2016 cohort

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Do some flipping work! How does setting flipped learning style tasks before a lesson impact on pupil abilities to answer higher order questions in A-level Physics?

In 2018, A-level Physics students achieved higher mean marks than GCSE combined science higher tier students in AO1 (recall) and AO2 (apply) style examination questions, but lower mean marks in AO3 (evaluate, analyse) style questions. [1,2] AO3 questions are the only group to show lower scores at A-level, indicating higher demands of AO3 questions at A-level compared to GCSE. This is also supported by the AQA examiner report on the 2018 A-level Physics exams, "AO3... Questions of this nature tend to be of high demand" is the opinion put forward by examiners. [1]

That the average A-level student has stronger AO1 and AO2 skills, we might expect as the Physics A-level cohort is presumably a more motivated/interested subset of the GCSE science cohort. However, this improvement is not present in higher demand questions, and this trend of a struggle with higher demand questions exists both nationally [1,2] and within my own school context.

A survey of teacher's attitudes to the new specification of A-level Sciences (introduced in 2016-17) I conducted at my school revealed that most teachers anecdotally how found it difficult to adjust to the increased demands of the new specifications while the amount of content remains similar.

From the student perspective, the proportion of study time spent on Physics has increased more than 5 times in the transition from GCSE to A-level, but much more time is expected to be spent learning independently – A student who completes 25 hours of timetabled GCSE lessons and a further 12.5 hours of homework each week will have to double their time spent on independent study in the GCSE to A-level transition.

A strategy to aid this transition is therefore essential, but we must be mindful of student's struggles with higher demand questions, and the pressure on teachers to complete all the content of an A-level course in the time available to them.

In order to address the problem of lower scores in these higher demand questions, I thought to introduce an intervention targeted at improving independent learning skills – in particular, if students are able to work on lower order skills before a lesson, this could free up lesson time to work on higher order skills.

The intervention involved a 5 point checklist designed to help students make a start on the particular AO1 (e.g. recalling definitions) and AO2 (e.g. applying formulae to simple problems) skills required for the lesson topic. The checklist included: Title (given to the students at the end of the previous lesson), specification reference (to increase student's awareness of how much of the

course has been completed, and which specific areas of the specification are strengths and weaknesses for them), all key definitions in the topic, all key equations in the topic (to start building AO1 skills), and a set of summary questions from the text book (aimed at building AO2 skills). These summary questions demand far less than examination style questions and should be accessible to students without much support.

Independent learning is a hot topic in educational research, Hockings et. al. (3) used a large scale qualitative study across several higher education institutions to suggest that ***"students initially use low level reinforcing and organising skills"*** *and later* ***"develop higher level extending and applying skills"***.

Thoonen et al. [4] are among those to question whether teachers can affect student's motivation to learning independently, and along with Stoten et. al. [5] put forward that *teachers should reflect more on how to facilitate independent learning*. Lau [6] suggests that *evaluating perceptual changes*, in particular self-perception of learner type is a useful tool in evaluating students' success when learning.

My primary group of students were year 12 and 13 students, but I also conducted some research with a year 7 group, and 3 year 11 groups. I selected these groups to conduct a preliminary investigation into how to build students independent learning skills from a younger age. Following a similar approach put forward by Lau et. al., I chose to use a combination of questionnaires and pupil interviews to try to elucidate any changes in learner self perception of their ability to work independently. As well as tracking student progress throughout the year using results from pre-public examinations.

I surveyed a range of students across Years 7-13 using structured questions to self-assess their independent learning skills, two major trends were evident from the data:

Students are more likely to identify as active learners in "exam season" than part way through their courses.

Student descriptions of independent work are 5 times more likely to be matched up to AO1 than AO3.

Most student's survey answers matched up with quotations from longer form interviews, with the conclusion that most students found the intervention made a positive difference to their confidence to work independently, and their confidence and focus in lessons. Most students identified themselves as more active learners than before the intervention, and this change in attitude is matched by an upward trend in exam results, although a more comprehensive analysis of the data is needed!

My analysis of the data so far suggests that the intervention represents a helpful way of structuring student's workload in the sixth form. Being explicit with students about how their workload is being structured, and how this mirrors how an experienced learner would go about studying a topic (preparation before the lesson, consolidation after the lesson) has made a positive change to student's ability to learn independently.

A natural further exploration would be to try a similar intervention in different A-level subjects, as well as different school contexts, and I plan to look into mobilising some of the RIS cohort to conduct a study across multiple schools next year.

References

1. AQA Exams Analysis GCE A-level Physics (2018) retrieved from https://results.aqa.org.uk/eAQA

2. AQA Exams Analysis GCSE Science (2016) retrieved from https://results.aqa.org.uk/eAQA

3. Hockings, C., Thomas L., Ottaway, J. and Jones, R. (2018). 'Independent learning – what we do when you're not there', Teaching in Higher Education, 23:2, 145-161

4. Thoonen, E. E. J., Sleegers, P.J.C., Peetsma T. T. D. and Oort F.J. (2011). 'Can Teachers Motivate Students to Learn?' Educational Studies 37 (3): 345–360.

5. Stoten, D.W. (2014) 'Are we there yet? Progress in promoting independent learning in a Sixth Form College', Educational Studies, 40:4, 452-455

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