education*, 87(2), 139(134).

Pohio, K., & Falloon, G. (2010). Deliberate acts of virtual communication: Cellphones as a tool to enhance student learning and engagement. *Set: Research Information for Teachers* [Wellington], 3.

Project Tomorrow. (2011). *The New 3 E's of Education: Enabled Engaged Empowered. How Today's Educators are Advancing a New Vision for Teaching and Learning*. California, USA: Project Tomorrow.

Rudd, K., Smith, S., & Conroy, S. (2007). A Digital Education Revolution: Election 2007 Policy Document. *Australian Labor Party, Australia*.

Schachter, R. (2009). Mobile Devices in the Classroom. [Article]. *District Administration*, 45(10/11), 30-36.

Shapley, K., Sheehan, D., Maloney, C., & Caranikas-Walker, F. (2010). Evaluating the Implementation Fidelity of Technology Immersion and its Relationship with Student Achievement. *The journal of technology, learning, and assessment*, 9(4), 1.

Suhr, K., Hernandez, D. A., Grimes, D., & Warschauer, M. (2010). Laptops and Fourth Grade Literacy: Assisting the Jump over the Fourth-Grade Slump. *The journal of technology, learning, and assessment*, 9(5), 1.

Wellington, J. (2000). *Educational research: Contemporary issues and practical approaches*. London: Biddles Ltd.

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