Learning to teach: a focus on the personal rather than the technical aspects of teacher education

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Abstract
Textbooks on dyslexia ascertain that writing strategies designed for dyslexic students are effective, some suggesting their suitability for all students. However, there is a lack of empirical evidence to substantiate these claims (Glazzard, 2011). This paper examines these claims, by presenting the findings from research into writing strategies designed for students with dyslexia. The research was conducted within an 11-16 all ability secondary school, in the East Midlands of England. Three writing strategies were trialled over a period of six months on four science classes (yrs. 7-8 aged 11-13, n=131) containing students with diagnoses of dyslexia (n=5). Written work was assessed pre-and post-strategy, to monitor progress, using National Curriculum (NC) levelled writing tasks and compared with progress of a control class (yr.7 aged 11-12, n=28). Empirical evidence provided shows that strategies impact positively upon all students. Whilst there was variation, variance between pre- and post- strategy NC levels shows all three writing strategies produced statistically significant improvements to NC levels. The small number of students with dyslexia meant there was not sufficient data to analyse statistically, although four showed gains above the average for their class. Teaching assistants (TAs) and students asked about the usefulness of the strategies identified, they helped organise written work. However, students acknowledged they would not use them independently. Identifying frequent modelling of strategies is necessary until students use them autonomously. Strategies provide a scaffold to organise thinking, and direct writing in a logical manner. Whilst trialled within science, strategies evaluated were general, applicable across the whole curriculum.

Key words:
Dyslexia; Writing strategies; Science; KS3; NC levels.

Introduction
There is a strong, centrally driven, curricular justification for an emphasis on teaching writing within science. The Professional Standards for Teachers (TDA, 2011 para 3), require all teachers to: 'demonstrate an understanding of and take responsibility for promoting high standards of literacy, articulacy and the correct use of standard English, whatever the teacher's specialist subject'. The Teacher Training Foundation (TTF, 2017, para 16) identifies all teachers must address the 'English needs of learners and work creatively to overcome individual barriers to learning'. Wellington and Osbourne (2001, p.3) assert that language is a major barrier, if not ***the*** major barrier, to most pupils learning science, suggesting that one of the most important acts that can be done to improve the quality of science education, is to pay greater attention to the use of language.

This study was undertaken against a backdrop of changes to GCSE examinations in science (DfE, 2010). The abolition of 'bite-sized modules', which could be retaken to boost overall grades, was replaced by end-of-course examinations, requiring extended written responses in which students are expected to demonstrate: 'reasoning which is coherent, relevant, substantiated and logically structured' (Ofqual, 2017) and accuracy of spelling, punctuation and use of grammar in key GCSE

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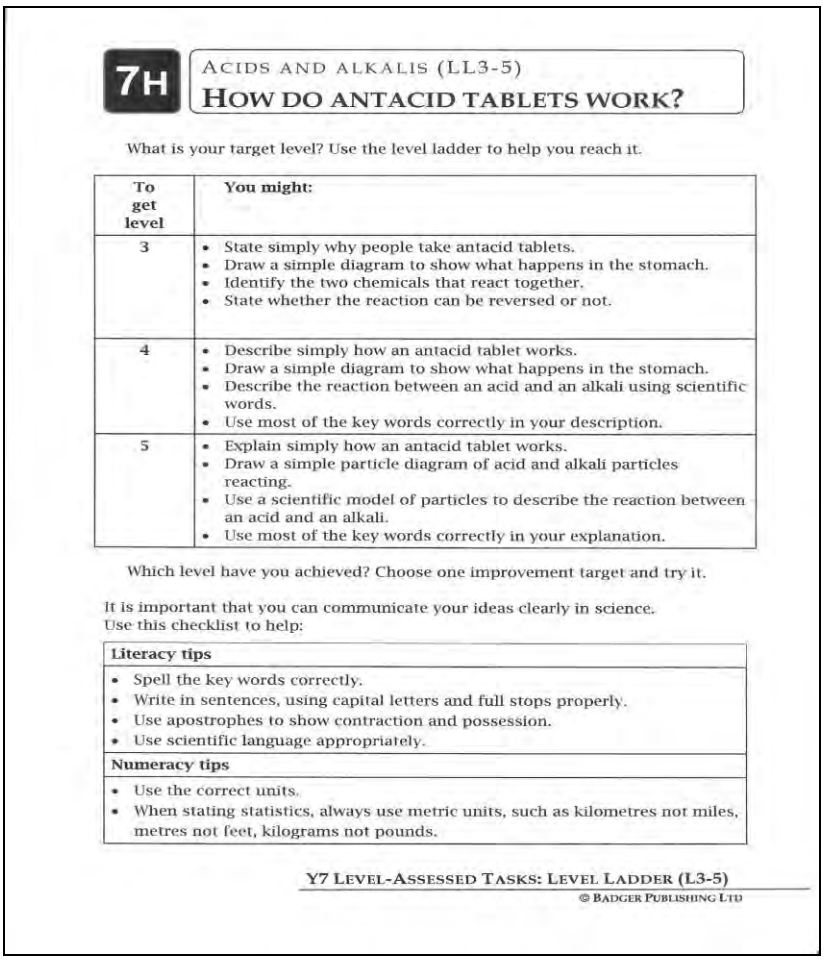
subjects essential. In response to the proposed changes, the school made extensive modification to the literacy policy. Raising standards of literacy were no longer seen as the sole responsibility of the English department; literacy activities, writing portfolios and extended writing tasks were introduced across the whole curriculum. The school, a small rural, 11 -16, mixed ability secondary school in the East Midlands of England whilst classified as mixed ability, does not have a genuinely 'comprehensive' intake. Approximately 25% of students in the school's locality pass selection tests for grammar school at age 11. The general standards of attainment of students on entry aged 11 (Yr. 7) are below average, the proportion of students within the top 20% ability band is low compared to other all ability schools, nationally. Many students 'have particularly low levels of literacy' (Ofsted, 2012).

Within the science department Badger Concept worksheets (Grevatt, 2008a & 2008b) were used as part of the routine assessment of KS3 students. These worksheets are NC (National Curriculum) levelled (DfES, 1988) and cover all three science disciplines. They require students to produce extended written work, allowing expression of ideas, knowledge and understanding which fits comfortably within the frameworks of assessing pupil progress (APP) and assessment for learning (AFL). Worksheets are levelled 3-5, 5-7 and 7-EP. Higher levels achieved as students move from stating, to describing and finally explaining, in a logical and coherent manner, the scientific concepts under assessment. Students provided with an appropriately levelled worksheet containing a level ladder to assist targeting NC levels (
Figure 1).



7H ACIDS AND ALKALIS (LL3-5)

HOW DO ANTACID TABLETS WORK?

What is your target level? Use the level ladder to help you reach it.

To get level	You might:
3	• State simply why people take antacid tablets. • Draw a simple diagram to show what happens in the stomach. • Identify the two chemicals that react together. • State whether the reaction can be reversed or not.
4	• Describe simply how an antacid tablet works. • Draw a simple diagram to show what happens in the stomach. • Describe the reaction between an acid and an alkali using scientific words. • Use most of the key words correctly in your description.
5	• Explain simply how an antacid tablet works. • Draw a simple particle diagram of acid and alkali particles reacting. • Use a scientific model of particles to describe the reaction between an acid and an alkali. • Use most of the key words correctly in your explanation.

Which level have you achieved? Choose one improvement target and try it.

It is important that you can communicate your ideas clearly in science.
Use this checklist to help:

Literacy tips
• Spell the key words correctly. • Write in sentences, using capital letters and full stops properly. • Use apostrophes to show contraction and possession. • Use scientific language appropriately.
Numeracy tips
• Use the correct units. • When stating statistics, always use metric units, such as kilometres not miles, metres not feet, kilograms not pounds.

Y7 LEVEL-ASSESSED TASKS: LEVEL LADDER (L3-5)

Figure 1: Example of a level ladder *Science level-assessed tasks: Yr. 7 concepts* (Grevatt, 2008a) Reproduced by kind permission of Badger Publishing Ltd.

I have found the disparity between the quality of oral and written work in students with literacy difficulties (SpLD) particularly those with dyslexia to be startling. Dyslexia can be conceptualised as a SpLD affecting students for whom reading achievement is below that expected on the basis of their age and IQ (Snowling, 2013). The central characteristics appear to be problems with word decoding, which subsequently affects spelling performance, reading fluency and comprehension. Students often experience difficulty with short-term memory, auditory sequencing and phonological processing, making holding verbal information, processing, organising and sorting information to answer questions in a logical structured manner problematical. Textbooks on dyslexia outline a variety of different writing strategies which provide mechanisms of organising and sorting information, to answer questions in a logical structured manner. Mackay (2006), Mortimore and Dupree (2008) and Dror, Makany and Kemp, (2011) ascertain that these writing strategies are effective in all areas of the curriculum. Further, Mackay (2006) suggests that these strategies are suitable for all students. However, Glazzard (2011) identifies a lack of empirical evidence to substantiate any of these claims. A literature search, specifically within the context of secondary science and dyslexia, similarly found little quantitative data to support the use of writing strategies, providing the stimulus for this study.

Methodology

I used an evaluative case study, whose aim was to identify and evaluate a range of writing strategies, to determine whether they improve NC levels in science KS3 students with dyslexia, and to establish if they are effective for all. Joseph Renzulli (1998) eloquently used the phrase 'A rising tide lifts all ships', suggesting that strategies for improvement (*a rising tide*) could have a wider impact in enabling all students to gain maximum benefit (*lifts all ships*). Whilst Renzulli's work was in gifted and able education, my hypothesis is that strategies to improve writing skills with students with dyslexia may similarly impact positively upon all students within the classroom. We should not assume that KS3 students organise thoughts and concepts logically. Strategies that provide a scaffolding mechanism to organise answers in a logical manner for students with dyslexia (Mortimore & Dupree, 2008) may similarly be effective with their non-dyslexic peers.

Research Questions

Can writing strategies improve NC levels of KS3 students with dyslexia?

Can writing strategies improve NC levels of all KS3 students?

Part of a larger MA study, the research was designed to comply with the ethical Guidelines for Educational Research (BERA, 2011). Written consent was gained from the Head teacher with permission to use data and findings in possible publications. Informed consent was gained from parents, students and staff who were interviewed outside of the normal classroom setting. Parent/guardians contacted first and permission sought for an initial meeting with students to explain the aims of the project. Those students verbally agreeing to the research were given a letter addressed to their parents/guardians explaining the research, its purpose, potential benefits and foreseeable risks, and how these will be managed, right to withdraw, confidentiality and opportunity to ask questions. Names and places have been removed to reduce the risk of individuals being identified.

Three writing strategies, a non-linear strategy, a linear strategy and a 'no writing' strategy, were trialled. Selection of strategies based upon the following criteria: Firstly, strategies need to be simple to use, for both staff and students. Secondly, they must tie seamlessly into present schemes of work. Further, they must engage reluctant writers, and finally and perhaps most importantly, enable

students to produce logical, structured written answers explaining scientific concepts, thereby raising NC levels.

Strategies

1 Box, underline and glance (BUGs)

A 'no writing strategy', each student is provided with a worksheet that contains information and questions. Students annotate the worksheet. Boxing instructions, underlining information to enable them answer the questions and finally, glancing back through the worksheet to check all information has been underlined. Students use their annotations to complete the questions. The strategy was trialled on two classes: yr. 8 and yr. 7 over a six month period together with a single opportune trial with a yr. 9 class.

2 Situation, problem, solution, outcome (SPSO)

A linear strategy, each student was provided with a writing frame, containing boxes labelled: situation, problem, solution, and outcome, to help organise thoughts and scaffold writing. This strategy enables students to identify and note the basic links of a story, event or science experiment. The strategy was trialled upon a yr. 8 class over a six month period together with a single opportune trial with a yr. 7 class.

3 Who, what, where, when, why, how (6Ws)

A non-linear strategy, students are provided with a writing frame with the '6Ws' as headings, each frame contained questions or prompts. The frame was then used to write a story. The strategy was trialled with a yr. 8 class over a six month period.

Strategies were trialled using Badger Concept worksheets (Grevatt, 2008a & 2008b). NC levelled, these enabled comparison across the disciplines of biology, chemistry, and physics offering, the opportunity to statistically analyse the effect of each writing strategy. The study was carried out over a six month period with four KS3 science classes that included students with diagnoses of dyslexia and students identified as having SpLD. Each class was assigned a particular strategy. The strategy was introduced and used several times, before the final assessment was made. Students and teaching assistants (TAs) were questioned during the lessons (Figure 2) to determine whether they felt the strategy made any difference to the organisation and structure of written work, and written work was examined to verify their response.

Conscious that increased maturity of students may improve NC levels, data was also gathered over the same time period, using Badger Concept worksheets, for a further Yr. 7 class (control) that were not included within the strategy trials. Single opportune strategy trials were also carried out, with different classes producing further qualitative data.

Students

- How are you getting on? (Follow up Q: would you like any help?)
- Do you think the strategy is helping? (*Follow up Q's: How? Or Why not?)*
- Would you use the strategy again?

TA

- How do you think the class are getting on?
- Do you think the strategy is useful? (Follow up Q's: Why/why not?)

Figure 2: Examples: classroom questions.

Results

Pre- and post- strategy NC levels obtained from Badger Concept worksheets were analysed using a paired-sample *t*-test with the null hypothesis being that intervention would make no difference to NC levels. To aid analysis NC levels were converted into numbers. Each NC level consists of 3 sub levels, each sub level counted as one point. Table 1 provides a summary of the statistical analyses. The probability level (*p*) used in determining *t* being ≤ 5 % with n-1 degrees of freedom.

Table 1. Summary of statistical analyses.

Writing strategy	*n*	Year group	Students with dyslexia	*t*	*p*
BUGs 1	30	8	2	5.91	<0.1%***
BUGs 2	31	7	1	2.60	<5.0%*
SPSO 1	22	8	1 *SpLD 7*	7.22	<0.1%***
6Ws 1	20	8	1 *SpLD 5*	3.12	<1.0%**
Control	28	7	*SpLD 4*	1.95	> 5%#

Key:

***very highly significant
** highly significant
* significant
# no significant difference

Analysis identifies that all strategies produced positive and statistically significant increases in student NC levels. More importantly, results from the control indicate that during the short time-span of the research, maturity has no significant effect on NC levels. Detailed results for each strategy follow:

Box, underline and glance (BUGs)

Trial 1

Yr. 8 (aged 12-13, n = 30, students with dyslexia = 2). Table 2 and figure 3 show pre-and post-strategy NC levels.

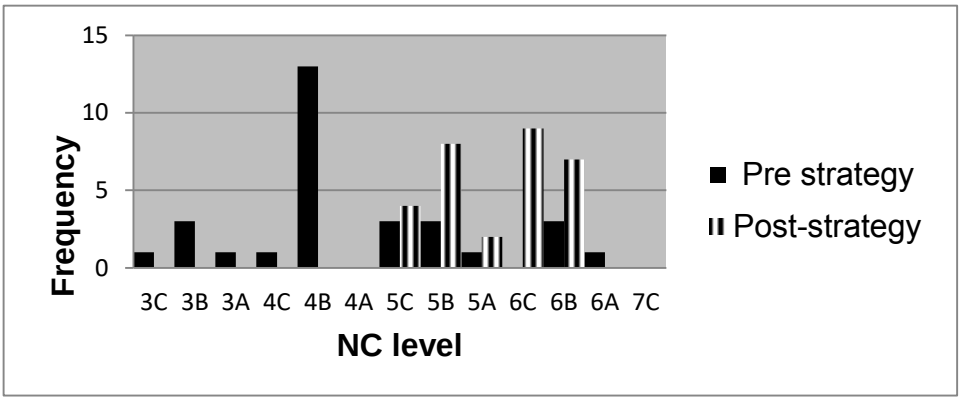


Figure 3. Change in NC levels: BUGs trial.1

Table 2. Change in NC levels: BUGs trial 1.

Student	NC level		Change
	pre	post	
B1	4B	5C	+2
B2	4C	5C	+3
B3	3A	5C	+4
B4	3B	5C	+5
B5	4B	5B	+3
B6	4B	5B	+3
B7	5B	5B	0
B8	5C	5B	+1
B9	6B	5B	-3
B10	6B	5B	-3
B11	4B	5B	+3
B12	5C	5B	+1
B13	3B	5A	+8
B14	4B	5A	+4
B15	3B	6C	+8
B16	5B	6C	+2
B17	5B	6C	+2
B18	5A	6C	+1
B19	4B	6C	+5
B20	4B	6C	+5
B21	4B	6C	+5
B22	6B	6C	-1
B23	4B	6C	+5
B24	4B	6B	+6
B25	6A	6B	-1
B26	4B	6B	+6
B27	5C	6B	+4
B28	4B	6B	+6
B29	4B	6B	+6
B30	3C	6B	+10

Analysis using a paired-sample *t*-test shows the variance between pre- and post- strategy NC levels to be very highly significant (t = 5.91, p= <0.1%), the BUGs strategy impacting positively upon NC levels. Positive comments about the usefulness of the strategy were made by both students and TAs.

‘It worked well … Most got it’ TA

‘It’s easy. I know how to do it’ Student

‘I think it has improved my work’ Student

Trial 2

Yr.7 (aged 11-12, n = *3*, students with dyslexia = *1*).

Figure 4 and table 3 show pre-and post- NC levels for this class using Badger Concept worksheets.

Table 3. Change in NC levels: Bugs trial 2.

Student	NC level		Change
	pre	post	
B101	4A	6B	+5
B102	5A	4B	-4
B103	4B	5C	+2
B104	4A	3B	-4
B105	5B	5C	-1
B106	4C	5A	+3
B107	4C	5B	+4
B108	4C	5B	+4
B109	4B	4B	0
B110	4C	4A	+2
B111	7B	5B	-6
B112	4B	3B	-3
B113	4C	5C	+3
B114	5B	3B	-6
B115	4C	4A	+2
B116	4A	7C	+7
B117	5B	5C	-1
B118	3A	4B	+2
B119	4B	5B	+3
B120	4A	6A	+6
B121	4B	7C	+8
B122	4A	5C	+1
B123	3B	6B	+6
B124	4B	4C	-1
B125	3B	4C	+2
B126	3C	4B	+4
B127	4B	6B	+6
B128	3B	3C	-1
B129	5A	6B	+2
B130	4B	4A	+1
B131	5B	6A	+4

Analysis using a paired-sample *t*-test shows the variance between pre- and post- strategy NC levels to be significant ($t = 2.60$, p= <5.0%) the BUGs strategy impacting positively upon NC levels.

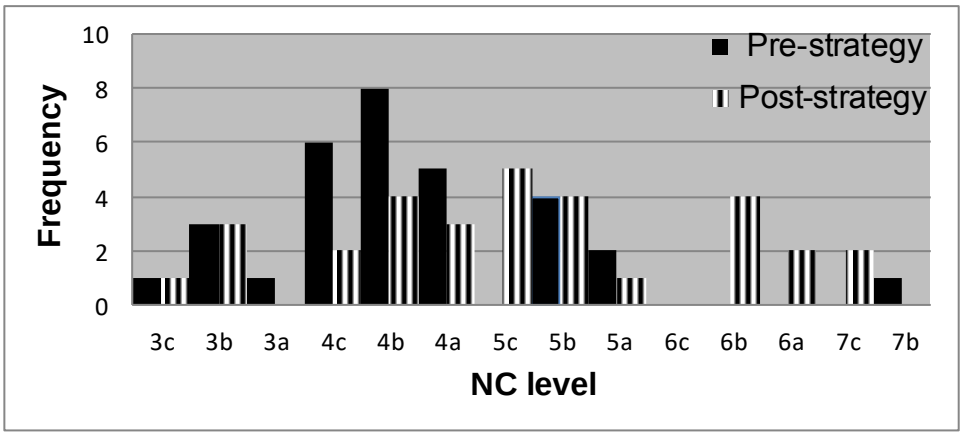


Figure 4. Change in NC levels: Bugs trial 2.

Trial 3
A single opportune trial with a Yr. 9 class (aged 13-14, n=15, students with dyslexia=1, SpLD=6, EAL=2).

A pre-GCSE chemistry group, an AQA GCSE Science worksheet was given which required information to be read, and applied, to complete a flow chart and derive equations. To further improve understanding of equations, the work was peer assessed; data obtained from students' peer marking being unreliable, an additional reason for it not being included in any statistical analysis. To provide qualitative data students and TA were questioned.

> 'It worked well. Most got it. It's a very high level worksheet; I am surprised how well they did. Have you seen RS? RS has completed all the work **and** all the equations are correct.RS has even started the extension work' (TA).

All students completed the flow chart correctly. The majority also applied the information and derived the word equations successfully. When students were questioned about BUGs one said:

> I think it helps… I can find the answers

Another commented:

> I can see how to do it

Situation, problem, solution, outcome (SPSO)

Trial 1
Yr. 8 (aged 12-13, n=*22, s*tudents with dyslexia=1, SpLD =7, Hearing impaired=1). Table 4 and figure 5 show pre-and post- NC levels.

Table 4. Change in NC levels: SPSO trial 1.

Student	NC level		Change
	pre	post	
E1	3A	4A	+3
E2	3A	4C	+1
E3	4B	5A	+4
E4	5B	5A	+1
E5	3C	5B	+7
E6	4B	4A	+1
E7	4C	5B	+2
E8	5B	5A	+1
E9	5A	5A	0
E10	4B	5C	+2
E11	4C	5B	+4
E12	5C	5A	+2
E13	4B	5B	+3
E14	4B	5C	+2
E15	4B	5B	+3
E16	4A	5A	+3
E17	5B	5B	0
E18	4B	5C	+2
E19	4B	5B	+3
E20	4B	5C	+2
E21	4C	5C	+3
E22	4B	5A	+4

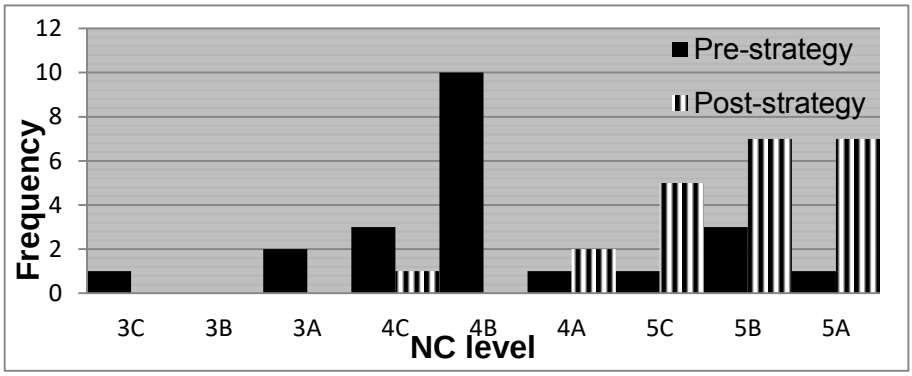


Figure 5. Change in NC levels: SPSO trial 1.

Analysis using a paired-sample *t*-test shows the variance between pre- and post- strategy NC levels to be very highly significant (t = 7.22, p= <0.1%), the SPSO strategy impacting positively upon students written answers.

SPSO trial 2

A single opportune trial. Yr. 7 (aged 11-12. n=*33).*

Task: How are animals adapted to their environment? The task required students to identify environmental problems of particular habitats, adaptations shown by organisms, and how these resolve the environmental problems. Not being a Badger Concept NC levelled assessed piece of work, it was not analysed statistically, but students were asked about the task and exercise books examined. Most students grasped the strategy quickly and when asked about the task JC said:

> Oh yes. I know what to do; it's quite clear and easy

Whilst ES explained:

> It makes sense. I can put my ideas down quickly

When asked if the strategy would help them explain how an animal was adapted to live in a particular habitat ES said:

> Yes, I think so

However, when asked if they would use it again ES replied:

> I don't know, may be, if I remember

Identifying that strategies need to be regularly used and embedded into teaching pedagogy, until students use them independently.

In the examples trialled SPSO had the desired effects of organising thoughts, and allowing them to be written in a logical manner so they could be read and understood by the student at a later date.

Who, what, where, when, why, how (6Ws)

Trial 1
Yr.8 (aged 12-13, n=20, students with dyslexia =1, SpLD = 5). Table 5 and figure 6 show pre-and post-NC levels for this class.

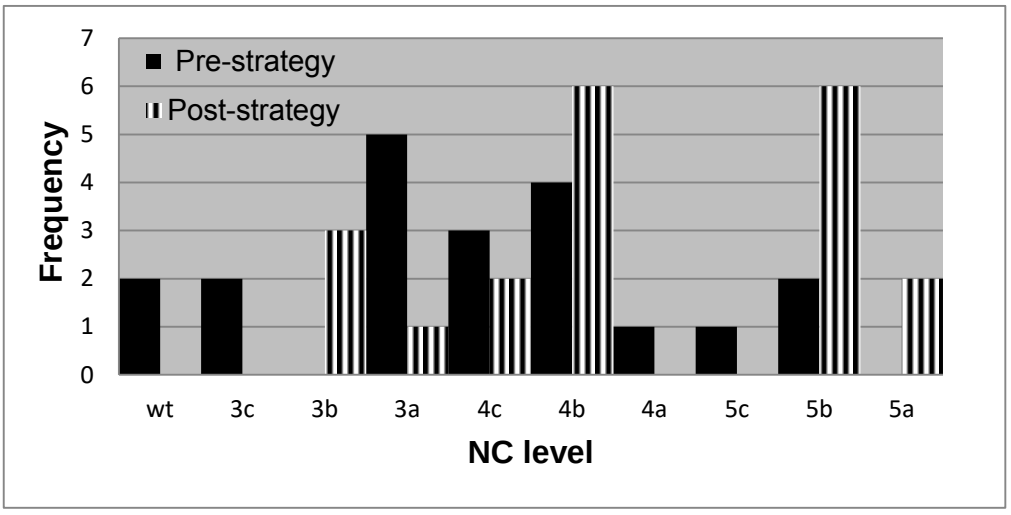


Figure 6. Change in NC levels: 6Ws trial 1.
NB wt = working towards

Table 5. Change in NC levels: 6Ws trial 1.

Student	NC levels		Change
	pre	post	
W1	3c	4b	+4
W2	3a	3b	-1
W3	3a	3b	-1
W4	4b	3b	+3
W5	3c	3b	+1
W6	3a	5a	+6
W7	4c	4c	0
W8	5c	5b	+1
W9	3a	3a	0
W10	4b	3a	-2
W11	5b	5b	0
W12	Wt	4b	+5
W13	5b	5b	0
W14	4b	5a	+4
W15	4c	4b	+1
W16	4a	4b	-1
W17	Wt	5b	+8
W18	3a	5b	+5
W19	4c	5b	+4
W20	4b	4c	-1

Analysis using a paired-sample *t*-test indicates the variance between pre- and post- strategy NC levels to be highly significant (t = 3.12, p= <1.0%), the 6Ws strategy, impacting positively upon NC levels.

Observation identified most students' written work to be concise, in chronological order, with marking points included. A point noted by the TA:

> There were some pupils who had ***those*** 3 points [*marking points*] …It was very clear, there was a sign in the question that said **clear, ordered writing important**. So they got their marks.

This method appealed to a number of students as planning for writing was minimal. Many simply converted notes into sentences by adding connectives. One student commented:

> I didn't really have to do much.

Discussion

The aim of the research was to identify whether writing strategies are effective at raising NC levels for students with dyslexia, and whether these strategies are effective for all students. However, before any evaluation of the effect of writing strategies on NC levels, the effect of increased maturity required consideration. NC levels for a non-strategy (control) group (yr.7, n=28, SpLD= 4) was compared over the same time period (six months), table 6 and figure 7.

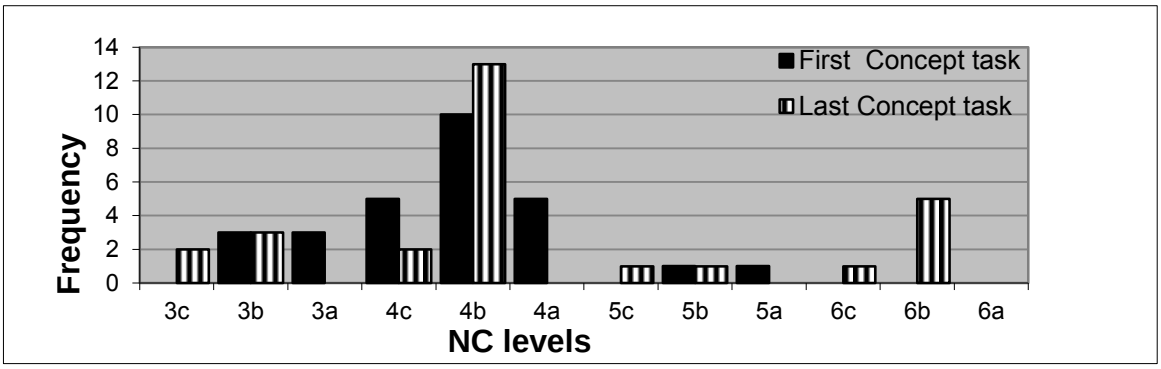


Figure 7. Effect of maturity upon NC levels: control group.

Table 6. Effect of maturity upon NC levels: control group.

Student	NC level		change
	first	last	
A1	3B	4B	+3
A2	4B	3B	-3
A3	4C	4C	0
A4	3B	4C	+2
A5	4A	3B	-4
A6	3A	3B	-1
A7	4B	4B	0
A8	4C	5B	+4
A9	4A	4B	-1
A10	4C	3C	-3
A11	4B	4B	0
A12	4A	4B	-1
A13	4B	5C	+2
A14	3A	4B	+2
A15	4C	6C	+6
A16	4B	4B	0
A17	4C	4B	+1
A18	4A	6B	+5
A19	4B	3C	-4
A20	3B	4B	+3
A21	3A	6B	+9
A22	4B	4B	0
A23	4B	4B	0
A24	5A	6B	+2
A25	4B	4B	0
A26	4A	4B	-1
A27	4B	6B	+6
A28	5B	6B	+3

This class was not included in the strategy trials because teaching was shared. Constraints of timetabling required me to adhere strictly to the original teaching plan; I did not have extra time to devote to implementing strategies. To increase reliability, I set and marked all Badger Concept

worksheet tasks within the same time frame as the strategy trials. Whilst figure 5 might suggest that maturity has a positive effect on NC levels, analysis using a paired-sample *t*-test indicates that during the short time-span of the research maturity had no significant effect on results; ($t = 1.97$, $p > 5\%$) differences simply a resultant of chance.

Given the small number of students with diagnoses of dyslexia (n=5), there is not sufficient data to analyse statistically, although four students showed gains above the average change for their class (**Error! Reference source not found.**), suggesting that the strategies have a positive effect. However one student (W10) showed a two point regression and was 3.80 points below the average for their class. As this student was not individually interviewed, it would be inappropriate to speculate, there being many possible factors, some external to the classroom, responsible for the regression.

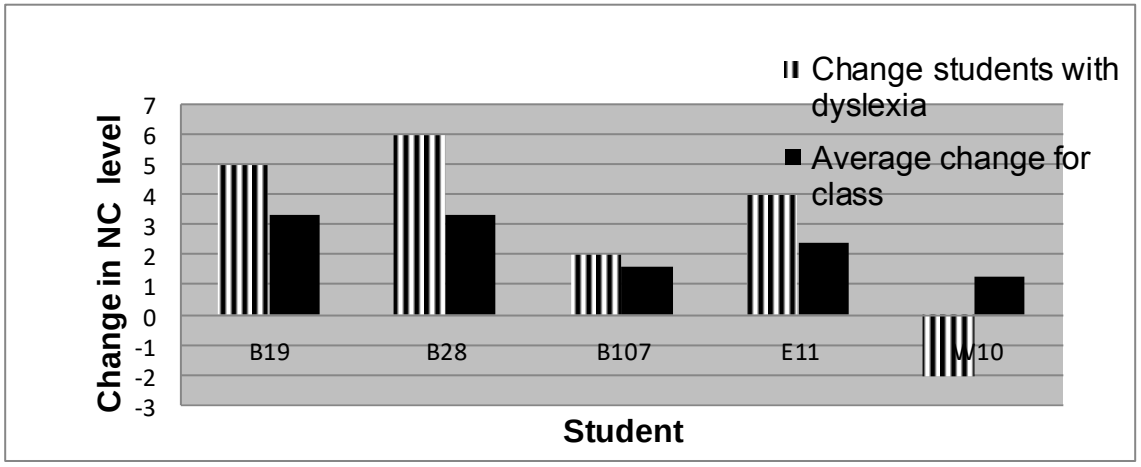


Figure 8. Change in students with dyslexia NC levels compared to average change.

NC levels for all students within the strategy groups show a positive and statistically significant increase. One possible reason for the improvement may be due to the increased length of time spent on the preparation of the task; modelling the strategy and explanation of the marking criteria. A further possible reason is that students had become fully aware of, and using, the level ladder (Figure 1) accompanying the worksheet. Observation of written work supports this premise, students moving through a logical sequence of stating, describing and then explaining the concept being assessed.

Whilst BUGs trials showed statistically significant and positive increases in NC levels for the whole cohort, a few students' levels decreased. In trial 1 (n=30) four students decreased and in trial 2 (n=31) nine decreased. There may be many reasons for this decrease, such as a change in science discipline. Other reasons may be external to the classroom, but as these students were not individually interviewed, it is not possible to speculate.

The 6Ws strategy showed a significant difference in the NC levels of students' work; writing was concise and marking points were included. This method appealed to a number of students as planning for writing was minimal. Because the information was presented succinctly, students knew exactly what was expected. Writing was planned and purposeful, many simply converted notes into sentences by adding connectives, showing students targeting the marking criteria, moving through the logical sequence of describing and then explaining the concept under assessment.

The SPSO strategy used a simple writing frame to organise information before students completed the written task. Initially SPSO appeared inflexible, suitable only for specific tasks however, having

used the strategy, I have begun to realise that it has the potential to be used in a wide variety of situations. Statistical analysis showed significant gains to NC levels. All but two students' levels improved. The strategy produced concise and chronologically ordered answers, although many students in trial 2 simply produced a series of bullet points or displayed their answers in the form of a table. Most expressed the strategy to be clear and simple to use.

Asking students as a class to reflect upon their work during lessons provided qualitative data. All made positive comments saying that it helped them to organise their work. However, these comments should not be taken at face value as students may wish simply to please and give the answer expected. In each case the product was also examined to see if it corroborated their statements. Examination of written work showed an improvement in structure, although many simply stuck rigidly to the marking criteria writing short sentences. As one of the goals is to prepare students for examinations requiring extended responses and reduce the possible negative impact of the new GCSE upon student grades, this tactic would have the desired effect. Answers were logical and coherent, students moving from stating to describing and explaining scientific concepts.

> For the purposes of Condition GCSE 5.1(a) an 'extended response' is evidence generated by a Learner which is of sufficient length to allow that Learner to demonstrate the ability to construct and develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.
>
> (Ofqual, 2017).

The research was carried out as part of an MA dissertation and by necessity consisted of small and opportune samples raising the question of quantitative vigour (Mortimore, 2005). To establish accuracy and objectivity, a number of pieces of written work from each trial were marked by a colleague and marks compared and agreed. Data and analysis were checked and verified by critical friends. Trialling strategies with different classes produced a wider range of data whilst repetition increased reliability. The relatively short time scale, six months of classroom research was the limiting parameter in terms of the number of strategies trialled, and data that could be collected.

Conclusion

The aim of the research was to identify and evaluate a range of writing strategies, to determine whether they improve NC levels in science of KS3 students with dyslexia, and establish if they are effective for all students. Four of the five students with dyslexia made gains above the average for their class suggesting strategies to be effective helping most students with dyslexia to accommodate for their difficulties, which corresponds with Hart's (2006) assertions that writing strategies can help address the imbalance.

Empirical evidence supports the hypothesis that strategies to improve writing skills with students with dyslexia impact positively upon all students within the classroom. Writing strategies made positive and significant changes to the majority of students NC levels, demonstrating that purposeful writing is effective. We should not assume that students organise thoughts and concepts logically, strategies merely provide a scaffolding mechanism to help organise answers in a logical manner (Mortimore & Dupree, 2008). Writing strategies help organise thinking and direct writing (Kartchner Clark, 2007; Dror et al., 2011). Given the heterogeneous nature of the students, writing strategies, although effective, were not equally effective. Improvement to NC levels may have been due to a number of factors: students becoming accustomed to writing to marking criteria and changes to teaching routines, students practising writing extended answers requiring them to explain, in a logical and coherent manner, scientific concepts.

Writing strategies are not cures for dyslexia, they are not a quick fix or a substitute for hard work. To improve writing skills and raise student attainment requires effort. Teachers need to give thought both to the written product and how to achieve the product (Dror et al., 2011).

Recommendations

Explicit teaching of writing strategies enhances the writing of all (Graham & Harris, 2003) particularly students with dyslexia (Berninger et al., 2008). Writing strategies need to become embedded as part of normal classroom routine (Kirby, 2011) to improve the structure and quality of written work, until students use them autonomously, regardless of whether there are students with dyslexia or literacy difficulties within the classroom by:

- Demonstrating and modelling skills and strategies through direct and systematic teaching (Weaver, 1998; Johnson, 2004; Mackay, 2006).

- Modelling structured answers to questions (Weaver, 1998; Johnson, 2004; Mackay, 2006; Mortimore & Dupree, 2008).

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