

Postman and weingartner's concerns of questioning in the classroom



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'The most important and intellectual ability man has yet developed- the art and science of asking questions is not taught in school! Moreover, it is taught in the most devastating way possible: by arranging the environment so that significant question asking is not valued.' (Postman and Weingartner, 1971, p. 23)

To what extent is Postman and Weingartner's concern still relevant and what are the implications for teachers of primary science?

Questioning is crucial in all classrooms. Black and William's extensive research (1998, p. 3) shows it can produce 'significant and often substantial learning gains' when used effectively. Clarke (2005, p. 63-75) justifies this, suggesting when used correctly, questioning can have rapid and positive changes in the classroom. Effective questioning in the classroom is closely tied with an understanding of Bloom's Taxonomy (Bloom et al., 1956, pp. 10-37) where teachers encourage higher order thinking skills by building up from lower-level cognition, progressing to reach evaluation. Postman and Weingartner (1971, p. 27) develop this further, suggesting a child-centered approach where children lead the questioning, encourages a more potent kind of intelligence and therefore pupils, rather than the teacher make decisions about conceptual change (Gilbert, 2004, p. 61). Hence, it is concerning that primary science has a lack of opportunities for pupils to ask questions (Helm, 2015, pp. 5-15), with questions going unheard and unasked thus supporting the findings of Postman and Weingartner's study (1971, pp. 3-52), suggesting there has been little development in the science classroom to support this skill.

The definition of ' *scientific inquiry*' is described as a separate process to general inquiry (Wellcome Trust, 2013) where the focus is on the development of concepts, specifically through questioning. Chin and Osborne (2008, pp1-39); Postman and Weingartner (1971, p. 23), emphasise that the formulation of questions is a creative act, at the ' heart' of science, thus should be structurally embedded in the operations of critical thinking, creative thinking and problem solving (Cuccio-Schirripa and Steiner, 2000, p. 40-53). Graesser and Person (1994, p. 56) however found students asked few questions and even fewer in search of knowledge. Within one classroom, science lessons appeared to focus primarily on pupils forming scientific proof and predicting. The pupils were given lego men and torches and provided with the investigative statement ' light from one light source can travel in two direction's'. Pupils presented their scientific proof and opinion, such as " the sun (the torch) is a sphere, so light will be shining from all angles, so light can travel two directions". The class teacher used their ' scientific proof' to look at misconceptions and together re-design the experiment in a more scientific way, such as using a funnel around the torch to focus the light. Although the class teacher did not directly focus on questioning, pupils continued to ask significant questions throughout the lesson, alongside developing the scientific skills of ' refuting ideas of arguments and reporting and presenting findings from enquiries' (DfE, 2013, p. 166). Although, I did notice how few students asked ' cognitive questions' (Carr, 2002, p. 39-53), with most questions being factual, procedural or closed in nature, suggesting these skills may be underdeveloped in this class. Thus, raising concerns on the integration and development of scientific questioning since Postman and Weingartner's work in 1971.

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Views on the *importance* of scientific questioning has differed within the last 40 years, shown by the National Curriculum reforms of 2013 (Wellcome Trust, 2013). Nevertheless, it is significant how Postman and Weingartner's research (1971, pp. 3-117) was constructed before science became a compulsory subject in schools (Newton, 2003, pp. 1-3). The primary aims of science in the 1960s were outlined as: providing a basic knowledge for student's future scientific study (Millar, and Osborne, 1998, pp. 2-9), studies have shown that these lessons appeared detached and irrelevant. Lemke (1990, p. 1-5) states that since the 1960s there has been an increasing emphasis on the critical role language, discourse and argumentation play in the 'personal and social construction' of scientific knowledge. Consequently, questions should be seen as 'part of the process of science', through a range of questions used prominently through a child-centered approach to learning (Newton, 2012, p. 55).

Asking questions is a natural way children and adults find things out (Helm, 2015, pp. 24-27) and thus to *prepare pupils for KS3* and adult life we must build the foundations and skills to do this. As stated by Wassermann and Ivany (1996, p. 81), the inquiry approach has evolved so almost any experience that invites pupils to 'mess around' with materials can be classified as inquiry, in this manner it shows the problematic nature of scientific inquiry. Despite this, Formery (2005, p. 65) suggests teachers should use techniques to support the formulation of questions, such as a question frame (Feasey, 1999 cited in Formery, 2005, p. 65). I trialled this on placement, the pupils experimented with two activities: a car on a ramp and a Newton's cradle. Eliciting children's ideas (Monk et al., 2000, cited in

Dawes, 2004, p. 1) I provided children with some structure as suggested by Formery (2005, p. 65), in this case it was paper-based question pointers to guide them on their journey of discovery rather than lead them down 'blind alleys'. However equally, children were not given any specific tasks except to note down questions from their observations, consequently Harlen & Ekstgeest (1985, p. 10) suggests freedom it is the best way to acquaint pupils with new materials. These questions were the foundation for the topic, addressing misconceptions about energy which directly benefits children's development in science (Gibbons, 2001, cited in Dawes, 2004, p. 1). This provided opportunities for interventions, consequently supporting Fensham et al (2013, pp. 140-142) research which suggests step 3 of the constructivist classroom is to challenge students' ideas, comparing their knowledge with their newly structured one. When analysing my teaching under Postman and Weingartner's suggestions (1971, p. 23), it could be suggested pupils were not given the opportunity to ask 'any' questions, as there was still some teacher input through question pointers, highlighting the difficulty for teachers to step back and observe. This style of classroom can be considered scientific and reflective of KS3 science, not only this but question asking was valued, guiding the lesson and the overarching topic ((Postman and Weingartner. 1971, p. 23)

Taking Wassermann and Ivany's research (1996, pp. 81-82) into consideration, the production of the *question formulation technique steps (QFT)* has been used specifically in scientific inquiry. Although most studies were focused in American high schools, it is significant in considering the preparation of school students for KS3. At the heart of these steps is the

recognition for metacognition in learning, one which should be developed by all students. The National Research Council (2000, cited in Rothstein and Santana, 2011, pp. 1-12) found many college students lack basic metacognitive skills and habits. It is important to recognise how this strategy highlights the link to art and science (Postman and Weingartner. 1971, p. 23). Rothstein's work states the QFT steps is artistic as it requires creativity and imagination when testing and exploring, not only this but as students have practice prioritising and justifying their choice of questions, something valued in KS3 science. In regard to scientific inquiry, this process values students asking their own questions consequently producing replicable results in a classroom laboratory where children follow a process rigorously, therefore providing a creative but disciplined structure. One school highly regarded the QFT strategy, suggesting when used carefully it can have greater significance than any other aspect of science. This was shown when a discussion on DNA raised the question of ' how do we get DNA out of something?'. After group research, the class teacher and pupils formed a procedure. During the experiment: extracting DNA from an onion, the amount of questions stemmed was high such as " are the DNA strands different in different parts of the body?". Thus, it suggests lessons such as this, exemplify Postman and Weingartner's research (1971, p. 23).

There are many reasons why *teachers prefer leading the questioning* such as controlling the direction of the discussion, time issues and the concern the lesson may go off task. However, often the teachers questioning can be equally ineffective due to the quantity of questions asked and the wait time given. Numerous researchers have found teachers typically wait less than

one second before calling on students (Moore, 2014, pp. 451-452). Not only does this short period of time stunt children's thinking, but it does not encourage in depth answers (higher-order thinking), especially in science, where often there is no 'clear' answer. Subsequently by providing adequate discussion time it avoids the lesson turning into a mechanical questioning process (Rowe, 2008 cited in Cecil and Pfeifer, 2011, p. 23). Research has also emphasised teachers often ask too many questions, such as that of Bromley (1992, cited in Cecil and Pfeifer, 2011, p. 4), which found teachers ask around 70 factual or literal questions in a 30-minute lesson. At one school their approach to science included the class teacher leading the whole lesson, using quick-fire questions. The pupils listened to the teacher read out the fossil formed process and showed pictures, pupils had to cut out pictures of the fossil formation process, labelling them, with no flexibility for questions from the pupils. Their work reflected this, not only was there a lack of enthusiasm, but pupils were unable to recall the process when recapping the lesson after. Subsequently, it is clear that if teachers do not provide time for in depth thinking it suggests they do not value the questions they ask themselves and therefore teachers must slow down the pace of questioning to provide an adequate model for pupils.

As evidenced by Mehan (1979, pp. 1-4), pressure is put upon students to respond to *questions which serve simply to display and practice their knowledge*, rather than provide information which the teacher does not know (Bansford et al., 2000, p. 110). One reason for this problem in the classroom is the considerable knowledge teachers need to answer accurately to unpredictable questions (Wassermann and Ivany, 1996, pp. 81-82 thus

should be a continuous target in a teacher's career. Routledge (2010, p. 6) suggests the nub of this problem is subject knowledge being treated as a list of facts rather than applying them to models to understand the world around them. Postman and Weingartner (1971, pp. 19- 23) suggest that when pupils lead the questioning, it ensures the questions are appropriate to the age and development of the pupils, thus reduces teachers worry in lessons. When students contribute to a coherent body of knowledge it emphasises the reconstruction of knowledge rather than just transmitting it and The National Research Council (1996, cited in Psillos et al., 2003, p. 11), state this makes ' meaningful and lasting learning'. Although I agree with this statement, Solomon (1994, cited in Psillos et al., 2003, pp. 11-13) argue that the metaphor ' the student as a scientist' provides the notion that pupils can construct all scientific knowledge by themselves, which is an unattainable goal for teachers and instead pupils should be seen as guided researchers.

As a result of the current educational system; the levels of assessment and constant academic targets and goals, students are restricted to the *process of memorising the answer* of other pupils' questions (Postman and Weingartner. 1971, p. 22). As a result of this, many pupils believe what they say is not relevant to the ' content' of the instruction or question, representing the dichotomy between content and method, which according to Postman and Weingartner is ' naive and dangerous' (1971, p. 19). While the National Curriculum (DfE, 2013, p. 155), clearly states pupils should have opportunities to ask relevant questions, gather, record and identify differences in results. Postman and Weingartner's (1971, p. 23) research states ' pupils are almost never required to make observations, formulate

definitions or go beyond repeating what someone else says'. We can suggest this research may be outdated and does not consider the progress science education has taken, for example the lesson based on 'light' did not focus on coming to a distinct answer, but instead the process and discussion throughout the experiment.

For some pupils, even when given opportunities to ask questions, they struggle to formulate the questions, sometimes due to the *scientific language* (Dawes, 2004, p. 667). Pupils scientific understanding and the language which they use to communicate are inextricably linked. Often teachers ask pupils to explain their ideas about a scientific context, this is an important opportunity for teachers to analyse whether a child's conception is firmly or tenuously held. It is important for pupils to consistently hear scientific language and vocabulary as when used colloquially it can generate misunderstandings (Dawes, 2004, pp. 667-669). Gibbons (2001, cited in Dawes, 2004, p. 669) emphasises the need for the environment to be arranged in a manner where any observations generated are subject to inquiry, supporting Postman and Weingartner research((1971, pp. 23-27). However, we must remember it can be difficult to ensure children can engage in 'stretches of discourse' about unfamiliar concepts and vocabulary.

On reflection, although Postman and Weingartner's (1971, p. 23) research was conducted before the *National Curriculum reform* of 2013, it still consists of scientific components which are significant in science today, such as the need for the classroom to be arranged in a style which values all questions, providing adequate opportunities for this. Since 1971 there has been a shift <https://assignbuster.com/postman-and-weingartners-concerns-of-questioning-in-the-classroom/>

in some aspects of scientific teaching such as having a child-centered classroom, where teachers learn alongside the pupils and a focus on preparing pupils for a KS3 laboratory style classroom, where questions stem the focus of lessons. As research has presented, it is crucial for teachers to understand and internalise the understanding originally presented by Postman and Weingartner. 1971, p. 22-45 and subsequently asking questions should not be classed as a 'basic' process and instead pupils need support in developing this important skill.

References:

- Bansford, J., Brown, A. and Cocking, R. (2000) *How people learn: brain, mind, experience and school*. Washington: National Academies Press.
- Black, P. and William, D. (1998) Inside the Black Box: Raising Standards Through Classroom Assessment. *Department of education and professional studies*. Phi Delta Kappan, 80(2), pp. 139-44.
- Bloom, S., Englhart, D., Furst, J., Hill, H and Krathwohl, R. (1956) *Taxonomy of education objectives, the classification of educational goals*. Handbook 1: cognitive domain. 1st edn. New York: Longmans.
- Carr, D. (2002) *The art of asking questions in the teaching of science: aspects of teaching secondary science*. 1st edn. London: Routledge Falmer.
- Cecil, N. and Pfeifer, J. (2011) *The Art of Inquiry: Questioning Strategies for K-6 Classrooms*. 2nd edn. Canada: Portage and Main Press.
- Chin, C. and Osborne, J. (2008) *Students' questions: a potential resource for teaching and learning science*. Pp. 1-39. Doi: 10.1080/03057260701828101.

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- Clarke, S. (2005) *Formative assessment in action: weaving the elements together*. 1st edn. London: Hodder Education.
- Cuccio-Schirripa, S. and Steiner, H. (2000) Enhancement and analysis of science question level for middle school students. *Journal of Research in Science Teaching*. 37, 210-224.
- Dawes, L. (2004) Research report. Talk and learning in classroom science. *International journal of science education* . [online] 26(6), pp. 677-695. Available at: http://thinkingtogether.educ.cam.ac.uk/publications/journals/Dawes_Science_677-695.pdf
- Department for Education (DfE)(2013) *National Curriculum in England: key stages 1 and 2 framework document*. London: Department for Education.
- Fensham, P., Gunstone, R. and White, R. (2013). *The content of science: A constructivist approach to its teaching and learning*. 2nd edn. London: The Falmer Press.
- Formery, C. (2005) *Getting the buggers into science*. 1st edn. London: Continuum International Publishing. c
- Gilbert, J. (2004) *The Routledge Falmer reader in science education*. 1st edn. London: Routledge Falmer Press.
- Graesser, C. and Person, K. (1994) Question asking during tutoring. *American Educational Research Journal*. 31 (1), 104-137.
- Harlen, W. and Ekstgeest, J. (1985) *Taking the plunge: how to teach primary science more effectively*. 1st edn. Oxford: Heinemann Educational Publishers.
- Lemke, J. (1990) *Talking science: language, learning and values*. 1st edn. New Jersey: Ablex Publishing Corporation.

- Psillos, D., Kariotoglou, P., Tselfes, V., Hatzikraniotis, E, Fassoulopoulos, G. and Kallery, M. (2003) *Science education research in the knowledge-based society*. 1st edn. Dordrecht: Springer Science + Business Media
- Helm, J. (2015) *Becoming young thinkers: deep project work in the classroom*. 1st edn. New York: Teachers College Press.
- Mehan, H. (1979) 'What time is it Denise?': asking known information questions in classroom discourse' *Theory into practice*. 18(4), pp. 285-294.
- Millar, R. and Osborne, J. (1998) *Beyond 2000: science education for the future. The report of seminar series funded by the Nuffield Foundation*. [online] Available at: <https://www.nuffieldfoundation.org/sites/default/files/Beyond%202000.pdf>[Accessed 4 Nov. 2018]
- Moore, K. (2014) *Effective Instructional Strategies: From Theory to Practice*. 1st edn. California: SAGE Publications
- Newton, D. (2012) *Creativity for a new curriculum: 5-11*. 1st edn. Abingdon: Routledge.
- Parliamentary Office of Science and Technology. (2003) Postnote: primary science: number 202 [online] Available at: <https://www.parliament.uk/documents/post/pn202.pdf>[Accessed 4 Nov. 2018].
- Postman, N. and Weingartner, C. (1971) *Teaching as a subversive activity*. 1st edn. Harmondsworth: Penguin Books
- Rothstein, D. and Santana, L. (2011) *Make just one change: teach students to ask the questions*. 1st edn. Cambridge: Harvard Education Press.

- Routledge, N. (2010). Primary Science: teaching the tricky bits. 1st edn. Berkshire: Open University Press.
- Wassermann, S. and Ivany, J. (1996) *The new elementary science: who's afraid of spiders?* 2nd edn. New York: Teachers College Press.
- Wellcome Trust. (2012) Quinquennial review of the national network of science learnin centres. [online] Available at: www.education.gov.uk/publications/standard/publicationDetail/Page1/WELL-00120-2012