

# **Small scale Educational Action Research Project: Assisting Adult Learners Develop confidence in Mathematics – A Contemporary Approach to a Traditional Problem**

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*The WIT Certificate in General Studies (formerly the WIT Certificate in Foundation Studies) course is targeted towards educationally disadvantaged adults. The aim of the course is to equip the learner to successfully take part in mainstream higher education. The research targeted these return-to-education adult learners within the mathematics modules only and attempted the sensitive and equitable assessment of mathephobic adult learners of maths: equitable because assessment must be reliable and redeemable; sensitive because the majority of these cohorts present with varying degrees of mathephobia.*

During my early years of engagement with these learners I experienced a so-called ‘critical incident’ causing me to research a ‘better’ way to assess such cohorts without the need for diagnostic tests and traditional entrance examinations. It was at that stage I examined the potential of learning journals in assessing adult learners of mathematics both initially and going forward; I also saw an opportunity for the learner to self-assess thus empowering the learner at the same time as building their confidence. A subsequent critical incident provided me with an idea to experiment with PowerPoint presentations as a means of confidence-building in the learners. Through collaboration and groupwork presentations on the impact of mathematics on society were delivered and peer-assessed. Subsequently this practice has been retained as an integrated part of the mathematics module continuous assessment regime.

## **The Learning Journal Experiment**

The experiment had multiple aims:

- Sensitive assessment of mathematics ability;
- Early ‘diagnosis’ (self-assessment) of ‘issues’ allowing earlier intervention and, ultimately prognosis;
- Instructor-learner dialogue
- Building up of interpersonal relationship

The benefits of the journal were ultimately multiple and diverse and the experiment’s aims were ultimately achieved. To highlight the diverse but positive benefits I have decoupled the learner and tutor and examined the benefits from each perspective.

### **Learner benefits:**

- Indirect relationship built with the instructor – shyness or reticence overcome;
- Self-image intact – ‘freer’ environment than class room to express true feelings/thoughts/opinions etc;
- Learning journal becomes a ‘monument’ of learning snapshots – successes were ‘replayed’ during tougher times. One learner commented on this aspect as the ‘this too, shall pass’ benefit of the journal;
- Confidence-building – firstly in mathematics, but anecdotally the benefits were visible across other subjects subsequently. Some learners commented on this aspect as being very positive for them;

### **Instructor benefits**

- Sensitive assessment of numeracy and mathematical ability of cohort. Dignity of learners respected – vulnerability and fear around mathematics and mathematics education handled appropriately;
- On-going dialogue established with learners – openness increased and superficiality decreased as dialogues developed - a perception of equality established;
- Early intervention by instructor was facilitated meaning an improved prognosis for course completion on the learners’ behalves. This illustrated a new depth to the learner-focussed ethos of the journal;
- Interpersonal relationship built facilitating an open and honest dialogue with learners – ‘the wounds of a friend are better than the kisses of an enemy’ benefit to both parties;

Although the benefits to the journal for mathematics assessment are mainly positive, the experiment highlighted several significant drawbacks to such an undertaking. From a workload perspective, the journal has the potential to become a burden. Weekly reading of entries and following-up involved much time and effort, as did the initial ramping-up period where reflexive workshops were needed ultimately to train the learners in the reflexive process; Jenny Moon’s work in this area was beneficial. On-going monitoring in the early stages was time-consuming until a ‘system’ for handling this was developed.

Further significant drawbacks are:

- Fabrication of ‘critical incidents’ by learners: constructing incidents in order to simply write something thus achieving a continuous assessment grade. Accounts were obviously ‘made up’ by learners, while others refused to go to any depth worth reporting preferring instead to remain at arms distance emotionally, detached and in some cases superficial. An open, honest dialogue with these learners was nearly impossible;
- Learner objection to reflexivity: not to be underestimated. Learners who disengaged from the process remained disengaged despite the consequences of forfeiting part of their continuous assessment grade. In all cases, these were learners who were achieving in any examinations;

Overall, the research found that a minority of just 15% of surveyed respondents disliked using the journal; 35% were neutral. Half of all respondents liked using the journal, mostly favoured amongst low- or non-confident learners. The findings showed a higher proportion of confident/competent learners disliked using the journal. Moreover, regularity or frequency of journaling seemed to correlate with respondents' measured confidence levels.

Half of all respondents liked writing about how they feel about mathematics; with nearly one-quarter disliking it. These data showed some low-confidence learners, who found mathematics difficult, liked using the journal. Why was this the case? Perhaps these learners identified benefits with journaling, possibly to communicate with their tutor and share their problems and difficulties with mathematics. By journaling regularly, perhaps these learners were able to 'deal' with their problems by making them explicit rather than allowing them to remain internalised, perhaps alleviating stress or anxiety. Findings by Selfe et al (1996) and Lanigan (2006) may provide insights in this context. They found journals provided a written account of the students' progress as seen not only by the instructor but by the student as well. The awareness provided by this exercise thus helped improve confidence and self-esteem in the learner, helping to create a more conducive learning environment.

In the final analysis of the journal experiment, the aim of the research was to find any link between confidence and competence in mathematics. The data showed that for non-confident learners of mathematics 41% reflected more frequently due to the journal; 38% reflected more deeply (increased reflexive and decreased descriptive writing); 36% saw evidence of increased ability; and remarkably, 42% preferred quality of reflections over quantity.

Furthermore, 40% were motivated to continue using the journal out of personal motivation, moreover 27% stated they would continue using the journal regardless of whether a continuous assessment grade were applied to its use or not. Almost 40% of non-confident learners were able to identify learning strategies to assist them with learning mathematics competently. A third claimed their instructor was provided with insights into their individual learning issues through the use of the journal in mathematics.

Benefits to confident learners were as good or better in most instances.

### **The Collaborative PowerPoint Presentation Experiment**

The overall aim of this experiment was to promote or increase the learners' awareness of and practicality of mathematics in the world around us. I hoped the learners would become aware of the everyday usefulness of mathematics and would counteract what Diana Coben termed 'invisible maths'. The experiment was influenced by the work of Howard Gardner's Multiple Intelligences theory, and would not be considered a typical kind of '3-Rs' assessment. I believed that if the experiment was a success, it would be measured by means of a paradigm shift in these learners' attitudes towards mathematics.

## Benefits of the Presentation to the Adult Learner

Awareness of mathematics around them was highlighted in post-presentation reflections. For example, a portion of learners highlighted the fact that although they had learned something from doing their own presentation, they learned far more from their colleagues' presentations in some cases. This is a very useful 'surprise' to emerge from the experiment. It highlights the benefits of collaborative teaching and of having the 'fun factor' within the mathematics classroom. Learners identified they were relaxed and relieved to have presented and were therefore more open to the presentations of their colleagues. Some learners identified an increase in their assertiveness and confidence through the exercise of presenting on mathematics to their peers. Indeed some showed deep levels of reflexivity and insightfully pointed out they were, in fact 'teaching' mathematics to their peers and colleagues through this exercise. This is a very important insight to have come out of the entire experiment.

## Benefits to the Instructor

One of the most surprising happenings to emerge from this experiment is that of the creation of new ideas for teaching traditional mathematics topics. Having witnessed firsthand, the uniquely creative manner in which some learners presented on topics in mathematics, I was enthused personally and professionally to approach them and seek their permission to utilise their unique perspective on the topic in my own classes in subsequent years. All those I have approached over the years have readily agreed to my requests and to say they are flattered is to understate immensely the pride they feel in themselves. Confidence is built in moments such as these.

Further benefits to the instructor include the truth about the collaboration process: the exercise of collaborating with colleagues (for better or for worse) is revealed in direct and open personal, guided, post-presentation reflections. This aids the instructor's task immensely when awarding a final grade for the team. Although the presentations are peer-assessed, I retain a veto on grades which I am very up front about with the learners prior to the exercise. It's as fair as possible under the circumstances.

## Drawbacks to the Presentation

- Time consuming to assess; fifteen to twenty teams presenting from anywhere from 5 to 15 minutes each;
- Level of mathematics involved can be light-weight in some due to various reasons e.g. lack of confidence, lack of motivation, lack of work-ethic, etc.;
- Level of mathematics involved can be heavy in some due to over-reaching on information and attempting to cover too much too fast; not being aware of the audience's level of mathematics is a contributing factor to the failure of such presentations;
- Technology: not preparing for it to fail! Poor knowledge of PC and/or data projector; poor knowledge of embedded multimedia files such as video and mp3 files etc.

## Overall Presentation Findings

The findings showed that 90% of respondents learn best in practical, hands-on classes. I feel there is some potential bias in these results due to the reticence of some adult learners towards so-called ‘theoretical’ classes. 89% claimed their views or attitudes changed regarding their awareness of mathematics and its everyday practicality.

In the final analysis of the entire experiment as a whole, it was found that:

- Journal-keeping positively benefited ‘honest’ learners;
- Weekly journaling built confidence in the learner;
- The Presentation positively impacted upon learner self-efficacy;
- Overall confidence improved;

To provide some evidence for the findings discussed above, I have included some quotations from learners to highlight specific findings and provide evidence. Rather than provide multiple quotations from many learners I chose to utilise one learner’s reflections to illustrate the personal nature of the journal. Some other smaller quotations are used from a selection of learners as supporting evidence for the findings.

### **Confidence-building...**

*“...now I know more maths than I have ever known in my lifetime of maths at school...I am no longer afraid of maths. I’d have more confidence in myself to tackle [maths] or apply for jobs or courses that involve maths, a road on which I would have never travelled before.”*

### **Further Confidence-building**

*“MATHS DOESN’T SCARE ME ANYMORE...Hip hip hurrah!”*

*“I have heard nothing but nightmare stories on this subject”,*

*“...It’s all about understanding what’s being asked (words like ‘deviation’), finding averages. I’m no longer scared of starting something new (what you sow you reap).”*

### **Instructor-learner dialogue with ‘Mary’**

*“...just hope I get more confident with numbers because they still frighten the life out of me...fractions! Algebra! I can’t believe I can understand them let alone do them! It’s great I really feel good about it, like I have achieved something already! Thanks Michael, I keep looking at the maths and smiling, thinking ‘I did that’ WOW!”*

### **Ongoing dialogue example – Mary**

*“Had a chat with Michael today, got some stuff that was worrying me off my chest. He asked me to sit up the front of the class for maths from now on. It’s a bit scary, like I’ll have nowhere to hide anymore!!! Maybe that’s a good thing? Funny how something like my fear of numbers can have an affect on my whole life?”*

### **Dialogue with Mary cont'd...**

*“I sat up at the top of the class today like Michael had asked, it’s mad but I was very nervous, felt really tense at first!!! But after a bit I calmed down, I think I even took in more, I actually managed to do the maths questions he gave us and got them right!! Can’t believe it, and with no one beside [me] I had to trust my own judgement. I came out of maths today with a little bulb over my head and I felt very proud. I hope that tomorrow I don’t start to clam up again because there’s no nicer feeling than when you understand something. It’s put a beautiful smile on my face. Normally when I’m in maths class I like to feel invisible but when I sat at the front today I had nowhere to hide. Thanks Michael, maybe I have taken my first step in the right direction?”*

### **Mary’s conclusions...**

*“...even though numbers still frighten the hell out of me I have come to realise sitting down the back of the class won’t make them go away, that the best thing to do is sit right up the front and face them, because if you sit there and look at them, I mean really look at them and not just think ‘Oh no, I can’t do these!!’, they’re not as scary as they first seemed! I’m not going to run away any more, when the going gets tough I’m just going to get tougher. Thanks Michael for making me believe in myself.”*

### **Concluding quotes...**

*“...I have achieved so much in these last few months. Facing up to my fear of maths has changed my life in so many ways!!! It’s hard to believe but it’s made me a much more confident person. I’m no longer that shy person trying to hide at the back of the class so Michael won’t see me. I can even look him in the eye now when he asks me a question instead of at the floor.”*

### **A Happy Ending...**

*“When I think of maths now it does not make me feel like a total freak!!! I now know if I give myself time to sit down and look at it I can find an understanding of it now...I have a much greater understanding of the subject today than I ever dreamed possible. I know that I made the best decision of my life the day I decided to take a second chance. Its great to be able to just sit down with my kids and help them with their homework without having to say “you’re going to have to ask daddy to do that with you love” because now...I can do my kids homework with them!!!”*