Using Video Diaries to Record Student Attitudes and Emotions towards Mathematics in Year Three and Year Six Students

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Accessing children's feelings and attitudes towards mathematics is a challenging proposition since methods for data collection may be fraught in terms of bias and power relations. This paper explores a method using iPads and a video diary technique not dissimilar to the 'Big Brother" room with which many children are familiar. We describe the development of the tool and process when implemented in a primary school setting. We allude to both the enabling prospects of the technique as well as some of the limitations we found when implementing the method.

A key difficulty for researchers is determining the attitudes of primary school students towards mathematics. The focus of this paper is the student experience of using iPads to discuss attitudes and feelings about school mathematics and it addresses the methodological implications of using iPads. Much of the research into student attitudes investigates secondary schooling contexts where students have the option of physically opting in or out of mathematics. The primary school context investigated in this research is different to secondary contexts in that students have no option to physically opt out of mathematics but may well be psychologically opting out by distancing themselves emotionally and attitudinally from mathematics. The cause of the opting out of mathematics appears to rest on the premise that many students demonstrate negative attitudes and emotions to mathematics and that these negative experiences of mathematics are associated with anxiety, shame, inadequacy, anxiety and hopelessness (Frenzel, Pekrun, & Goetz, 2007; Prawat & Anderson, 1994).

Literature Review

Our specific focus is a synthesis of research into the use of video diaries as a means of gathering data from primary school students to help determine why disengagement with mathematics occurs. Although we used iPads as the recording device in our study, the device shares many of the affordances and limitations of video recordings used in the research we critique. Despite the fact that the use of video recordings is in itself a novel research methodology (Buchwald, Schantz-Laursen, & Delmar, 2009), its proponents argue that using videos enables researchers to collect data of a more profound, compelling quality, than the data normally collected in interviews, surveys, or observations (Lundström, 2013; Noyes, 2004). In this critique we consider notions of student voice and narrative; students as central agents in the data collection process; student comfort with technology; and ethical issues of personal privacy and self-disclosure. In the body of the paper we will argue that the use of iPads enables a researcher to more authentically establish when the first signs of mathematical withdrawal occur. The essence of this research is gaining knowledge concerning the students' thoughts, feelings and emotions as they engage with school mathematics and thus we relied heavily on student voice and ongoing narratives regarding their experiences. The limited literature available suggests

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that the use of videos encourages students' voice and the telling of personal narratives (Buchwald, et al., 2009) and argues that student voice is critical as it can often be problematic for adult researchers to understand the world view of students.

A common research concern involving children is the asymmetrical balance of power between them and the adults with whom they interact and children are largely conditioned to this adult-child dynamic and have developed strategies to deal with adult intervention whereby 'honest' responses are minimal and 'correct' responses are offered instead (Bogdan & Biklen, 2007). The use of videos may be a mechanism to reduce the power imbalance and minimise the tendency of children to seek to please adults. Lundström (2013) suggests that video diaries can be a means of empowering participants to speak authentically of the experience under investigation and to thereby "create representations of their own experiences (p. 7). This opportunity to create accurate representations is particularly relevant in research on primary school students whose means of written self-expression may be limited.

In the initial research work of Noyes (2004), the students were able to video themselves whenever they chose; however, they were not able to delete and/or re-record their videos. Therefore, the use of the iPads to self-record video diaries adds an additional degree of freedom to the participants in our research as they are in complete control of the entire recording process. In practice, as in the work of Buchwald et al. (2009) and Lundström (2013), this meant that students had control over creating a video or not; determining what they would like to say; and then editing or deleting the material afterwards if they were not satisfied with the result. By virtue of this facility, the participants, and the subsequent data, are less influenced by the agenda of the researcher (Lundstrom, 2013). In addition, the act of recording a video demonstrates a degree of comfort in the process and a willingness to share personal narratives (Buchwald et al., 2009). It was evident in the data collected in this project that the majority of students were comfortable with using the iPads to record and share their stories and that, in one sense, the camera appropriated the various roles of audience, friend or adviser (Buchwald et al., 2009).

The apparent high degree of rapport and comfort established with the video recording process, and the subsequent sharing of thoughts, feelings, and emotions, has obvious ethical implications for research of this kind. Therefore, maintaining student privacy is particularly important in video research such as this as the recorded material is easily identifiable and may include information harmful to relationships between teachers and between peers (Noyes, 2004). A related issue is ensuring the confidential storage of the recorded videos, as gaining access to the videos would constitute a significant "breach of confidence" (Buchwald et al., 2009, p. 17) and diminish the likelihood that the students involved would authentically record their thoughts, feelings and emotions.

We have indicated earlier in this critique that the use of videos offers a richer body of information than can be collected from surveys, observations or interviews. This is of obvious benefit to the researcher as the recordings can be replayed as many times as necessary to closely scrutinise the data, thus avoiding possible misconceptions present in other forms of data collection. In addition, it is also a relatively simple task to transform the video material into text for analysis using tools such as Leximancer or Nvivo (Buchwald, et al., 2009). However, the very richness of the data can itself be a challenge in terms of analysis and interpretation (Lundström, 2013) particularly in instances where non-verbal data is also being analysed as the video footage places greater demand on the researcher's knowledge of the context, the students, and on non-verbal cues (Noyes, 2008). Noyes

(2004) suggests that, due to the increased complexity of the analysis task, there is a heightened onus on the researchers to bring a high degree of reflexivity to the analysis task and "to understand this filtering/translating process so as to reinterpret as thoroughly as possible the original contribution and how it forms a part of the considerably bigger picture that is the child's habitus" (p. 203). This process can be hampered in that the opportunity to further probe the data is limited (Buchwald, et al., 2009). Nevertheless, Noyes (2004) indicates that "despite the epistemological challenges of constructing and interpreting video data, there is considerable value in using this medium as a means for exploring children's broader social history" (Noyes, 2004, p. 207).

The body of research presented here suggests that video data collection, cognisant of the provisos noted, is a highly appropriate methodology for researching the thoughts, feelings and emotions of children. It is apparent that this form of data collection can encourage children to offer data that is unlikely to be gathered using more traditional methods of classroom data collection. The suggestion is that video diaries provide a mechanism for a deepened investigation of the experiences of participants over an extended period of time (Buchwald et al. 2009). It also affords the researcher the privilege of being privy to "otherwise inaccessible aspects of the students experience" (Noyes, 2004, p. 207).

Methodology

Using video diaries as a mechanism for identifying students' experiences in primary (elementary) mathematics, we sought to develop the method using an iPad, rather than a digital video camera. An iPad was provided for each year level along with a small tent to create a "mathematical thinking space". Students were able to use the iPad camera to record their musings, and if they needed, they could also take photographs of schoolwork relevant to their conversations. One of the researchers met with the teachers and students on a weekly basis so that a rapport with the researcher developed. Written prompts (e.g. If I was to speak to mum and dad or my principal about mathematics what would I say to them; If I were an animal, when I do maths I would be a… because) were placed within the tent. In analysing the video experiences, we followed the approach established by Noyes (2004) and focused on critical incidents that "provide significant insights into the object of inquiry" (p. 205) over the course of the ten week data collection phase of the research. We thus draw upon illustrative videos that demonstrate the affordances and limitations of the use of the iPads to collect relevant data concerning students' experience of mathematics.

Two classes of year 3 and year 6 students, in one school, participated in the study. The total number of students involved in the study was 105. Two tents were erected, one in each shared space for the two-year levels. Students were able to enter the tent whenever they chose, within the boundaries of the usual classroom teaching requirements. This was usually in the time when students would be seated doing individual work or when they had completed set tasks. Teachers often reminded students that they were able to enter the tents so as to promote the recording of videos. 116 individual video entries were recorded. The video entries were regularly downloaded and then deleted from the iPad to enhance student privacy. The videos were transcribed and then coded using NVIVO. As the focus of this paper is the research methodology, we concentrate the discussion on data concerning the themes addressed in the critique of the literature.

Results and Discussion

Presented initially is a descriptive examination of the data including individual video entries, entries by year level and gender, and multiple entries by individual students (Table 1). In terms of percentages of students to record a video, of the 105 students involved in the study, (67/105 or 64%) recorded at least one video. In terms of gender, (42/67 or 63%) of the entries were from female students and in terms of year level (40/67 or 60%) of the entries were recorded by year 3 students.

Table One
Total number of video entries by gender and year level

Year Level	Male Entries	Female Entries	Total Entries	No of individuals recording a video
3	25	53	78	40
6	19	19	38	27
Combined	25	42	116	67

These data suggest that students were comfortable using the iPads to record a video as approximately 64% of the students did so. We take this as evidence for the success of the iPad as a means of accessing student thoughts about mathematics. The high relative percentage of female students recording a video, as compared to male students, may account for the overall largely negative response towards mathematics. This finding is in line with much of the current research that suggests a higher level of negativity towards mathematics by female students than their male counterparts. What is interesting, and perhaps contrary to expectation, is that the gender split in year 6 was practically equal both in terms of numbers of individual students recording a video (14 F to 13 M) and identical in terms of videos recorded (19 each). The year 3 gender split was much more pronounced both in terms of numbers of individual students recording a video (28 F to 12 M) and also in terms of videos recorded (53 to 25). Whilst it is perhaps not surprising to see that the year three students were more willing to discuss their thoughts than the year six students; the fact that many of the Year 3 videos were negative has implications in terms of the teaching of mathematics in the early primary years as it suggests that the withdrawal from mathematics occurs earlier than first thought.

It is immediately apparent from the data (116 videos from 67 students) that a number of individuals recorded multiple videos. To ensure that a small number of students did not skew the data in terms of positive or negative attitudes towards mathematics, we also sorted the data according to number of entries per student (Table 2). Pseudonyms are used in the description of any particular students in the study and S3, S29 etc. indicate that the student did not use their name in recording the video.

There were a further ten students who recorded two videos each. Despite these multiple recordings, by far the greater number of students (47) only recorded a single video during the ten-week period. In terms of percentage, of the students who recorded a video, 70% of them only recorded a single video, and this percentage remains consistent when separate year level data are examined. The data indicates that Beatrice, Paul and, to a lesser extent, Sonia were very willing to share their thoughts about mathematics. It is beyond the scope of this paper to determine why this is the case; however, future research will examine the experiences of Beatrice and Paul as two case studies. In terms of this paper, there was no

distortion of the proportion of positive or negative comments overall as Beatrice was largely negative about mathematics and Paul was largely positive about mathematics. The remainder of the discussion will focus on the themes identified in the literature review to determine whether our findings match or challenge previous findings.

Table Two
Frequency of individual students with three or more separate video entries

Student	Year level	Gender (M/F)	No of diary entries
Beatrice	3	F	11
Paul	3	M	10
Sonia	3	F	6
Charlie	3	F	4
S3	3	F	3
Jane	3	F	3
Joseph	3	M	3
Hank	6	M	3
S29	6	M	3
S20	6	F	3

Student in control and comfort with technology. Overall our data suggests a significant level of comfort with the research design. This is a point of divergence from the Noyes (2004) study as our research participants were in total control of the process. They could record as much or as little as they liked, and also had the opportunity to delete and re-record their work at their discretion. The iPads also had improved functionality for young students for them to easily record photos or videos of the mathematics they were completing. Indicative student comments regarding the research design include

> I love this place…what can I talk about today? With maths you can count sheep, you can count other stuff. It is a really good thing to keep on doing math because you keep on getting smarter.

> Hi, I like working in groups because I like co-operating with other people and it is funner than sitting at your desk writing things out. So that's all I feel like saying at the moment, thanks. Bye.

> Sometimes maths is blah – I don't really want to talk. I don't like mathematics. Goodbye.

In addition, it was clear that while recording their videos, many students felt as if they were directly talking to the lead researcher. The lead researcher visited the classrooms on three occasions before the study commenced and also visited the classrooms each week so the students likely grew quite comfortable with his presence. Indicative comments include

> (Researchers Christian name), tell me, why do we have to do maths it's just so hard and boring. Like my times and my takeaway and my division and my plusses. Why are they all hard? I don't really know (Researchers Christian name).

> Bye (Researchers Christian name). And if you know someone called Vanessa, tell them I said hi. Have fun watching this video.

> Thank you for my diary visit. Amen.

This phenomenon was much more prevalent with the year 3 students. The researcher's name was mentioned on 12 occasions by year 3 students but not once by the year 6 students. However, although the year 6 students did not address the lead researcher by name, they appear to be speaking to him directly in terms of the various salutations at the end of their transcripts including

> *So that's how I feel about math and what we have been doing, so hope you enjoy it, bye.*
>
> *I've got to go finish it in my book now so see ya.*
>
> *Just so you understand, I'm doing this (photo of work included).*

Student voice and personal narrative. One of the primary reasons for using the iPads was to encourage authentic student reflection on their experiences of mathematics. The high degree of comfort that the students displayed in using the technology indicated to us that they felt comfortable in discussing their thoughts. Although it is difficult to verify the veracity of the student videos, the range of positive and negative responses suggests a certain level of integrity in the process. We suggest that this is the case because the students felt they did not need to be telling us what they thought we wanted to hear. Indicative student comments include

> And it's just a big blob of confusion and it makes me frustrated that I can't understand it. I want to understand so I can do good in the rotations but it's just like a big blank. It makes no sense at all. It's really confusing.
>
> Hello, Yah! I got everything right. I got everything right. I love math. See, see, I knew all the answers (shows workbook). I'm so excited, Yah. And everyone is angry with me because I got everything right. Yeah, but I did really well today so I'm really happy.
>
> It absolutely sucks. And it sucks because it's hard and you have to do it every single day. Most people just have to do math all the time and I don't like doing math all the time.

Non relevant data / reflect on data. We did not experience the potential complication of students recording non-relevant information as occurred in Lundström's (2013) study as there were minimal occurrences of non-mathematical content being recorded. On two occasions only, year six students each individually recorded a series of comical faces. However, both students then proceeded to record a thoughtful video. We also experienced minor examples of non-mathematics entries including

> Oh, one more thing. Do you want to see my nose hairs?
>
> Like I'm good at doing the splits, I'm not lying. My friend Josh, he can't do the splits.

Although we provided students with approximately a dozen prompts for them to use when they were in the diary tent, these prompts were largely unsuccessful in encouraging student reflection. When students did use the prompts, they responded with abbreviated, one sentence answers such as "I would tell mum I don't like maths" or "I like plussing".

Ethics - Personal disclosure and privacy of data. As foreshadowed in the critique of the literature, there are a number of unique ethical concerns in using the iPads to collect and store data. An initial concern was that students would disclose personal issues, not related to mathematics, as reported by Noyes' (2004) and Lundström (2013). Whether the ability to delete videos was a factor or not, we did not encounter any experiences whereby

personal, non-school related videos were recorded. However, this is not to imply that the students did not self-disclose as they recorded highly personal videos concerning mathematical self-identify, self-esteem and affective responses relating to their experiences of mathematics. Indicative student comments include

> I feel embarrassed because people laugh at me because they're smarter than me and then I feel sad.
>
> I don't like maths and maths makes me want to feel sick.
>
> Doing maths just thrills through me and I just can't get it out.

We did encounter a small number of comments indicating that students were concerned that other students or teachers might be listening to their work e.g.

> What is most annoying is when I'm videoing myself, people come and put their ear to the tent and listen to me and I hear them and I see their shadow. I don't want them to know what I feel when I'm doing maths cause they'll tell Mr (Class Teacher) and I'll have to go to tutoring and I don't like it.

In addition, some students were concerned that other students or their teachers may watch their video before it was downloaded and deleted e.g.

> I prefer her (student teacher) to Mr (Class Teacher), sorry Mr (Class Teacher) if you're watching this, but she's good at teaching it better.

This may have been a factor in the skewed distribution, in terms of year level, of recorded videos. Although there appears to be an overall level of comfort with the process, the year 3 students recorded twice the number of videos than the year 6 students. We suggest two possible reasons for this difference. Firstly, in the year 3 classrooms, the tent was located in a corner of the double teaching space where teachers could see it; however, the year 6 tent was in a separate room between the classrooms. It could be the case that the year 3 teachers were more comfortable with students using the tent in terms of student safety and time on task than the year 6 teachers and this encouraged greater use of the tent space. Secondly, in addition to recording more videos, the year 3 students (22/40) were much more willing to identify themselves by name than the year 6 students (6/27). This may be linked to an increased awareness in the year 6 students that others (including teachers) may be listening to and later viewing their work and also an increased awareness of the potential consequences if their privacy was breached (of course this ignores the fact that if teachers were viewing the videos they know who the students are without the named identification).

Implications

Firstly, we need to find a better way to engage with a greater number of students. There were 105 students involved in the study with 64% of them recording a video. Whilst this is an acceptable level of engagement, the range of data collected was reduced by the fact that 70% of the students who recorded a video, only recorded one during the 10 weeks of the study. While this is a low rate, it is still better than would be expected of more traditional methods such as voluntary surveys thus providing a promising return via this method. The balance to be struck in future research is to encourage students to record a video without coercing them to do so. The more coercive the process, the more likely that students will record what they think the researchers want to hear, or will record negative videos more to do with the process than with mathematics. As we alluded to at the start of this paper, we

are seeking to develop a tool that will enable more reliable data in relation to personal aspects of mathematics learning. Coercing more participation may defeat the purpose of engagement with the tool as a tool for accessing this aspect of the students' experiential learning. Secondly, a means to make the videos more private is required as it was possible, during small windows of time between downloads, for students to see the videos recorded by other students. However, having raised this concern, there were no reports of students accessing other students' videos and the potential of this happening was minimised by the regularly downloading and deleting of videos from the iPads.

Conclusion

We suggest that the use of iPads as a tool to collect the video diaries was highly successful. The students in this research appeared very comfortable with their use and no specific iPad training was required. Students had full control of whether or not to record their thoughts about mathematics. Having decided to record their thoughts, they then had the option of easily watching what they had recorded and, if necessary, deleting and re-filming their diary entry. The degree of negativity concerning mathematics expressed by the students indicates that mathematics education may be in troubled times. More importantly for this paper, the honesty of the students suggests that the use of iPad video diaries is an appropriate methodology to use in research involving young children. If we are to address the decline in positive attitudes towards mathematics, apparent at earlier year levels than previously thought, we need to continue to listen authentically to student voice.

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References

Bogdan, R. C., & Biklen, S. K. (2007). *Qualitative Research for Education. An introduction to theories and methods* (Fifth ed.). Boston: Pearson Education.

Buchwald, D., Schantz-Laursen, B., & Delmar, C. (2009). Video diary data collection in research with children: an alternative method. *International Journal of Qualitative Methods, 8*(1), 12-20.

Frenzel, A. C., Pekrun, R., & Goetz, T. (2007). Girls and mathematics – A "hopeless" issue? A control-value approach to gender differences in emotions towards mathematics. *European Journal of Psychology of Education, XXII*(4), 497-514.

Lundström, M. (2013). Using video diaries in studies concerning scientific literacy. *Electronic Journal of Science Education, 17*(3).

Noyes, A. (2004). Video diary: a method for exploring learning dispositions. *Cambridge Journal of Education, 34*(2), 193-209. doi: http://dx.doi.org/10.1080/0305764041000170056l

Prawat, R. S., & Anderson, A. L. H. (1994). The affective experiences of children during mathematics. *The Journal of Mathematical Behavior, 13*(2), 201-222. doi: http://dx.doi.org/10.1016/0732-3123(94)90024-8