2019 cohort

Thomas Pearson – Chemistry Teacher

Can Metacognitive Skills Improve Student Exam Performance and Reduce Test Anxiety?

I compared the results of the students from the studied school on extended response questions to the national average. I drew data from the AQA biology paper 1 and 2 from 2019. I used the biology papers due to the high number of questions that required prose in the answer compared to a higher amount of mathematical processing required in physics and chemistry.

The results demonstrated a 6% drop below the national average on extended response and focussed questions compared to a 4% drop on standard 1–4-mark questions.

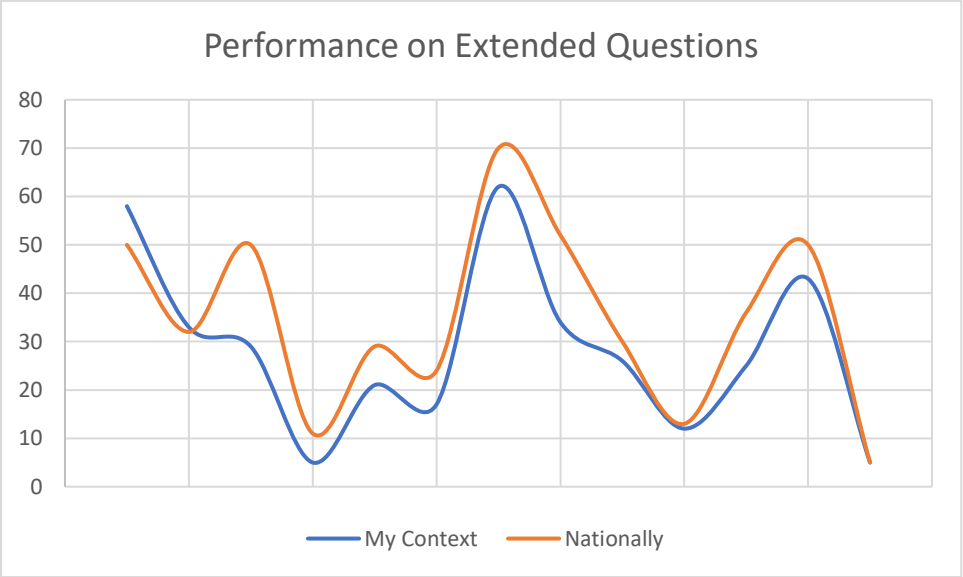

Figure 1 – Student performance on extended exam questions compared to national average. Data obtained was obtained from the AQA for combined science. The Y-axis denotes percentage of marks, and the X-axis is an arbitrary question number.

I then polled different year 11 classes as they left mock exams to understand their thoughts and opinions on extended response questions. The word cloud highlights some of the most frequent expressions that the students used.

What is interesting here are the number of responses from students that mention the inherent difficulty of the question. This includes "too many lines", and "too much writing". That is either a sign that the style of the question is difficult for them, or that the student is not adequately motivated to provide an answer. Even if there is time left for the student at the end of the paper, they decide to put their head on their desk instead of attempting something difficult!

I believe one of the main obstacles to performing on extended response questions lies in test anxiety (Hembree, 1988). Anxiety is best understood as a negative emotional state without a specific object (Reber, 1995). Anxiety in exams is differentiated as being specific to a situation and

context where students feel under threat (Spielberger & Vagg, 1995). Several distinct themes arise from analysing the root of this emotion (Denscombe, 2000).

Metacognition is a collection of skills and knowledge that bring about the feeling of knowing (Tarricone, 2011). Wolf, Brush and & Save (2003), acknowledges it as the knowledge of self, the task at hand, and strategies to be employed". It is a highly important skill for effective pupil learning. Students with well-developed metacognition are aware of their strengths and weaknesses, can organise thoughts effectively and implement strategies to overcome difficult tasks (Labuhn, Zimmerman & Hasselhorn, 2010).

Students develop metacognitive skills as they mature, but many from disadvantaged backgrounds are less likely to develop these skills (Macleod, Sharp, Bernardinelli, Skipp & Higgins, 2015). A large proportion of students from the studied school can be regarded as being from a disadvantaged background with 42.8% being classed as eligible for pupil premium. Veenman (2002), recognises that multiple types of test anxious students can exhibit poor metacognitive skills. Zeidner and Mathews' (2005) self-regulatory model explains that metacognition features as a central role in how a student responds to anxiety.

This project aims to teach students metacognitive skills and make metacognition explicit. Instead of simply utilising a scaffold to teach students to address tasks, I set out to enable students to create their own metacognitive cues to be used in exams.

The project utilised pre and post study questionnaires designed to analyse student awareness of metacognition, test anxiety and motivation to complete tasks. There was a baseline test with several extended response questions and then the same test at the end of the study. Their thoughts and feelings were also recorded in session diaries throughout the study.

The interventions consisted of me initially explaining the background material and introducing the idea of planning, monitoring and evaluation. I taught enough science content for students to then be able to engage with the planning task. An extended response question was then posed, and students were asked to design an answer plan in their diaries. The second and third interventions followed a similar structure, with the exception that students were taught metacognitive cues. These cues were discussed and refined as a group before students got the opportunity to further practice planning and answering extended response questions.

Four main questions emerged from studying the problem of student capability on extended response questions. When using metacognitive skills:

1. Can student attainment be improved?

2. Can students' motivation to tackle questions which they would usually avoid be increased?

3. Can students' anxiety be reduced?

4. Are students more focussed and documenting less task irrelevant responses?

The main two data collection sessions, the first and the fifth, had eleven participants. They were given the same exam questions for both the baseline test and the concluding test. It was encouraging to see that the numbers of marks scored on the two tests did increase by an average of 26% across the sample group.

There were two notable exceptions of students who did not improve quantitatively. One of the two students wrote a plan and some thoughts in their diary; however, they did not have enough knowledge to score any marks on the extended response questions. In the case of the second student, they decided to spend the final session on their phone, before quickly writing a plan down in their diary and not adequately addressing the questions.

The post-study questionnaire demonstrates that four students now have exam techniques at their disposal, who previously answered that they did not. The questionnaire asks the participants to

explain how they would answer a six-mark question, and the slide displays the four responses. The content of these responses is derived from the metacognitive cues featured in the intervention sessions. Phrases like "use previous questions to answer new ones", and "link things together in a conclusion", originated from discussing which cues were most helpful to the planning process.

Overall anxiety levels have dropped over the course of the interventions, although not a single student claims not to feel anxious at the prospect of an exam.

My goal is to disseminate my research within the Science department in the studied school. I expect that my findings are applicable to the Science department as a whole. The output of upcoming work will include the refining of the metacognitive cues, with an accompanying guide on best practice for use within lessons and mock exams to allow my colleagues easy access to the pedagogy.

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