

# Student Perceptions of a Cloud Assessment Learning Environment

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## ABSTRACT

This paper describes a multi-method study conducted at a New Zealand polytechnic which investigated student perceptions of a cloud assessment learning environment. Factors examined included teacher-student interpersonal behaviour, conceptual change, student achievement, attitude and computing confidence. This unique study provides a clear insight into student perceptions of the cloud assessment learning environment. Educators will be able to utilise data from this study to better prepare students, manage expectations, and emphasise positive aspects of their own classroom learning environment.

Keywords:

## INTRODUCTION

This paper presents a summary of an investigation into student perceptions of the cloud assessment learning environment and draws its findings from a much larger study. The cloud assessment learning environment is a unique learning environment made possible by the recent advent of cloud computing and the associated technologies. The implementation of a cloud assessment learning environment allows teachers to monitor and guide student progress over the duration of an assessment (Google, 2011a). This is in contrast to traditional assessment methods where teachers often only see student work in summative assessment items at the end of the teaching and learning period (Race, 2007). Although the cloud assessment learning environment offers educators the benefit of being able to monitor and guide students throughout an assessment, an important question which existed as the fundamental motivation behind this study remained, namely, what do students make of this new assessment environment?

### Background

The cloud assessment learning environment exists when the collaborative sharing features of a cloud computing tool (e.g. Google Docs) are utilised for a continuous assessment. Continuous assessments being those assessments where students are given an extended period of time (usually weeks) to complete an assessment task (e.g. write a report). At the beginning of the assessment (day 1) each student uses a cloud computing tool to start their assessment (e.g. create a blank document in Google Docs). Each student then shares their work with their teacher by using the collaborative sharing feature of the cloud computing tool. It is this act of 'sharing' that allows the teacher to then monitor and guide each student throughout the duration of the assessment. This process allows a high degree of individualised and personal interaction with the students also. The cloud assessment learning environment can therefore be defined as the learning environment that exists when the collaborative sharing features of cloud computing tools are utilised by teachers to monitor and guide students during continuous assessments. Figure 1 provides a visual representation of the cloud assessment learning environment.

This study exists loosely within the overlap between cloud computing and learning environments research. The literature reveals that a number of studies over the past 30 years have been conducted into the areas learning environments. Many of these studies utilise instruments such as the QTI (Questionnaire on Teacher Interaction) (Coll,

Taylor, & Fisher, 2002), (Telli, den Brok, & Cakiroglu, 2007), (den Brok, Fisher, Wubbels, Brekelmans, & Rickards, 2006), (Maulana, Opdenakker, den Brok, & Bosker, 2011) as well as other instruments unique to specific learning environments (Fraser, 1978), (Ketelhut, Dede, Clarke, Nelson, & Bowman, 2007), (Shaft, Sharfman, & Wu, 2004), (Levine & Donitsa-Schmidt, 1998). The literature also reveals a number of studies have been conducted in the area of cloud computing in education (Petrus & Sankey, 2007), (Brodahl, Hadjerrouit, & Hansen, 2011), (Ó Broin & Raftery, 2011), (Guth, 2007). However a lack of research into student perceptions of the cloud assessment learning environment is also evident from the literature.

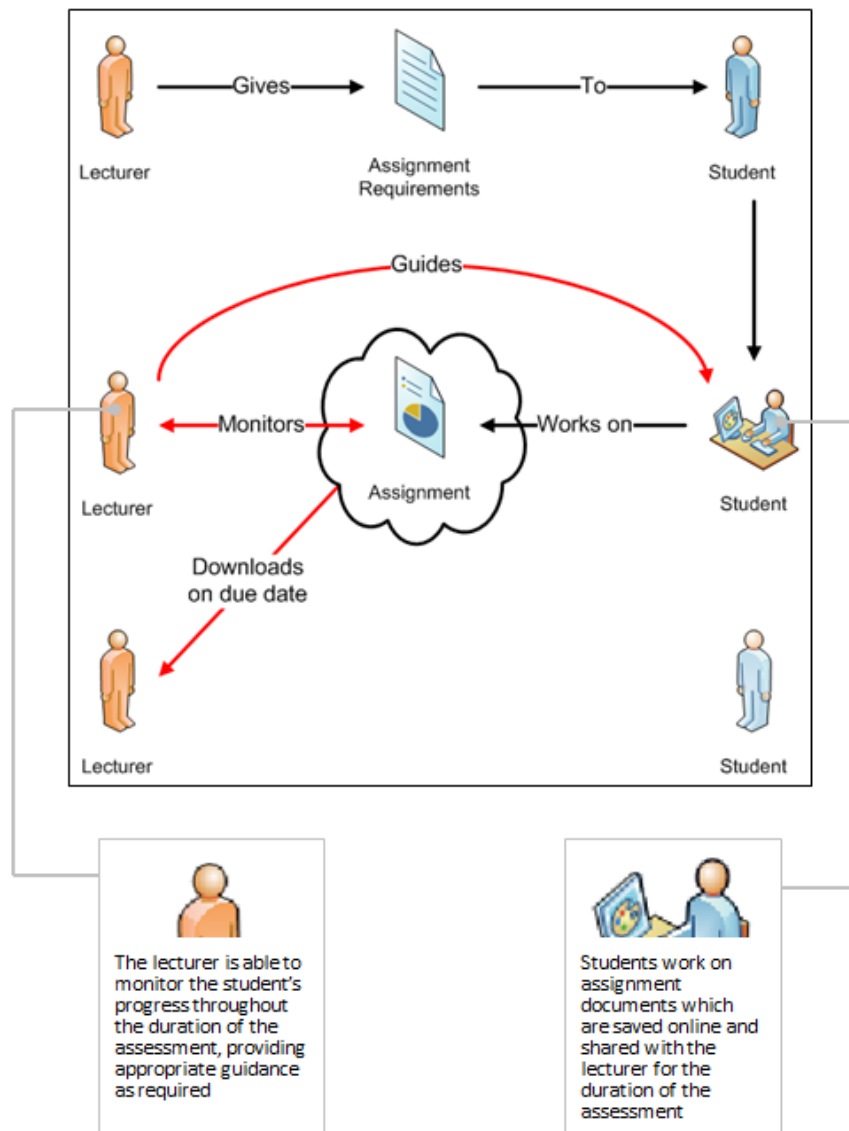


Figure 1: Cloud Assessment Learning Environment

## METHOD

Building from the motivating question which initiated this study a number of specific research questions were developed. The two main research questions which will be addressed in this paper are:

- What factors of the cloud assessment learning environment do students perceive as either positive or negative?
- Is there a conceptual change in student understanding of the cloud assessment learning environment?

In order to investigate student perceptions of the cloud assessment learning environment, and consequently address the research questions, a multi-method ethnographic case study approach was selected for the study with the

researcher acting as a participant observer. Both qualitative and quantitative data were collected from the research sample through a variety of methods, these were: the LIQ (Lecturer Interaction Questionnaire) instrument (an adaptation of the QTI), the CAQ (Cloud Assessment Questionnaire) instrument (a questionnaire unique to this study that is focused on aspects of the cloud assessment learning environment), concept maps, class interviews, focus group interviews, written lecturer descriptions, participant observations, virtual participant observations, online activity statistics, attendance records, and achievement levels. Furthermore, a number of the aforementioned data collection methods have also been used in a pre-test post-test design. Accordingly, both qualitative and quantitative data were collected with the results from the various data sources being used to help support, validate and triangulate the overall findings through methodological triangulation (Cohen et al., 2000). Table 1 provides an overview of the data collection methods utilised over the course of a 16 week semester.

The main instrument utilised by the study to collect data on student perceptions of the cloud assessment learning environment was the CAQ. The CAQ was administered twice during the study, first at the beginning of the assessment to capture student pre-engagement perceptions and then again at the end of the assessment to capture student post-engagement perceptions. The CAQ included five main sections: Monitoring, Google Docs, Feedback, Cloud Storage, and Preference. Each section contained both quantitative Likert scale items, and open-ended short answer questions.

**Table 1: Data Collection Overview**

Data Collection Method	Occurrence
LIQ	Week 4 & 8
CAQ	Week 6 & 10
Concept Maps	Week 6 & 10
Class Interviews	Week 6 & 10
Focus Group Interviews	Week 10
Lecturer Descriptions	Week 10
Participant Observations	Weeks 1-16
Virtual Participant Observations	Weeks 1-16
Online Activity Statistics	Weeks 1-16
Attendance Records	Weeks 1-16
Achievement Levels	Weeks 4, 9, 12 & 16

The collected data was analysed at the conclusion of the semester using various approaches. The quantitative data was analysed using the SPSS software package, the qualitative data was coded and analysed manually, and where appropriate, also analysed statistically.

The research sample used for this study consisted of 50 ICT students enrolled in a second year IT Project Management course of a three year degree. The researcher was also the sole teacher of the IT Project Management paper in which this study was conducted. The study focused specifically on student experiences during a project management plan (PMP) assessment that was conducted within a cloud assessment learning environment. The assessment required students to use Google Docs (a cloud computing word processing tool) to write a PMP for a given scenario over a four week period (due at the end of week nine of the semester).

## RESULTS

The results presented in this section are a subset of the results from a larger study and will focus on the key findings from that study.

As mentioned earlier, the main instrument utilised by the study to collect data on student perceptions of the cloud assessment learning environment was the CAQ. The internal consistencies of the scales included within the CAQ were calculated and revealed statistically acceptable levels (see table 2).

Table 2: CAQ Internal Consistency

Scale	Alpha Reliability	
	CAQ1	CAQ2
Monitoring	.85	.85
Google Docs	.72	.71
Feedback	.91	.97
Cloud Storage	.78	.83
Preference	.78	.77

N = 48 CAQ 1, n = 40 CAQ2

Each scale consisted of five point Likert scale items. For each item students could either: agree (value of 1), disagree (value of 5), or select a value in between (2, 3, or 4). The CAQ was administered twice throughout the study in order to only capture student perceptions of the environment but to also capture any changes in student perceptions over the course of the assessment period. Accordingly a mean comparison for each of the scales is given in table 3 and will be discussed in greater detail in the discussion section. The following sub-sections will also present summaries of the qualitative results from each of the five areas of the CAQ.

Table 3: CAQ Scales Mean Comparison

Scale	CAQ1	CAQ2	Difference
Monitoring	3.57	3.98	.42*
Google Docs	3.36	2.88	-.48*
Feedback	4.38	4.40	.02
Cloud Storage	4.27	4.13	-.14
Preference	3.02	2.96	-.06

\* Change is significant at the 0.05 level, n = 40

## MONITORING

The first section of the CAQ focused on Monitoring. This specifically looked at student perceptions of having their assignment document shared with their lecturer for the duration of the assessment, thus enabling the monitoring of progress. The short answer question put to students in this section was *"What do you think about your lecturer being able to see your assignment document for the duration of the assessment?"*

The results of the first short answer question suggested a number of common perceptions shared among the students. The majority of students were positive about having their assignment progress monitored, some students initially had concerns about this aspect of the cloud assessment learning environment but the majority of these concerns were alleviated after having gone through the assessment process. This ultimately resulted in an increase in positive student perceptions relating to the monitoring aspect of the cloud assessment learning environment. The improvement in positive perceptions also coincides with a quantitative increase in the corresponding Monitoring scale (see Table 3).

## Google Docs

The Google Docs section focused on student perceptions of the cloud technology used for the assessment (i.e. using a web browser to access and complete their assignment in Google Docs). The short answer question from this section was *"What do you think about using Google Docs (an online/web based document editor) for this assignment?"*

A number of common themes appeared to emerge from the student responses to the second question. Students began with a relatively optimistic view of using Google Docs for the assignment despite many having not used it before (this evidenced by the results to the *"Had you used Google Docs before this assignment?"* item also included in the

study). The notion of being able to use a free, online, Google product was appealing for many. However, a number of students had reservations regarding perceived limitations of the web based word processing tool. After engaging with the tool (Google Docs) for the assessment, overall student perceptions underwent a noticeable shift. Many students drew attention to the problems and issues they had with the tool during the assessment process and indicated that the tool did not live up to their expectations. The main areas of concern were a lack of features, and bugs experience during the use of the system. Interestingly, the change in the short answer results is also reflected in a reduction of positivity in the corresponding quantitative scale. However, it is also worth noting that despite the limitations of the tool, a many of students still expressed a positive attitude towards Google Docs.

### Feedback

Section three of the CAQ aimed to discover student perceptions of the early feedback mechanism made possible by the cloud assessment learning environment. The short answer question from this section was *“What do you think about your lecturer being able to give you assignment feedback before the due date?”*

Regarding the responses to the feedback related question, it is worth highlighting that not a single negative response was given either before or after engaging with the cloud assessment learning environment. The post assessment responses remained consistent with the pre assessment responses with the majority of comments being positive in nature. Many of the students saw the feedback mechanism as a safety net that would help them to stay on task and also as a means for improving the quality of their submitted work.

### Cloud Storage

The fourth section of the CAQ was focused on student perceptions of having their assignment document stored accessed, and submitted through the cloud. The question from this section was *“What do you think about having your assignment stored online and automatically submitted on the due date?”*

The short answer responses from this section revealed a number of key perceptions shared throughout the student group. Generally, students appeared to see online storage as positive, however a number of students seem to express initial mistrust with regards to the technology. This mistrust was later compounded by reported reliability problems with Google Docs. The students also appeared to be divided concerning automatic submission, many saw the aspect as a motivating positive, while others felt the feature restricted their ability to complete last minute work and submit the assignment late. Interestingly, a number of students preferred being able to submit their work manually as opposed to waiting for automatic submission.

### Preference

The Preference section of the CAQ focused on students perceptions of using the cloud assessment learning environment and associated technology (i.e. Google Docs) for the assessment as opposed to a traditional assessment environment with a desktop word processing tool (i.e. Microsoft Word). The short answer question from this section was *“What do you think about using an online word processor (Google Docs) for this assessment instead of a traditional desktop word processor (Microsoft Word)?”*

Based on the short answer responses prior to engagement with the environment student preference varied regarding the use of an online word processor as opposed to a traditional desktop word processor. Although many indicated a preference for Google Docs, a large number also noted a perceived lack of features. Also, a notable number of students also indicated a preference for a traditional word processor often citing familiarity and better features as the reasons.

Post engagement, the short answer responses revealed that students had mixed views which largely varied depending on their individual experiences. Some students appeared to have had a positive experience with Google Docs and valued the online tool over traditional desktop solutions. Students also noted that the concept behind Google Docs for assessment was essentially ‘good’, however they felt let down by the actual implementation. Other students reported a mixture of positive and negative experiences with many focusing primarily on aspects they found frustrating, in particular, the lack of familiar formatting features emerged as a common concern.

## DISCUSSION

The results from the first CAQ provided insight into the research samples perceptions of the cloud assessment learning environment prior to engagement. Likewise, the results from the second CAQ provided insight into student perceptions after having engaged with cloud assessment learning environment. The CAQ included five sub sections relating to various aspects of the cloud assessment learning environment.

## Monitoring

The quantitative results suggest that before engaging with the cloud assessment learning environment students viewed the feature of the environment that enabled their lecturer to monitor their progress as slightly on the positive side of neutral. The short answer responses added depth to this statistic by revealing that the students had mixed opinions about this aspect of the environment with the majority of students expressing positive viewpoints which included non-specific positive remarks, and positive remarks with a specific focus, i.e. feedback, motivation, and helpfulness. However, a number of students also expressed concerns relating to this feature, these concerns included remarks relating to constant scrutiny, lecturer misunderstanding, lecturer inconsistency, and compulsion to change approach (i.e. start earlier than normal). Interestingly, this mix of opinions was also expressed through the initial class interview, the initial concept map collection, and participant observations of the research sample during the same time period (data not presented in this paper). Overall, prior to engagement, students seemed positive regarding the monitoring features of the cloud assessment learning environment but also had some reservations relating to how it would be used in actuality.

After engaging with the cloud assessment learning environment the quantitative results reveal that the slightly positive view students had previously expressed, had significantly increased (from 3.57 to 3.98,  $p = .04$ ). The short answer responses relating to this aspect of the environment also support this shift and reveal an increase in the number of positive written responses and a decrease in the number of concerned responses. The short answer responses appear to suggest that the majority of the concerns that were initially expressed had been alleviated through experience (i.e. initial fears did not become a reality and therefore were not expressed post engagement). Again, this increased acceptance of the monitoring aspect of the cloud assessment learning environment also emerged from a number of the other data sources including the second class interview, the second concept map collection, the focus group interviews, participant observations, and virtual participant observations (again data that has not been presented in this paper). Overall, after having engaged with the cloud assessment learning environment students viewed the ability for their lecturer to monitor their progress as a positive.

## Google Docs

The Likert scale results from the first CAQ suggest that students initially viewed the use of Google Docs as an overall slightly positive aspect of the cloud assessment learning environment. The short answer results from the first CAQ support this slightly positive initial view. Interestingly, many of the positive responses appear to have come from students who had not used Google Docs before, but were expecting a positive experience. This initial positive expectation regarding Google Docs was also noted in a number of the other data sources including the initial concept maps, initial class interview, and participant observations (data not presented in this paper).

In contrast to the quantitative scale results from the first CAQ, the results from the second CAQ suggest that students ended up viewing the use of Google Docs as an overall slightly negative aspect of the cloud assessment learning environment. A paired sample T test revealed a statistically significant drop in the results relating to the quantitative Google Docs scale (from an initial score of 3.45 decreasing to 2.88,  $p = .01$ ). This decrease of .57 was also the largest change out of the five cloud assessment scales. These results suggest that after engagement, student viewed the use of Google Docs more negatively than they had prior to engagement. The short answer responses also support this notion of increased negativity with the number of positive comments decreasing and the number of negative comments increasing (when compared to the results from the first CAQ). Although there still remained a comparable number of positive comments regarding the use of Google Docs post engagement, the contrast with the first CAQ results suggested the change represented an apparent shift in perceptions.

One noticeable change in the short answer results was the obvious lack of expectantly positive comments. Having engaged with the cloud assessment learning environment, students were no longer in a position to express an opinion based on expectations, but instead were able to express opinions based on experience. Another noticeable change was the increased number of negative comments relating to the various limitations and bugs students had experience through their use of Google Docs. This overall change in perceptions regarding Google Docs was also reflected in other data sources from the study.

The change in student perceptions regarding the use of Google Docs within the cloud assessment learning environment is one of the most obvious changes observed in this study. This change in perceptions can be seen to stem from the difference that existed between student expectations and the eventual experience had by students. The results suggest that many of the students initially had high expectations regarding Google Docs and unfortunately for many, it appears these expectations were not met.

## Feedback

The early feedback mechanism made possible by the cloud assessment learning environment was viewed as a



very positive aspect of the environment according to the scale results from the first CAQ. Based on the results from the first CAQ, the early feedback feature of the environment was viewed as the most positive out of the five cloud assessment sub scales. The short answer responses from the first CAQ also support this view with the overwhelming majority of comments being positive in nature, with only a few responses expressing a mixed view (e.g. conditionally positive so long as the feedback is appropriate). Interestingly, there were zero negative comments provided relating to this aspect of the cloud assessment learning environment.

The Likert scale results from the second CAQ were almost identical to the results from the first CAQ with regards to the early feedback aspect of the cloud assessment learning environment. Again, the results suggest that the early feedback mechanism was still perceived as very positive from a statistical standpoint (4.40 up from an initial 4.38). As with the first CAQ, the short answer responses from the second CAQ also support this positive view of the feedback mechanism. Interestingly, the early feedback mechanism within the cloud assessment learning environment is made possible by the collaborative features of Google Docs. In contrast to the results from the previous section, where through experience students perceptions of Google Docs became more negative, the results from this section indicate that student perceptions of this particular aspect of the cloud assessment learning environment are essentially unchanged and remain positive (despite the feedback aspect being a core feature of Google Docs). This unchanged positive view of the feedback mechanism of the cloud assessment learning environment is also expressed through a number of the other data sources from the study (data not presented in this paper). It is also worth noting that the feedback aspect was also the most commonly cited positive aspect of the cloud assessment learning environment.

### Cloud Storage

The scale results of the first CAQ indicated that the online (cloud) storage and automatic submission aspect of the cloud assessment learning environment was also perceived as a positive by the research sample. The short answer responses also support this view with the majority of comments being positive in nature, many of which cite a perceived reduction in workload and reduced concern regarding the loss of work. The initial written responses also included a number of concerns regarding privacy and security factors related to the online cloud storage. This generally positive perception also emerged as a theme in many of the other data sources included in the wider study.

The results from the second CAQ were consistent with those from the first, and suggest that students continued to view the online storage aspect of the cloud assessment learning environment positively. However, it should be noted that there was a slight drop in the Likert scale results (4.30 down to 4.13), however this was not found to be statistically significant ( $p = .37$ ). The written responses also remained consistent with those from the first CAQ however there was a slight drop in the number positive comments which was coupled with an increase in the number of students who elected not to provide a written response to the short answer cloud storage item in the second CAQ.

It was interesting to note that a number of students expressed a degree of mistrust regarding the automatic saving feature of Google Docs. For this single aspect of the cloud assessment learning environment a number of differing themes emerged from the data, these included a positive view relating to the convenience and reliability of online storage, a mistrust regarding the automatic saving feature, and a generally positive view of the automatic submission feature.

### Preference

The first CAQ revealed that from a statistical perspective, students did not have an overwhelming preference for the cloud assessment learning environment over a traditional approach. Interestingly, this seemingly neutral quantitative result becomes more complex when the short answer responses are considered. The written responses relating to preference indicate a mixed view was held by the members of the research sample with an almost even spread of positive, mixed neutral, concerned and negative responses. This mix of short answer responses also suggests that the quantitatively neutral result may have been caused by a levelling out of different opinions.

The Likert scale results from the second CAQ are slightly less favourable than the initial results, however the resultant scale mean scores remain relatively consistent (2.96 down from 3.11). Again, when the scale results are viewed in light of the short answer responses, the same pattern emerges as was seen in with the results of the first CAQ (i.e. a mix of responses). The main theme that emerged from the post engagement written responses was the notion that the idea behind the cloud assessment learning environment was good, however the implementation did not live up to expectations due to limitations and bugs experienced within Google Docs.

## CONCLUSION

This paper sought to present an investigation into student perceptions of the cloud assessment learning environment. Specifically, the study aimed to answer two main research questions that looked at student perceptions of positive and negative factors of the environment and whether or not there is a conceptual change in student understanding of the environment.

### Positive and Negative Perceptions

A number of key themes emerged from the study that highlighted aspects of the cloud assessment learning environment that students perceived as either positive or negative, these will now be summarised.

The feedback mechanism was universally viewed as a positive aspect of the cloud assessment learning environment. The online storage aspect was viewed as either positive or negative and appeared to be dependent on the student's user experience (i.e. whether or not students had experienced bugs). The automatic submission feature was also viewed as either positive or negative. However, this perception appeared to be dependent on student's personal preference and was not found to be associated with the student's user experience. The limited feature set was predominantly viewed as a weak negative by the research sample, with many becoming content with this issue. Bugs experienced within the Google Docs system emerged as the most significant negative aspect of the cloud assessment learning environment as perceived by the research sample. This negative perception appeared to be dependent on individual students user experiences, accordingly the significance of this negative perception varied across the research sample ranging from a mild inconvenience through to an intense dislike for the entire system. Interestingly, the research sample felt that overall, the positive aspects of the cloud the assessment learning environment outweighed the negatives with only those students who had experienced significant bug related issues subscribing to the alternate position.

### Conceptual Change in Understanding

The second research question covered in this study focused on conceptual change in student understanding of the cloud assessment learning environment over time. In order to address this research question the same data was collected both prior to and after students had engaged with the cloud assessment learning environment. This dual collection provided data that allowed a comparative analysis of students' conceptual understanding of the environment pre and post engagement.

The study concludes that there is a conceptual change in student understanding of the cloud assessment learning environment over time. Prior to engagement students had a simple, hopefully expectant conceptual understanding of the environment. The environment was generally viewed as interesting, new and potentially very beneficial. Students expressed a curious excitement and initially had a number of unanswered questions relating to the environment.

After the assessment, students' conceptual understanding of the environment had changed from simple and hopefully expectant to a clearly refined, detailed, and experienced based understanding. Where students had been initially generally positive about their expectations, students had become very specific about what they understood as positive and negative aspects of the environment and based these views on first-hand experience. Accordingly, the unanswered questions initially expressed by the students were no longer present post engagement perceptions. Interestingly, the conceptual understanding that emerged prior to engagement was generally consistent across the entire research sample, in contrast, the final conceptual understanding that was captured post engagement tended to vary significantly depending on the individual student's user experience with Google Docs. Although there existed variation in the conceptual understanding possessed by students post engagement, each member of the research sample was seen to undergo a similar change from simple and expectations based to detailed and experienced based. Initial student expectations were primarily positive, whereas actual student experiences were more balanced between both positive and negatives aspects of the environment.

Ultimately, this paper has provided a unique insight into student perceptions of the cloud assessment learning environment. It has utilised an extensive multi method, multiple data collection research design for both quantitative and qualitative data (although only a subset of this data has been presented here). The study has provided interesting findings relating to an emergent area of computer use in education for learning and assessment and has consequently made a unique contribution to the literature in its associated areas. Finally, the study has provided a solid foundation for future research into cloud assessment learning environments that may allow others to test the outcomes of this study in their own unique educational contexts.



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