

Implementing e-Tools for Assessment

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Abstract

This literature review explores the challenges and strengths to both teachers and students in incorporating e-tools into assessments. There is conflicting research surrounding the validity between paper and computer-based assessments, which will remain a problem in determining appropriate future practice; however, research also points to possible benefits in using e-tools for both teachers and students. For teachers, e-tools ease the burden of management and marking of assessments, allowing them to focus on providing quality formative feedback. Students are more motivated and engaged in assessments when they have opportunities to interact with formative feedback, which creates a positive assessment experience. Digital assessment can be challenging for teachers who feel they do not have institutional support behind them or those who face technical difficulties in proctoring examinations. Some students also find digital assessment to be a negative experience, particularly when taking numeracy-based assessments. With conflicting research surrounding the transition from paper to computer-based assessments, various strengths and challenges for teachers and students, and an apparent gap in the integration of research into the New Zealand Ministry of Education's assessment documents, more research may be needed to inform future digital assessment practices in Aotearoa New Zealand.

Keywords: *Digital Assessment, E-Tools, E-Assessment, Computer-Based Assessment, Paper Assessment.*



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Introduction

Technology has become an integral part of our lives over the last 20 years, transforming almost every facet of human communication and interaction. With the increase of technology use in everyday life, schools all over the world have to grapple with how to integrate e-tools into the classroom and curriculum in an appropriate and effective manner. The New Zealand Curriculum's vision for young people is that they are "effective users of communication tools" and "will seize the opportunities offered by new knowledges and technologies" (Ministry of Education, 2007, p. 8). It is, therefore, imperative to understand the benefits and challenges of bringing e-tools into the classroom. The purpose of this literature review is to explore the particular challenges and strengths associated with implementing e-tools into assessments. Assessments offer opportunities for students to consolidate their learning and to share their learned knowledge with their teachers. Assessments are also integral to understanding academic achievement and to monitoring student progress throughout the years at school.

The New Zealand Ministry of Education demonstrated initial interest in understanding how to implement technology effectively in assessment by commissioning a literature review

(Leeson & Hattie, 2009) to inform the 2009 Directions for Assessment in New Zealand (DANZ) Report (Absolum, Flockton, Hattie, Hipkins, & Reid, 2009). However, there is a gap in the integration of the research on e-assessment in the DANZ report; although Leeson and Hattie's work was commissioned for the report, none of the research is mentioned in the final DANZ report. The word "technology" appears only once and is used in the context of forming valuable partnerships with parents and families rather than in reference to assessment as such (Absolum et al., 2009, p. 29). Likewise, the Ministry of Education (2011) Position Paper on assessment includes only one small segment on incorporating e-tools into assessment (p. 23). It is evident that more critical research into the strengths and challenges of digital assessment needs to be analysed further and integrated into government documents.

This literature review examines the conflicting research surrounding the validity of computer-based assessment compared to traditional paper format assessments in secondary and tertiary contexts. In addition, this literature review consolidates research on the benefits and challenges for both teachers and students of using e-tools in assessment.



Transitioning From Paper to Computer-Based Assessment

Traditional assessment practices have consisted of using pen and paper to demonstrate student knowledge by writing essays, solving equations by hand, or physically circling multiple choice answers. Though students today are considered “digital natives” (Prensky, 2001) in terms of using e-tools, there remains a concern that computer-based assessments will advantage certain students and disadvantage others. In particular, the transition from paper to computer-based assessment could disadvantage students who do not have much familiarity with computers or word processors. Research has found that less experience with word processors can become a disadvantage for students when completing computer-based writing tasks, with paper assessments eliciting higher quality responses (Chen, White, McCloskey, Soroui, & Chun, 2011). Likewise, students who are comfortable with digital word processing could be at an advantage in an assessment, as “a greater fluency and comfort with the materials of composing appears to impact students’ performances on high-stakes essay exams” (Whithaus, Harrison, & Midyette, 2008, p. 16). Schroeders and Wilhelm (2011) mediated this challenge by exploring how measurement of comprehension skills in English as a foreign language is affected by test medium. Their carefully designed investigation ensured motor skills requirements were comparable across paper and computer assessments, which meant the “rank order of participants was not affected by test media” (p. 865). Even so, they strongly caution that the findings of their study cannot, and should not, be generalised for other assessments, because they carefully designed the test media for their particular assessment, and there is “no theoretical or empirical framework that guarantees that measures would be invariant across test media” (Schroeders & Wilhelm, 2011, p. 866). Across the board, these studies suggest that the transition from paper to e-assessment is more complicated than originally anticipated, requiring careful design and manipulation of the assessment to ensure valid and fair results.

Although these studies find great issue with the validity of digital assessments compared to paper assessments, the New Zealand Qualifications Authority (NZQA) has forged ahead with digital assessment trials and pilots in order to determine whether the test medium has an effect on National Certificate for Educational Achievement (NCEA) examinations in New Zealand secondary schools (New Zealand Qualifications Authority, 2016; New Zealand Qualifications Authority, 2017; Johnston & Paki, 2017). In evaluating the results in the 2014 and 2015 Electronic Mathematics Common Assessment Tasks (e-MCAT), there were minimal differences in student results, suggesting that “the mode of assessment was irrelevant to the outcomes” (NZQA, 2016, p. 11). In looking at results from the 2016 trials and pilots, there was no evidence of disadvantage to any student who took their NCEA examination in a digital medium (NZQA, 2017). There were, however, some differences in the results’ distribution in favour of those who completed the assessment digitally. This was attributed to the fact that students could opt into the digital medium in the trials and pilots, so more digitally able students may have intentionally opted for the digital option, which positively affected their performance. This explanation connects back to previous research that computer familiarity (or lack thereof) will have an impact on student

performance for digital assessments (Chen et al., 2011; Whithaus et al., 2008).

Although the NZQA pilots and trials sound promising for the future of digital assessment, possible limitations should be noted. Johnston and Paki (2017) conducted a psychometric and statistical analysis on the results to ensure validity of the research, concluding that there were sufficient results to form a reliable analysis, but noted that there were four times as many students taking the paper examinations as the computer-based examinations. The distorted proportion of students taking the paper assessment over the computer-based assessment is a limitation of the study, and future replications and trials should include a more balanced split between media in order to gather better information. In addition, almost all student survey responses were too low to draw valid conclusions regarding student satisfaction and experience with digital assessment (NZQA, 2017). This is a limitation in being able to provide formative feedback on the benefits and challenges for students in transitioning from paper to computer-based assessments, and should be mediated for future NZQA trials and pilots. In looking at current research that examines the validity and reliability of the medium of assessment, there still lies a tension in how to appropriately and effectively transition from using paper assessment to computer-based assessment in New Zealand schools.

What are the Benefits?

Teachers can Provide Quality Feedback Through e-Tools

Further research will be needed to determine best future practice in assessment validity, but current research does identify benefits and challenges to students and teachers of using e-tools for assessments. In particular, digital assessment can assist teachers in the management and marking of assignments by making marking more efficient. Markers of the eMCAT assessments in the Digital External Assessments Prototypes (DEAP) project found online marking to be more favourable and efficient than traditional marking (NZQA, 2016). In addition, using e-tools can support administrative tasks, such as “accepting assignment submissions, managing deadlines, recording submission details, dealing with safe and secure storage; managing the distribution of assignments to markers and facilitating the communication within the marking team” (Heinrich, Milne, Ramsay, & Morrison, 2009, pp. 471 – 472). If teachers use e-tools to assist them in the administrative side of assessment, they are able to use their freed-up time to provide quality feedback on the assessments themselves (Heinrich, Milne, Ramsey et al., 2009; Heinrich, Milne, & Moore, 2009). Teachers found that using e-tools supported them in providing timely and continuous feedback to students, which could lead to higher student achievement and engagement (Heinrich, Milne, & Moore, 2009). Overall, teachers found e-tools beneficial in both the marking and the management of assessments.

Empowering Personalised Learning in Students

Research has shown that using e-tools for assessment can also have benefits for students. Educational-technology initiatives and projects have found that providing personal learning devices (such as PDA’s or tablets) to students can improve student motivation, engagement, and attitude towards learning (Somekh

et al., 2007). Student motivation in using e-tools can be extended to benefits for assessments, particularly for formative assessments. If students have the opportunity to read formative feedback on an assessment, e-tools can provide greater motivation for students to take the time on assessments and correct their mistakes (Jiao, 2015). E-assessment tools create an archive of student work, allowing them to re-read feedback. This ability to go back to the feedback from previous assessments gives students the opportunity to “close the gap between their current and desired performance” (Heinrich, Milne & Moore, 2009, p. 182). Likewise, the implementation of the e-assessment program, eTutor, for students in an engineering course “motivated students in independent learning and resulted in improved performances” (Jiao, 2015, pp. 14-15). However, Jiao (2015) and Heinrich, Milne, and Moore’s (2009) research makes clear that implementing e-assessment alone does not increase student motivation, but it must be used in conjunction with providing quality feedback, so that students find value in reading comments and correcting their mistakes.

Evidence has also shown that, for certain assessments, students find digital assessment to be a more positive experience than paper based assessment (Jiao, 2015; NZQA, 2016; NZQA, 2017). In surveys given to students at the end of the engineering course, “70% agreed or strongly agreed that eTutor increased their learning interest and helped them study the unit content” (Jiao, 2015, p. 12). Students felt satisfied partly because of the benefits mentioned above and also the facility to resubmit their assessments. Students also felt that digital assessment could play to their digital strengths, which gave them more confidence in the examination. Although survey results were remarkably low for the NZQA trials and pilots, students who did respond to surveys found the e-assessments to be positive experiences because they “were more confident using a keyboard, that they liked the word count and timer, and that the instructions were easy to follow” (NZQA, 2017, p. 16). Many students in the survey results claimed that taking a digital assessment was a more positive experience than paper-based assessment because of the assistance of a word processor to type out responses instead of handwriting, making their work easier to read and edit before submission (NZQA, 2017). In essence, implementing digital assessment can lead to added benefits for students when used effectively. In incorporating digital assessment to classrooms and the curriculum, students are provided with more immediate opportunities for formative feedback and the ability to go back to their assessments and correct their mistakes, making the assessment a more positive experience.

What are the Challenges?

Discrepancies In Student Experience

There is a discrepancy between the benefit of e-assessment tools for students depending on the type of assessment. For writing-based assessments, students generally found digital assessment to be a positive experience, with most NCEA Media Studies and Classics respondents “agreeing or strongly agreeing that they found undertaking the examination digitally was a positive experience” (NZQA, 2017, p. 16). However, as noted earlier, the majority of respondents taking numeracy-based assessments, like the 2015 eMCAT examinations indicated that the digital medium of the examination “felt worse or much

worse” than taking the examination through a paper format (NZQA, 2016, p. 19). Likewise, student feedback on the benefits and limitations of eTutor showed that some still preferred to receive paper feedback. Because most engineering assessments are numeracy-based, some students wanted to receive specific feedback on their errors in calculation or parameter, which was not possible through eTutor (Jiao, 2015).

Even students who generally found digital writing assessments to be positive had to mediate new and unfamiliar challenges. The NCEA English Level 1 Pilot in 2016 had many technical difficulties with locking out students before they began the examination, which created a more unpleasant and stressful experience for some students (NZQA, 2017). In addition, the students who responded to surveys experienced more distraction due to the sound of typing from other students (NZQA, 2017). The introduction of digital assessment can present specific challenges for students based on the type of assessment and cognitive processes required for the assessment. The discrepancies in student experiences with e-assessment show that teachers must be very careful when designing and planning digital assessments and should think about whether the assessment will benefit all students in the classroom.

Technical Difficulties and Lack of Institutional Support

The challenges for teachers surrounding the use of digital assessment are both similar and different from those of the students. When students experience technical difficulties in examinations, as with the NCEA English Level 1 Pilot, teachers and supervisors are also placed in a very difficult position in monitoring the examination and trying to help students solve the technical issues. Of those teachers who administered the English digital examination and responded to the survey, the majority agreed or strongly agreed that “digital examinations were more difficult to manage than paper-based examinations” (NZQA, 2017, p. 21). Some teachers felt that the technical difficulties in the examination meant teachers had to keep a close eye on all students’ computers, which made students feel more nervous and disoriented (NZQA, 2017). This difficulty in managing technical problems can be a source of tension for teachers who are considering using digital assessment in their classrooms.

In addition to mediating technical issues, teachers also face challenges when they do not have appropriate institutional support from schools to help them implement e-tools in the classroom. Teachers need support from their institution to help teach them about the options for e-tools, as well as give them a voice in what kind of tools may be used for assessment in the classroom (Heinrich, Milne, Ramsay, et al., 2009; Heinrich, Milne, & Moore, 2009). With this kind of support from their working environment, teachers will “take some ownership over their e-learning system,” which will lead to higher quality assessment strategies (Heinrich, Milne, Ramsay, et al., 2009, p. 476). Introducing e-tools into a teacher’s classroom requires institutional support from colleagues, students, and the entire school environment. One teacher found the lack of institutional support troubling, saying, “there should be a central investigation as to what a good tool is or what some good tools are and then it should be provided centrally” so that teachers are not struggling to implement e-tools on their own (Heinrich, Milne & Moore, 2009, p. 181). Qualitative research and interviews with teachers has shown that they face different challenges with implementing

e-tools from those of students, but with strong institutional support, some of these challenges can be mediated.

Conclusions

In examining the literature on the subject of implementing e-tools for assessment, it is clear that there needs to be further research done on how to mediate validity and reliability challenges between paper and computer-based assessments. Teachers need to understand that computer familiarity and experience with digital tools may affect the students' ability to take assessments digitally. Therefore, all assessments must be carefully and consciously designed not to advantage or disadvantage any particular group of students (Schroeders & Wilhelm, 2011).

Overall, recent literature on the subject of digital assessment shows its effectiveness in providing benefits for both students and teachers to improve their learning and management of assessment. However, there are still challenges in student experience and supporting teachers in the implementation of digital assessment that will need to be addressed and fixed in future classroom spaces. Although this is a new and challenging area of education, there are ways to mediate digital challenges in order to benefit students and teachers alike, as long as assessments are carefully constructed, take students' computer familiarity into account, and allow for quality feedback to be provided to students.

References

- Absolum, M., Flockton, L., Hattie, J., Hipkins, R. & Reid, I. (2009). *Directions for Assessment in New Zealand (DANZ): Developing Students' Assessment Capabilities*. Wellington: Ministry of Education Accessed from Te Kete Ipurangi – Assessment Online: <http://assessment.tki.org.nz/Research-and-readings>
- Chen, J., White, S., McCloskey, M., Soroui, J., & Chun, Y. (2011). Effects of computer versus paper administration of an adult functional writing assessment. *Assessing Writing*, 16, 49–71. doi:10.1016/j.asw.2010.11.001
- Heinrich, E., Milne, J., & Moore, M. (2009). An investigation into e-tool use for formative assignment assessment - Status and recommendations. *Educational Technology and Society*, 12 (4), 176–192. Retrieved from http://www.ifets.info/download_pdf.php?j_id=45&a_id=993
- Heinrich, E., Milne, J., Ramsay, A., & Morrison, D. (2009). Recommendations for the use of e-tools for improvements around assignment marking quality. *Assessment and Evaluation in Higher Education*. 34 (4), 469-479. doi: 10.1080/02602930802071122
- Jiao, H. (2015). Enhancing students' engagement in learning through a formative e-assessment tool that motivates students to take action on feedback. *Australasian Journal of Engineering Education*, 20(1), 9-18. doi:10.7158/D13-002.2015.20.1
- Johnston, M. & Paki, E. (2017). *Psychometric and statistical analysis - English level 1 externally assessed achievement standards using digital medium*. Wellington: New Zealand Qualifications Authority Retrieved from <http://www.nzqa.govt.nz/assets/About-us/Future-State/2016-trials-and-pilots/Psychometric-and-Statistical-Analysis-English-Level-1-Externally-Asses....pdf>
- Leeson, H., & Hattie, J. (2009). *The use of technology for assessment (Commissioned Review Paper 12)*. Auckland: Visible Learning Labs, Faculty of Education, University of Auckland. Retrieved from: <http://assessment.tki.org.nz/Media/Files/Leeson-H.-and-Hattie-J.-The-use-of-technology-for-assessment-University-of-Auckland>
- Ministry of Education (2007). *The New Zealand Curriculum*. Wellington: Learning Media.
- Ministry of Education (2011). *Ministry of Education Position Paper: Assessment [Schooling Sector]*. Wellington: Learning Media. Retrieved from
- http://assessment.tki.org.nz/content/download/5539/49218/file/MOE_AssessmentPositionPaper_October11.pdf
- New Zealand Qualifications Authority. (2016). Summary Report: Digital External Assessment Prototypes Project. Wellington. Retrieved from <http://www.nzqa.govt.nz/assets/About-us/Future-State/DEAP-key-learnings.pdf>
- New Zealand Qualifications Authority. (2017). *National Certificate of Educational Assessment (NCEA) External Digital Assessment 2016 Trials and Pilots: User Experience Evaluation Report*. Wellington. Retrieved from <http://www.nzqa.govt.nz/assets/About-us/Future-State/2016-trials-and-pilots/2016-Trials-Pilots-User-Experience-Evaluation-Report-Publication-FINAL.pdf>
- Prensky, M. (2001). Digital natives, digital immigrants: Part 1. *On the Horizon*, 9(5), 1–6. doi:10.1108/10748120110424816
- Schroeders, U., & Wilhelm, O. (2011). Equivalence of reading and listening comprehension across test media. *Educational and Psychological Measurement*, 71(5), 849–869. doi:10.1177/0013164410391468
- Somekh, B., Underwood, J., Convery, A., Dillon, G., Jarvis, J., Lewin, C.... Woodrow, D. (2007). *Evaluation of the ICT Test Bed Project Final Report*. Coventry: Becta.
- Whithaus, C., Harrison, S. B., & Midyette, J. (2008). Keyboarding compared with handwriting on a high-stakes writing assessment: Student choice of composing medium, raters' perceptions, and text quality. *Assessing Writing*, 13(1), 4-25. doi:10.1016/j.asw.2008.03.001