

**A Research Analysis & Critique: An International Review of eExam Technologies  
and Impact**

**Lori Jones**

**University of British Columbia**

**[jonesbke@hotmail.com](mailto:jonesbke@hotmail.com)**

The study undertaken by Andrew E. Fluck entitled “An international review of eExam technologies and impact” endeavoured to investigate the contribution of eExams on pedagogical transformation in education by collecting and interpreting data from 17 different individuals in 11 units from multiple countries. This qualitative and interpretive study aimed to explore the gap in knowledge surrounding the implementation of e-exams as an evolution of pedagogical decisions in education. Five major areas of study emerged as outlined by Fluck:

“...the scale of eExam adoption; assessment integrity (student cheating/security/reliability); eExam accessibility for students with disabilities; eExam architecture and affordances for assessing higher order thinking; and inter-sectoral relationships between universities and schools concerning eExam assessment environments” (Fluck, 2019).

Fluck points to the gap in research by referencing the initial research findings of [Russell, 2010](#) regarding the link of online assessments in distance education combined with the constructionism theory as framework provided by [Papert & Harel, 1991](#), to investigate the improvement of learning outcomes via computer as outlined first by [Resnick in 1998](#) and subsequently: [Hoadley, Gordin, & Means, 2000](#); [Scardamalia, 2004](#); [SRI International, 2011](#). Fluck further outlines how the literature has framed online assessment specifically e-examinations using the following definition of an eExam: “a timed, supervised, summative assessment conducted using each candidate's own computer running a standardised operating system” (eExam, 2017). Fluck does point out in the abstract that local definitions of eExams varied significantly from this definition.

The research hypothesis was further broken down into research questions to satisfy the emerging 5 areas of study. As explained by Suter, these types of questions are the hallmark of most mindful qualitative research (Suter, 2012 pg 499). Those questions are as follows:

“RQ1: What kinds of institutions are using eExams?

RQ2: What are the enablers and hurdles for the expansion of eExams in such institutions?

RQ3: Are, and if so how are, curricula being transformed by the adoption of eExams?” (Fluck,

2019). These questions stemmed from Fluck’s knowledge of the trend worldwide for some countries to adopt a more administratively friendly form of summative assessment, eExams. Fluck points to studies in New Zealand, Australia, Sweden, Scotland, and the United States where exam administration is shifting to an electronic platform. This shift driven in part by administrative efficacy creates tension in the secondary versus the tertiary system of education.

“One reason for supporting a change to eExaminations is the linkage between tertiary and secondary assessment methods. These are only loosely linked systems, yet it is likely methods used in one sector will be noticed and appropriately adopted in the other. Secondary sector assessments may be impeded from adopting computer mediated methods whilst tertiary systems rely heavily on high stakes written examinations (Fluck, 2007, p. 519).”

The above research questions are a distillation of all of this information. These questions are answered through a qualitative study derived from a non-intervention collection of data already in existence combined with interview style data collection from individuals involved in eExamination at those sites. Some of the data used was collected in a more quantitative manner; however, the overarching interpretation of all of the data is qualitative. The extent to which data was collected quantitatively is not outlined. The qualitative results of this study that were used and thus it does not lead this to be a mixed methodology study.

Fluck states in the methods portion of the study, heterogeneous aspects of eExam architecture, culture and device were present across the 11 study locations. The replication of these key attributes allows for a more confident basis from which to infer generalized trends about the results collected from the 17 individuals interviewed at the 11 sites. If we follow the rules of thumb for research, the 17 individuals and 11 locations do not satisfy 25 participants needed for a quantitative study; however, the level of replication for a study based on existing data without intervention through a qualitative lens is quite robust in its replication (Suter, 2012).

The study was vetted through an ethics review board and satisfied the ethical considerations of each institution that participated as well as the institution associated with Fluck. All participants were initially approached via email and given all of the necessary information to meet the privacy and safety conditions of an ethical study (tcps2core, 2019). The interviews with participants were conducted and recorded in audio format on an Android device. Memos and field notes were also collected for each unit. Each participant in a given unit was directly involved with eExams at their respective institutions. To reduce bias, the researcher conducting the interviews had never worked with or met the participants.. The transcribed interviews were collated into a summary sheet of topics derived from the literature that led to the problem-based correlational gap study.

The summary sheet contained the following areas:

- “ • Demographic and institutional data
- Ethical clearances
- eExam product in use
- Scale of eExam adoption
- Student cheating/Security/Reliability [assessment integrity]
- Students with special needs [accessibility]
- eExam architecture and affordances
- Assessing higher order thinking
- Pedagogical richness v. administrative convenience

- Relationship between university and school sector assessment environments [inter-sectoral relationships]” (Fluck, 2019)

The data from the summary sheets was first shared with participants for approval and for the initial discussion of emerging findings. Inductive reasoning was used in the formation of a new theory. The framework outlined by Fluck in a previous study ([Fluck, 2003](#)) combined with SAMR model outlined by [Puentedura, 2017](#) was used in conjunction with constant comparison within the grounded theory ([Urquhart, Lehmann, & Myers, 2010, p. 369](#)) for a more theoretical analysis (cited in Fluck, 2019 pg 1-2). This analysis method is in juxtaposition to the problem-based framework of the overall study. This framework allowed for selective coding of results which after constant comparison to avoid duplication and overlap led to the five interactions. These 5 interactions were where the analysis elaboration took place. The results were sent to all participants for approval and second member validation as outlined by ([Creswell, 1994, p. 158](#)). This was all done to increase validity as outlined by Fluck, “These member-checking procedures correspond to the best practice guidelines for qualitative research on educational computing (Twining, Heller, Nussbaum, & Tsai, 2016, p. A8) to enhance validity of the findings.” (Fluck, 2019)

The analysis yielded the following result broken into the 5 interactions discovered in the constant comparison, grounded theoretical analysis as stated above: the scale of adoption, assessment integrity, accessibility, architecture and affordances for assessing higher order thinking, and inter-sectoral relationships (Fluck, 2019).

The first emerging pattern was the variability in the units’ definitions of eExam. Due to the intense variability, “including the extent of supervision, the ownership of the computer used by each candidate, whether software needed to be pre-installed, and when and what networking was required” (Fluck, 2019) as a mechanism for removal of confounding, the only remaining pattern after abstraction was that an eExam constituted “student candidates were undertaking an assessment using a computer in a defined period of time.” (Fluck, 2019)

Scale of adoption was one of the interactions. It was analysed by categorization of the data collected, shown below in Table 4 from the Fluck study, making distinction with Operating System (OS) used and the type of questions administered. The site coding is as outlined in the appendix in the study.

**Table 4**  
eExam system affordances and scale of adoption.

Site	First year	OS	Question styles	Scale of adoption
UoI	1998	int	MS Office, PDF	10%
OU1	2006	int	Quiz via browser	50% in some courses
NCL	2007	int	LCMS via browser	< 10%
AAU	2009	ext, network	LCMS Quiz via browser, Apps	~ 40%
AU-eExams	2009	ext, USB	Office, Apps, PDF	< 1%
FIN-U	2014	int	Quizzes, essays	up to 10%
RU	2014	ext, USB	Quiz, IDE, long essays	10%
FIN-S1	2015	ext, USB	Quiz via browser, Apps, PDF	100% of class
FIN-S2	2015	ext, USB	Quiz via browser, Apps, PDF	100% of class
FIN-S3	2015	ext, USB	Quiz via browser, Apps, PDF	?
FIN-S4	2015	ext, USB	Quiz via browser, Apps, PDF	100% of class
OU2	2016	int	Browser-based	0.3%
FIN-S	2016	ext, USB	Quiz via browser, Apps, PDF	moving to 100% <sup>a</sup>
OU3	2018?	int	LCMS, TeSLA	not yet known

<sup>a</sup> In late 2017 FIN-S received 28,671 answer-scripts, marking 50% adoption nation-wide (Lattu, 2017).

The second interaction was assessment integrity. In order to preserve the institutional reputation, the coding data for this section was not included. Topics covered in this interaction were “normal cheating prevention techniques.” This included: “Seating arrangements maximized the distance between screens, randomised paper and question allocation techniques minimized the chance of successful copying.” According to Fluck, other forms of cheating including bluetooth ear pieces and cheat sheets were also mitigated, as they would be with a pen and paper testing environment. Most exams mitigated digital intrusion by using a locked down browser. The major complication in these exams being mathematical and scientific formulas in order to mitigate this, with the exception of Finnish school, Mains electrical power was supplied. LCMs system accessible exams used a variety of mitigation methods for security from timed logins to database security and examination inaccessibility after closing. Both open source and proprietary software were used. To mitigate start-up issues, 10% extra laptops and practice sessions were used (Fluck 2019).

The third interaction was accessibility. “Providing equitable access to eExam assessment for students with disabilities werediscussed in both management and technological terms. “How this was accomplished varied by unit site, ranging from loan laptops equipped with screen readers and braille keyboards, to extension of time, and in some cases modification of questions.

The fourth interaction was architecture and affordances for assessing higher order thinking. There was a general agreement between sites that the eExams must run on a variety of platforms including windows and Apple operating systems. Mobile technology like smartphones and tablets were not discussed as options for exams. The type of architecture varied depending on the type of questions:, multimedia with higher order thinking, short and long answers versus primarily self-marking database multiple choice questions.

The fifth interaction was intersectoral relationships. There appeared to be much isolation in eExam construction and administration, in that institutions were not aware other institutions were using eExams and little to no collaboration between units was evident. In line with the aim of qualitative research outlined by Suter in Chapter 12, pgs 494-535, “In general, the data were regarded as being obtained from sites noted for truthfulness, credibility, and trustworthiness. The descriptions were rich and deep, providing good opportunity to undertake constant comparisons”(Fluck, 2019).

The study answered the 3 main research sub-questions of the overarching objective which was “How are eExam’s being implemented worldwide?” (Fluck, 2019). RQ1-”What kinds of institutions are using eExams?” (Fluck, 2019) After generalising the definition of eExam to compensate for the varied definition from institution to institution, it was found that the use of eExams as summative assessment at both the secondary and tertiary level is widely distributed, and currently being explored and expanded upon. RQ2: “What are the enablers and hurdles for the expansion of eExams in such institutions?”(Fluck, 2019). Enablers included administrative ease via workload benefits from automatic marking to native language speaking possibilities for foreign nationals to clarity via mitigation of handwriting. Hurdles included: the changes in infrastructure and network topology to complicate usb booting and secure network access; the restriction to institution provided devices versus a secure methodology for the use of BYOB (bring your own device) systems. RQ3: “Are, and if so how are, curricula being transformed by the adoption of eExams?” (Fluck, 2019). Fluck found that insufficient data was collected in order to make interpretations of this question.

The study by Fluck has great significance to Educational pedagogy in laying the groundwork for further investigation into how and why eExams shift current best practices. The worldwide collection of data in this study demonstrates a significant emerging shift in assessment practices on a global scale by providing rich and confident data. The compensation for bias and the removal of personal connection with those being interviewed is key to confidence. The omission of some countries due to funding shortfalls for travel and data collection could be something addressed. A continued look at the progression and implementation of eExams could lead to conclusions about how the 5 interactions are shifting as technology, familiarity with eExams, and the ubiquity of eExams as a practice all shift over time.

Fluck says that this investigation has 2 broad educational implications: eExams could address the major criticism of paper-and-pen exams by alleviating student stress allowing them to provide text with their personal familiar text creation tools, it could also solve economic issues around marking a pen-paper test. Fluck concludes that this study reveals tensions between

administrative ease of eExams and the pedagogical shift for them. He points to R3: “Are, and if so how are, curricula being transformed by the adoption of eExams?” (Fluck,2019) as the next area for study.

References

Creswell, J. W. (1998). Pg 158. In *Qualitative inquiry & research design: Choosing among five approaches* (p. 158). Thousand Oaks,California: SAGE Publications.

Fluck, A. E. (2019). An international review of eExam technologies and impact. *Computers & Education, 132*, 1-15. doi:10.1016/j.compedu.2018.12.008

Welcome. (n.d.). Retrieved March 25, 2019, from <http://tcps2core.ca/welcome>

Review of Critique. I really appreciated the critique I recieved. Tanya was very responsive and made some suggestions about being more direct that I appreciated and incorporated into the paper as a section about the educational significance of the study (found near the end) She was thorough and open of communication about the analysis throughout the project.