Multiple choice questioning and whole class feedback

Emmanuel College

Introduction

Problem: Describe the problem or issue your innovation addresses
What challenge(s) do your school(s) have that need to be addressed?

Emmanuel College is a high performing comprehensive school in the north east of England which has been rated as outstanding for the 29 years it has been open. In addition to this, it was designated a Teaching School in 2014 and is the flagship school in a small multi-academy trust of six schools from Doncaster to Northumberland. One of the main challenges that the school faces is improving the outcomes of pupil premium (PP) or ever free school meals (FSM) pupils. As pupils who are PP or FSM are more likely to have medium- to low-attainment in primary school, the intervention will measure the impact, if any, on these pupils.

The main focus of the intervention is to assess the impact of whole class feedback on the quality of feedback, staff workload and the attainment of all pupils including those that are PP or FSM.

At the moment we have a policy of formally marking books every two weeks and leaving formative comments. This takes a lot of staff time which could be used for planning better feed-forward or follow up tasks for pupils to assess. In a number of subjects, the follow up tasks or feed-forward tasks are completed to a poor standard so that it doesn't help 'close the gap' in pupil attainment.

Pupils will complete Learning by Questions (LbQ) tasks as a means of assessing what has been taught and then staff will give whole class feedback to the pupils. This will primarily come in the form of re-teaching content that has not been learnt sufficiently well but may come in different forms such as further structured practice. By moving to a whole class feedback method (explained later) it should improve the pupil's response to feedback and in theory their attainment. Additionally, the Learning by Questions app will be used to support retrieval practice.

Additionally, the school has been approached by Gateshead Council to take more pupils due to a local school shutting down. We have subsequently needed more teaching classrooms in the school as currently we do not have planning permission to expand. Computer suites have been removed to solve this problem. When not being used for this project, class sets of tablets loaned

by LbQ can be used for other ICT based tasks that can be integrated into lessons and support the computer literacy of our pupils, as well as to trial LbQ with other subjects/year groups.

Existing evidence: What existing research evidence exists?

What does the existing research evidence say about this problem and how it could be addressed?

There is evidence that multiple choice questioning (Bjork-Bjork et al) can be used to help both assess pupils' understanding and to support pupil retrieval of information. The aim is to use the multiple choice (and other) questions within Learning By Questions during the first two terms of the year to aid retrieval and the revision of material. It will also allow staff to assess progress over time.

Retrieving information in different contexts improves long term memory (EEF, [Improving secondary science guidance report](#)).

Additionally, it is well documented that pupils acting on feedback is one of the most effective ways of improving pupils' performance in the classroom. However, the original research by John Hattie argued that pupils responding to teacher intervention is more important than pupils being given passive feedback. This is backed up by the research of Dylan Williams in his book *Responsive Teaching* and from the research that he carried out on embedding formative assessment in the classroom with the SSAT. We are keen on measuring the effect whole class feedback can have on science attainment at Key Stage 3. The mechanism for this is described in the innovation section below.

Innovation: Describe the innovation you will evaluate

Give a brief description of the innovation. What existing research suggests the innovation will help improve the problem you have identified and benefit teachers and learners?

This action plan that would be carried out by the Science department over the next year starting in the summer term of 2019. MHi is short for Matthew James Hirst the leader of the intervention.

1. MHi to send a staff voice survey on how they currently give feedback to pupils and the barriers to pupils responding to feedback.
2. MHi to work with the head of physics, chemistry and biology and map out where the Learning through Questions application could be used through the first phase of the Key stage 3 (KS3) curriculum.
3. MHi to work with the business manager/IT to look at the best way to set up the loaned

tablet sets from LBQ for the intervention.

4. MHi to work with the Schools Network department to sign intervention pupils in KS3 up to the Learning by Questions app.

5. MHi to deliver a half day CPDL session to all KS3 science departments on the intervention project and to introduce the two-term plan. However, only intervention class teachers are trained in the new approach to running lessons, using LbQ to deliver practice and feedback.

Implementation fidelity

MHi to visit intervention classes at the beginning and middle of the intervention, to ensure that the approach is being delivered correctly, and suggest any changes that are needed. Use a checklist to identify the key features of the intervention which will be shared with staff before the intervention. Half way through the intervention, week commencing16th December, MHI to lead a session evaluating the impact on teacher skill during a half-day inset. Staff voice to be taken at this point to help improve the process before the second half of the intervention.

Research question(s) or hypothesis

What effect will the intervention, implemented for how long, with which pupils, have on which outcomes?

'What impact does using Learning By Questions followed by whole class feedback delivered for 30 minutes each week for 18 weeks have on the attainment of Year 7 pupils in science knowledge when compared with business as usual.'

Method: Describe exactly how the evaluation will be conducted

Sample

Who will participate in your evaluation? What consent will be gathered for them to participate? Briefly describe the key characteristics of the setting and participants.

The innovation will be trialled in Year 7 science in the first two terms of the academic year 2019/20.

All parents of Year 7 science pupils given rationale and then the chance to opt out of the evaluation of the intervention. This does not mean that the pupils will not take part in the innovation but their data will not be shared with LbQ. As part of GDPR, the data will be anonymised for the report and if it is shared with the Institute for Effective Education. When the

data is used in house it does not need to anonymised.

Assignment to condition

How will you allocate participants to the intervention and control groups?

Year 7 science classes are divided into eight linear sets. Pupils are allocated to these sets according to their Key Stage 2 and Cognitive Ability Test (CAT) results. Science lessons for these sets are organised as follows:

W/C		Year 7 (2018-19)		
		Set		
		Sets 1-3	Sets 4-6	Sets 7-9
02/09/2019	Week 1	Induction: Lab safety & general introduction		
09/09/2019	Week 2			
16/09/2019	Week 3			
23/09/2019	Week 4	1B	1C	1P
30/09/2019	Week 5			
07/10/2019	Week 6			
14/10/2019	Week 7			
21/10/2019		Half term		
28/10/2019	Week 8			
04/11/2019	Week 9			
11/11/2019	Week 10	1P	1B	1C
18/11/2019	Week 11			
25/11/2019	Week 12			
02/12/2019	Week 13			
09/12/2019	Week 14	1C	1P	1B
16/12/2019	Week 15			
23/12/2019		Christmas		
30/12/2019				
06/01/2020	Week 16			
13/01/2020	Week 17			
20/01/2020	Week 18			
27/01/2020	Week 19			

The content for each of the section are here:

	Unit Title	Old spec references
Year 7	1C Matter 1	7G - The particle model 7E - Mixtures and separations
	2C Matter 2	7H - Atoms, elements & molecules 8F - The periodic table

	Unit Title	Old spec references
Year 7	1B Organisms 1	7A - Cells,Tissues,Organs,Systems () 7B - Reproduction in animals
	2B Organisms 2	7C - Muscles & Bones () 8A - Breathing and respiration Nutrition and digestion

	Unit Title	Old spec references
Year 7	1P Energy and Electricity	7I - Energy () 7J - Current Electricity () New - Heat transfers
	2P Forces	7K - Forces () 8J - Fluids
	3P	4.1 Sound

We are currently writing a 'knowledge led' curriculum document which will cover the knowledge that we want pupils to cover in the units C1, B1 and P1. These are based around the Department of Education's programme of study for Key stage 3, Best Evidence Science Teaching and resources produced in house.

One set from each column will be an intervention set. Another set from each column will act as a control. The sets pairings will be 2–3, 5–6 and 7–8. Pupils are setted in science using their prior attainment in maths and English coupled with their Cognitive Ability Test score.

Pre-test of pupils in the control and intervention sets. Pairs of sets will then be created that have similar pre-test scores. These pairs will then be allocated to intervention or control by a coin toss.

The pre-test will be written in house. The assessment will be written to test the knowledge that has been taught in Year 5 and Year 6 science programme of study written by the Department of Education (2013). The assessment will be written using a mixture of multiple choice based questions and fact recall questions.

The head of science and MHi to plan a CPD session that will be delivered to intervention teachers on how to use the Learning by Questions app and how to get all intervention pupils signed up to the app. Staff will then be trained by MHi in-house for a half-day session.

Attainment of intervention group is compared to the control groups through a post-test assessment using a mixture of multiple choice questions and fact recall questions.

Innovation

Describe your innovation in detail.

Lessons in science notionally have the structure: instruction – practice – feedback.

School data suggests that instruction is carried out well, but lessons are weaker on practice and feedback. To address this, intervention classes will receive one lesson a week where "practice" is achieved using Learning By Questions question sets completed by pupils in class, and feedback is delivered by the class teacher, depending on the pupils' performance on the question sets. This might involve, for example, re-teaching a misunderstood area of content to some, or all, of the class. This approach should deliver more immediate, and therefore more effective, feedback to pupils, leading to better understanding and retention of knowledge.

Control classes will continue with business as usual.

Sets (to be confirmed) in Year 7 science are to use the Learning by Questions resource for 30 minutes and staff will use whole class (or individual or small group) feedback to 'bridge the gaps' using the assessment data for the remainder of the lesson (between 15–20 minutes. Control classes will continue with business as usual.

Outcome measures

What outcome measures will you use? When and how will they be administered and scored?

Pupils in intervention and control sets will sit a pre-test at the beginning of the autumn term and a post-test two weeks after the last module.

The pre-test and the post-test will be marked by teachers who are not part of the intervention or at least not their classes. The name of sets will not be recorded on the paper so that staff have

no preconception of the ability of the pupils. The post test will also be marked by teachers who are not part of the intervention under the same format.

To measure the change in attitude towards science in both the control group and the intervention group.

Process analysis

What data will you gather for the process analysis?

All pupils to complete a questionnaire on their attitudes toward science and the use of the Learning through Questions app.

All staff to complete a questionnaire to measure the perceived effect of the intervention on their own practice and the feasibility for moving forward.

Pre- and post-test scores will be recorded to measure the impact of the intervention on pupils' scientific knowledge before and after the assessment. Additionally, pupil and staff voice surveys will be used before and after the intervention on the engagement of pupils in science to help see the impact on change of view of pupil premium (PP) and ever free school meals (FSM) pupils on science.

Process evaluation

Questionnaire for intervention teachers asking what they thought about the new approach, perhaps including whether they thought it reduced their workload.

Questionnaires for intervention pupils asking what they thought about the new approach, and perhaps for all pupila (intervention and control) measuring attitudes to science, for example:

At the pre- and post-test, pupils in intervention and control classes will be asked to rate the following statements on a scale of 1 (strongly disagree) to 5 (strongly agree):

- I enjoy science

- I find science interesting

- I like talking about science

- I am good at science

- I wish to do a science job in the future

- I feel confident that I can solve problems in science

- What has been the best part of your science lessons this year/in primary school? (open ended).

Analyses

How will you analyse your outcome and process data?

To analyse the impact, we will be looking at the overall average attainment of pupils in the paired sets from the pre-test to the post-test.

Additionally, I'll look at the impact, if any, on the progress of ever FSM with non-FSM pupils within these sets.

Conclusion

Potential limitations

What are the potential limitations of your design?

Small-scale project; sets unlikely to be directly comparable; impact of individual teachers.

Implications

What would you do if your results were positive? What about if results are negative or neutral?

If the results are positive, possible expansion into Key Stage 4 science to help pupils recap at the start of the key stage. This could be a similar programme using an education app that is based around the knowledge taught at Key Stage 4 and set out in the AQA Combined Science Specification.

References

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