Changing perceptions among adult learners (19+) in further education studying GCSE mathematics: Methodology and data analysis- the importance of the pilot study

By

Jenny Stacey

Sheffield Hallam University

a0025098@my.shu.ac.uk

Setting the scene

- General Certificate in Secondary Education (GCSE) Mathematics: Level 2 qualification for 16 year olds, marker exam for university entrance in tandem with Level 3 qualifications

- Many adults are on a non- traditional pathway into Higher Education

- Expanding opportunities, higher earnings, promotion, or secure employment in nursing, teaching, policing, social work, software development…

- 30 650 adult learners in England enrolled for GCSE maths exam in 2020 (Gov.UK, 2020)

- Approx. 10% of the total

- Follow on from Functional Skills

Purposes of Investigation

- To add to our understanding of the diversity of both the students and their perceptions of mathematics and examinations: are confidence or anxiety levels, or both, related to exam success?

- To fill a gap in our knowledge: there is much existing work on maths anxiety for school aged children, adults in HE provision (Evans, 2000), adults on numeracy courses (Griffiths and Stone, 2013) and 16-18 year olds in FE (Dalby, 2012), but less on adults (19+) in FE provision on GCSE courses

Purpose of the pilot study: To develop the knowledge and skills of the post graduate researcher prior to the main data collection

- Does the questionnaire give sufficient information to formulate answers to the research questions?

- Did participants find it easy to understand and use?

- Is an analysis by themes helpful for understanding the data collected? What themes could be explored?

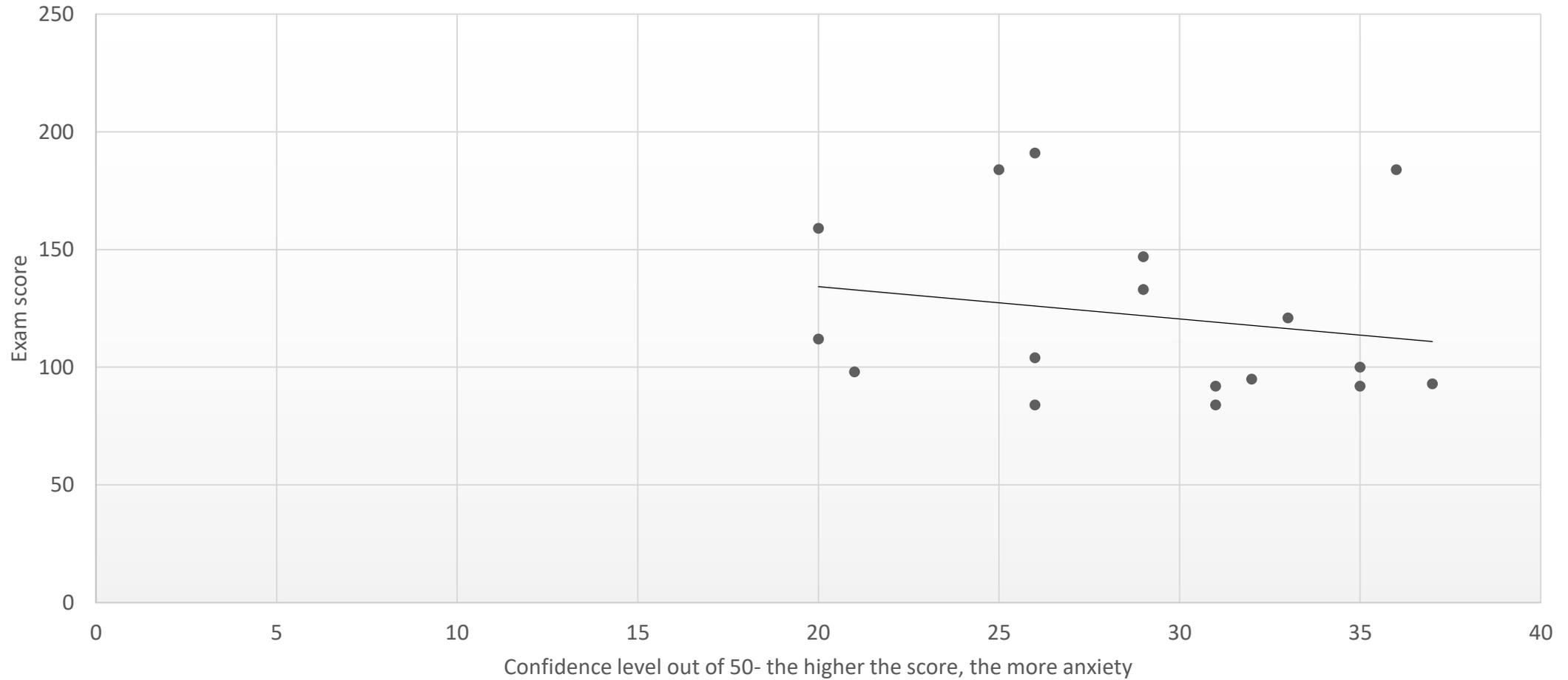- Do I need to collect exam scores or grades or both?

Action research project using mixed methods (Biesta, 2017) Materials tested(1-3) and used(4-5) in pilot study

1. Information letter
2. Consent form
3. Questionnaire was based on the AMAS questionnaire but altered to Mathematics and Examinations Confidence Scale (MECS), a single Likert scale 1-5 from 'very confident' to 'very anxious' plus 1 additional question and a comments space
4. Feedback form 1: MECS vs Abbreviated Mathematics Anxiety Scale (AMAS) questionnaires
5. Feedback form 2: staff presentation

COMPARISON BETWEEN CONFIDENCE LEVEL AND EXAM GRADE FOR 18 ADULT LEARNERS

EXAM GRADE

CONFIDENCE LEVEL OUT OF 50- THE HIGHER THE SCORE, THE MORE ANXIETY
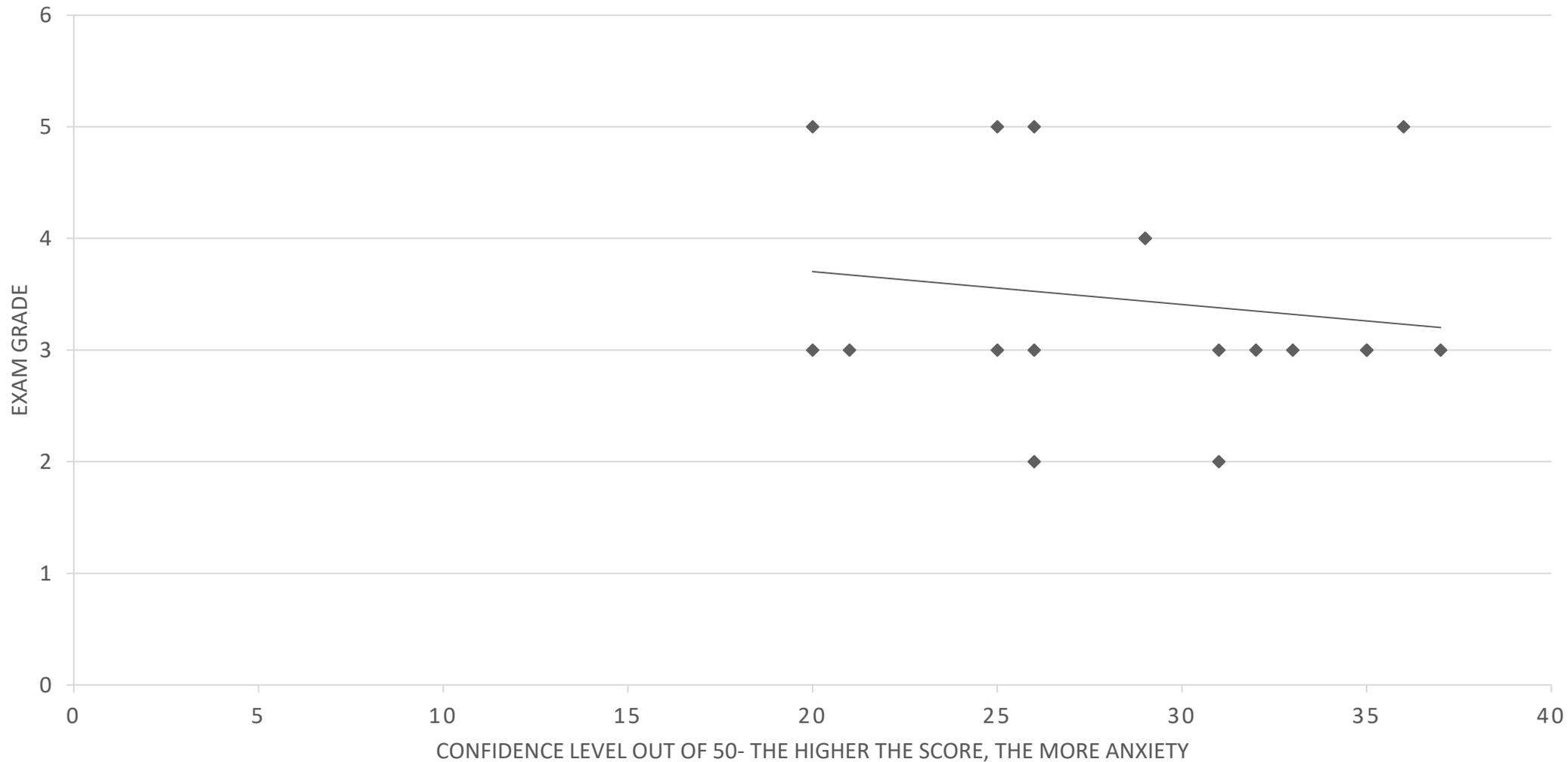
Comparison between confidence level and exam score for 18 adult learners

Exam score

Confidence level out of 50- the higher the score, the more anxiety

Gender as a theme:
Comparison between confidence level and exam score for 6 male adult learners

Exam grade

Confidence level out of 50
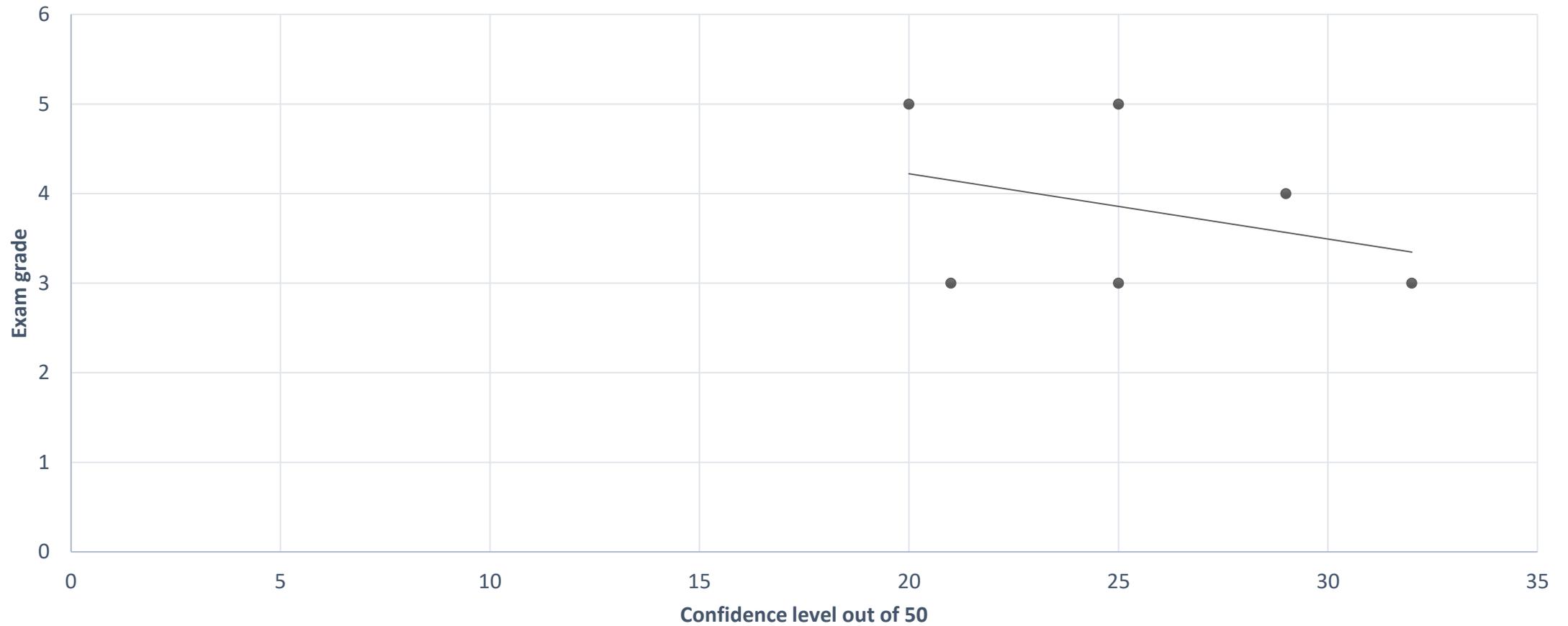
AGE AS A THEME:
COMPARISON BETWEEN CONFIDENCE LEVEL AND EXAM GRADE FOR LEARNERS UNDER THE MPV FOR AGE: 38.5 YEARS

EXAM GRADE

CONFIDENCE LEVEL OUT OF 50
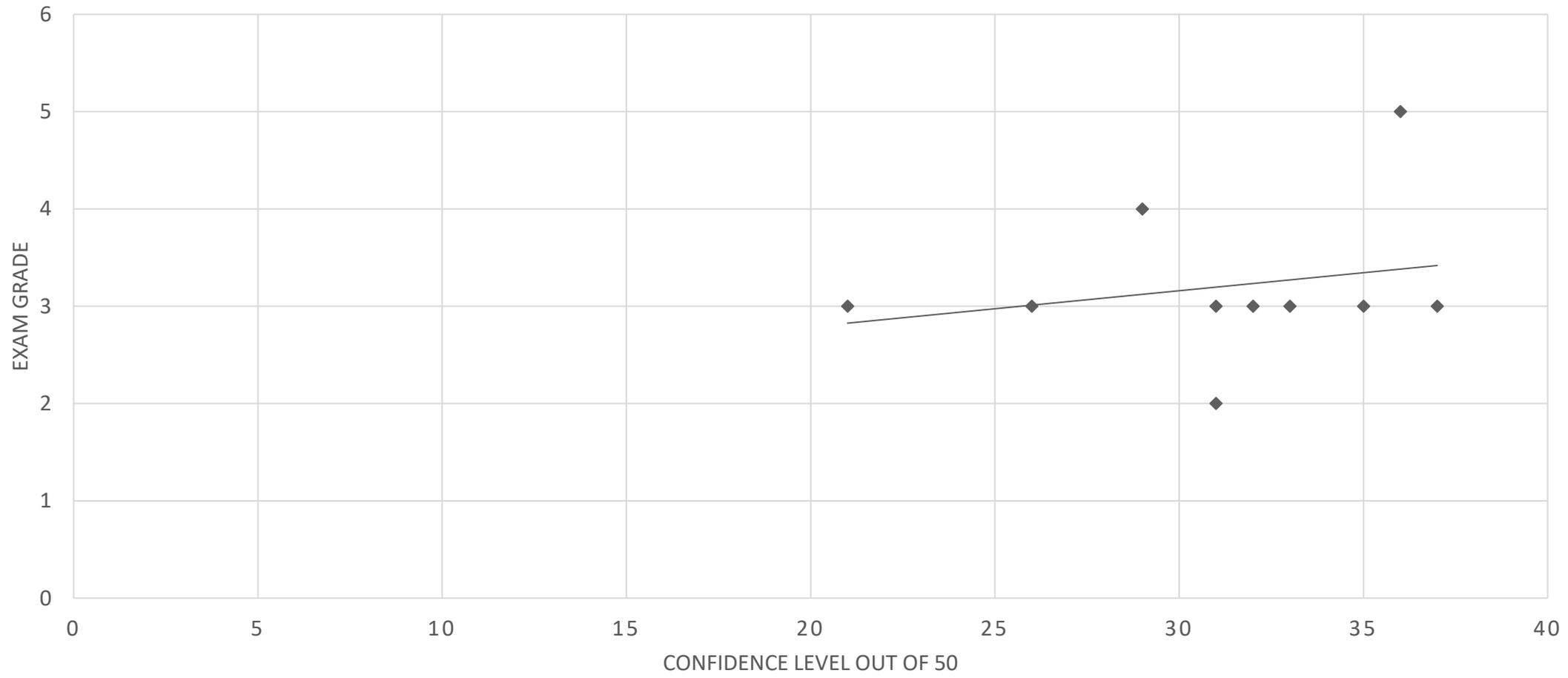
Question number and main topic	Mean average response per question (3 is neutral)	Range on Likert Scale	Number of comments per question	Positive comments	Negative comments
Q1 x table grid	2.05	1 to 4	8	6	2
Q2 maths test next day	3.7	2 to 5	11	5	6
Q3 algebra question	2.65	1 to 5	12	7	5
Q4 maths GCSE exam	3.6	2 to 5	12	2	10
Q5 other GCSE exam	3.45	1 to 5	8	3	5
Q6 tricky homework	3.05	2 to 4	8	4	4
Q7 listen to teacher	1.55	1 to 2	9	9	0
Q8 listen to a student	2.7	1 to 4	8	2	6
Q9 maths quiz	2.9	1 to 5	11	5	6
Q10 new topic	2.7	1 to 5	8	3	5
Other			10	6	4 exam time

Examples of comments on exams, maths exams and maths tests

- I am always anxious on the day; I am worried that I won't be able to think straight; I am scared of failure and remembering facts
- The feeling of failure is always there
- I am not feeling confident; I get nervous before hand; Thinking about it is worse than taking it
- The desire to pass and the anxiety causes a mental block; It's the exam situation that causes me to freeze
- Extremely nervous; in a class a test is far different from an exam

Comments on MECS questionnaire and a comparison of MECS vs AMAS

- Verbal comments: The AMAS form predisposes for anxiety; I did feel my anxiety was justified and listened to, and that made a difference; It was a validation- it's okay to feel this way about an exam

- Written comments: Prefer not having anxiety written as that can stir up anxiety; Starting a scale with the word would make me more anxious; Prefer having a comments section as you are able to make sure you are fully understood; Sometimes it is not a simple as 'yes' or 'no', and need more of a description for explanation, comments are good; It gives the student more opportunity to express themselves; I like the re-wording from American to English for better understanding

Staff feedback post pilot study

- Include a question on the exam environment? As a college we need to investigate if there is an impact when we remove students from the Sports Hall- No

- Remove 'anxiety' from the questionnaire? Change anxiety to low and/or no confidence- Sort of! Two scales separated.

- Obtain approval for students' scores, rather than grades- No

- Extreme bias of the sample so issues of validity: optional and my students- Yes

- Issue of significance due to small sample size- Yes

Conclusions drawn from the pilot study

- The questionnaire needed more work: include geometry, word problems; cluster questions on testing- exams, maths exams, test, quiz etc

- Gender as a useful theme: males may have a clearer correlation between confidence and results, so the more anxious are less likely to pass, females may be anxious even when they get the top grade, so there is less correlation between confidence/anxiety and results

- Age also a useful theme- younger learners more anxious than older learners- higher stakes?

- Small sample sizes: stronger patterns may emerge in the main study

- There is no evidence that learners will not use all 5 points on the Likert scale

- Participation must be optional to 'do no harm'

- Inherent bias and volunteer bias both present in studies that use volunteers.

- There is evidence that learners liked to be asked about their confidence levels, which may have an impact on their results- collection of data can on its own affect the outcome

References

Ashcraft, M. H. (2002). Math Anxiety: Personal, Educational and Cognitive Consequences. *Current Directions in Psychological Science*, 181-185.

Bandura, A. (1997). *Self-Efficacy: The Exercise of Control.* New York: W. H. Freeman & Co.

Biesta, G. (2017). Mixing Methods in Educational Research. In R. Coe, M. Waring, L. V. Hedges, & J. Arthur, *Research Methods & Methodologies in Education (2nd Edition)* (pp. 159-165). London: Sage.

Braun, V., & Clarke, V. (2013). *Successful Qualitative Research.* London: Sage Publications.

Cohen, L., Manion, L., & Morrison, K. (2018). *Research Methods in Education (8th Edition).* Abingdon, Oxon: Routledge.

Creswell, J. (2012). *Educational Research (4th Edition).* London: Pearson.

Dalby, D. (2012). From failure to functionality: a study of the experience of vocational students with functional mathematics in Further Education. *Informal proceedings: BSRLM*, 55-60.

Evans, J. (2000). *Adults' Mathematical Thinking and Emotions.* London: Routledge Falmer.

Gov.UK (1). (2020, June 22). *Education and training aim, participation and achievement demographics*. Retrieved from Statistical Data Set- Education and Training:
 https://www.gov.uk/government/statistical-data-sets/fe-data-library-education-and-training

Griffiths, G., & Stone, R. (2013). *Teaching Adult Numeracy: Principles and Practice.* Maidenhead: Open University Press.

Hopko, D., Mahadevan, R., Bare, R., & Hunt, M. K. (2003). The Abbreviated Math Anxiety Scale (AMAS): Construction, Validity and Reliability. *Assessment: Volume 10*, 178-182.

Spiegelhalter, D. J. (2019). *The Art of Statistics- Learning from Data.* London: Pelican Books.

Stacey, J. (2017, June 17). Mathematics and Examination Anxiety in Adult Learners: the findings of surveys of GCSE Maths students in an FE college in the UK. *All Hands on Math- Proceedings of the 24th International Conference of Adults Learning Mathematics* (pp. 113-121). Rotterdam: alm-online.net. Retrieved from Adults Learning Mathematics: http://www.alm-online.net/wp-content/uploads/2016/12/ALM24-

Swan, M. (2006). *Collaborative Learning in Mathematics.* London/Leicester: NRDC/NIACE.