

Numeracy: What counts?

The word numeracy makes some people shudder. Taking them back to memories of rote and drill ways of learning in school, but why is it socially acceptable to declare that one cannot “do” mathematics? Approximately 20% of pupils leaving primary school do not reach the attainment level set out in the assessment guides for 11-year old children (Felder, 2007, p.3). What could be considered as a more impactful statistic is that low levels of adult numeracy skills cost’s the UKs economy approximately 20.2 billion a year, of which 8.2 billion is out of the public purse (National Numeracy Org, 2014). Numeracy is not just something that has to be remembered so a test can be passed in a school, but it is a life skill. Everything from making sure you have been given the correct change in a shop, what time the next bus arrives at the stop or working out how much it will cost to put a new carpet in the living room, requires basic numeracy skills. First, there is a need to define numeracy. The National Numeracy Framework states that:

Numeracy at key stages 1 and 2 is a proficiency that involves a confidence and competence with numbers and measures. It requires an understanding of the number system, a repertoire of computational skills and an inclination and ability to solve number problems in a variety of contexts. Numeracy also demands practical understanding of the ways in which information is gathered by counting and measuring, and is presented in graphs, diagrams charts and tables. (DfEE, 1999, p.4)

This essay will explore the use of current initiatives in my setting and evaluate their effectiveness. Several reports and initiatives including the Cockcroft Report, 1984, the Literacy and Numeracy Framework (LNF) 2008 and the Successful futures Report 2015 will be evaluated and it will be shown how they support the development of numeracy in the classroom. It is currently a time of change for education in Wales as the curriculum moves from the LNF to the successful futures curriculum. This essay will also look at the theoretical approaches of Jean Piaget. It is difficult to relate my personal experience in my setting to just one key stage as pupils of the same age are not typically at the developmental level of the key stage for their age, but most pupils fit under the foundation phase. My setting, which will be referred to as School A for the purposes of this

essay, is an additional learning needs (ALN) school. There are approximately 150 pupils with a variety of additional needs including but not exclusively, Autistic Spectrum Condition (ASC), Global Developmental Delay (GDD) and Attention Deficit Hyperactivity Disorder (ADHD). Most pupils have more than one additional learning need. Of the 150 pupils 43.2% receive free school meals (FSM) and 4% are looked after or cared for (LAC).

Firstly, the current Numeracy Framework will be explored. The LNF became a statutory requirement in Wales from September 2013 and this led to the introduction of national tests to assess literacy and numeracy in schools yearly, from May 2013. One of the factors leading to this educational reform was the results of Wales' performance in the Programme for International Student Assessment (PISA) in 2009. Wales performed below the average according to the Organisation for Economic Co-operation and Development (OECD). According to a report based on the findings of the 2009 PISA by Braddshaw et al (2010), it was stated that "Compared with the top performing countries in the world Wales was lacking in high achievers in mathematics.". The LNF sets out 4 strands in numeracy which are: developing numerical reasoning, using number skills, using measuring skills and using data skills. Each strand has elements attached to it which cover aspects of the strand. For example, the using number skills strand has 5 elements which are; Use number facts and relationships; Fractions, decimals, percentages and ratio; Calculate using mental and written methods; Estimate and check; Manage money. The framework tracks progression from routes for learning to Year 11. The routes for learning progression steps are especially targeted at pupils with profound and multiple learning difficulties (PMLD) therefore the framework encompasses all learners (Ware, 2014, p.353). A criticism of the framework is that it could be difficult for teachers to ensure that the whole class progress along the elements at the same pace. Due to staffing levels in mainstream classrooms it would be difficult to give the required support to pupils, to ensure that they meet the required progression step by the time they move to their next class. The progression steps are well laid out and gradually build and consolidate knowledge, but this needs to be done at the learner's pace. The new curriculum for Wales as advised by Graham Donaldson in the Successful futures report (2015) puts Mathematics and Numeracy as one of the six Areas of Learning Experience (AoLE). Every AoLE has the same 4

purposes statements to underpin them of what all children and young people should be. They are:

“ambitious, capable learners ready to learn throughout their lives; enterprising, creative contributors ready to play a full part in life and work; healthy, confident individuals ready to lead fulfilling lives as valued members of society; ethical, informed citizens ready to be citizens of Wales and the world.”(Donaldson,2015 p.29)

The four strands of the Mathematics and Numeracy AoLE are; Developing numerical reasoning; Using number skills; Using measuring skills; Using data skills. What’s different is the approach to teaching and the way the new curriculum encourages all staff and learners to think about mathematics and numeracy. Everyone that works with children are considered central to supporting learners in developing their skills placing a great emphasis on the pedagogy used to deliver numeracy across the curriculum. The new curriculum in numeracy also has 5 proficiencies which learners will work on across all tasks. They will not be gained in order and may work on a few at a time. The proficiencies are; conceptual understanding; communicating with symbols; Strategic competence; Logical reasoning; Fluency (Welsh Government, 2019) The aim of the new curriculum is to emphasise understanding in maths and discourage learning through tricks or rote just so teachers can tick a box. Learners need to experience mathematics in hands-on ways; exploring ideas and physical objects from mathematical perspectives. This approach could be considered too laden in words, although it is still in the developmental stages, there is hope that the final document will be easy to read. It is made clear that the focus is on experiential learning, which is fun and engaging, and allows the learner to choose their own learning pathways not unlike the theories of Carl Rogers, John Dewey and Jean Piaget.

School A sets out a topic for each term which every class in the school follows. This allows the teachers to develop a cross curricular ‘Rich task’ which is also holistic in its approach. One of the founding fathers of holistic approaches in education, Ron Miller(1992) states that “Holistic education is not to be defined as a particular method or technique; it must be seen as a paradigm, a set of basic assumptions and principles that can be applied in diverse ways”. This is particularly

relevant when discussing numeracy as numeracy skills need to be applied to multiple scenarios in school and in life. The basic numeracy skills learnt must be made explicit by the teachers to ensure that pupils know where and when they can be applied elsewhere. It is staff's responsibility to make the pupil aware of the links and therefore the child can then consolidate their learning. The 'Rich task' usually starts off with a 'hook', an initial introduction to arouse curiosity in the pupils. This is a basic feature of the foundation phase framework as you cannot make a pupil curious. The curiosity needs to come from them, as a staff member you can help them to notice something which then ignites their curiosity. Piaget recognised the importance of letting a child make sense of the world around them and his theories in schemas gives a good explanation of how children consolidate their knowledge and apply it to different experiences. Piaget explained that the initial phase of assimilation is when a child makes connections with a new experience and something they already know, which in turn they fit in with their own way of thinking. The child then moves on to the accommodation phase, which is when they adapt their way of thinking due to the new information or experience, they have had. The blending of these two phases is equilibration, putting all the knowledge together and creating their view of the world (Hughes, 2009, p.9) In a report on raising numeracy standards in Australia it was of noted importance that the practical applications of numeracy "are learnt most effectively in the contexts where they naturally arise (such as the relevant learning area), rather than in the contrived circumstances of the mathematics classroom" (Carter, 2015, p.297) therefore highlighting the need for cross curricular approaches to numeracy. The effectiveness of cross curricular numeracy teaching has been brought to the forefront in several reports and journals. Although mainly focused on secondary education settings, the definitions of numeracy can differ depending on what member of the faculty is asked (Carter, 2015, p.599). It has also been highlighted that student teachers understanding of the term numeracy can differ and it is important that there is a whole school approach to the pedagogies of teaching numeracy. It has been noted in England that there was no provision of what training student teachers will receive to ensure that they deliver numeracy in a cross curricular way (Stables, Martin & Arnhold, 2004, p.345). The true nature of numeracy could be considered as cross curricular, and that is why it is so important for it to be offered in that way.

Historically, there have been many developments in school mathematics and numeracy initiatives on a national and local level. One of the most noted developments in the last 40 years has been the Cockcroft report in 1982. The Committee investigated the need for improvements in numeracy teaching in schools and highlighted the importance of teaching the numeracy skills which need to be carried on to adult life. The committee stated that “functional innumeracy is far more widespread than anyone has cared to believe.” (HMSO,1982). It could be argued that the Cockcroft report triggered the Education Reform Act in 1988 which led to the introduction of the National Curriculum in 1988. It was particularly difficult for teachers of pupils with ALN to draw from the curriculum how they would teach numeracy to pupils. The National Curriculum contained the content but not the methods. Due to the nature of ALN some children with ALN have basic difficulties with numeracy which are often exacerbated by behavioural , social and emotional difficulties. During the 80’s many ALN schools had developed a ‘life skills’ curriculum, and as the National Curriculum was delivered as an inclusive curriculum, there was a fear that these essential life skills learning opportunities could be lost(Ashdown et al, 1991, Bowe et al, 1992).

In school A there are several initiatives embedded to support the pupils in the development of their numeracy skills. School A is a pioneer school for the new successful futures curriculum with their subject expertise being mathematics and numeracy. School A has gone through several packages which are ‘bought in’. Firstly, the LNF framework will be discussed as it is still a vital part of developing numeracy within the school. All pupils have a numeracy target each term that they work on. This is documented on their Individual Educational Plan (IEP). The target would have to be observed on at least 3 occasions for the pupil to achieve that target. The target is chosen by the teacher and is specific to the pupil’s progress through the LNF. For example, pupil A who is on Year 1 in the using number skills strand of the LNF, needs to work on their managing money skills so they would be given the target to “use different combinations of money to pay for items up to 20p” (Welsh Government, 2020). The targets are displayed in class and the pupils can access them. There are opportunities in school A to go shopping in the local shop, play in a shop role play area and buy items from the Key Stage 4 café group. The benefit of this type of initiative is that it is a practical application of numeracy and can also develop life skills which is

essential to promoting independence in children with ALN. The disadvantage in School A is pupils are often moving to different groups and sessions throughout the week so the teacher may not always be able to observe the target being met. This could inadvertently hold the pupil back as they need to progress through the elements of the strand in a linear way. The nature of assessing progress through the LNF is formative and has been defined as “the frequent, interactive assessment of students’ progress and understanding to identify learning needs and to adjust teaching appropriately” (Wiliam, 2011). It has also been observed in some key stages in School A that the observed meeting of these targets is not formally recorded. This could lead to dishonesty and the pressures of meeting achievement targets in schools plays a part.

In School A the mathematics programme called White Rose Maths is used to deliver mathematics and numeracy sessions 3 days a week to ability grouped pupils. The package is used to build up skills gradually and consolidate prior knowledge. The bulk of resources provided with the White Rose Maths programme are worksheets which can seem repetitive. No formal training has been received by teachers and support staff on the delivery of this programme. This could lead to inconsistencies in teaching across the ability grouped classes. As previously mentioned pupils across 3 key stages are split into groups based on numerical ability. This has been done. As stated by Slavin and Karweit (1985) this is done “to reduce classroom heterogeneity so that students can be more efficiently taught” so ability grouping has been common practice for many years. There has been research conducted into the validity of ability group classes as opposed to grouping ability with a class group and little positive effect has been found (Esposito, 1973; Good & Marshall, 1984; Rosenbaum 1980). The programme relies heavily on teachers to develop engaging and exciting methods of delivering the required material. The programme goes back to the fundamentals of mathematics and numeracy and echoes the Successful Futures Curriculum but only if the pedagogical approach is delivered well by the teacher i.e giving the pupils valuable learning experiences. Time constraints are another factor as the session is given a 45-minute slot. Pupils sometimes struggle with the transition and can take time to settle down therefore eating into the precious minimal learning time. It is difficult to provide an experience which is transferable and requires innovative teaching methods.

To conclude, teaching staff have had a lot of changes imposed upon them in recent years. When an initiative has been embedded it seems to change. This could lead to frustration. Numeracy has been given the same importance as literacy in all government policy, it is no longer acceptable to say that you cannot do maths. The true focus on numeracy should be placed on relevant learning experiences that children and young people can use in the real world. Training and support will need to be put in place for all teaching and support staff. Support staff are now required to do more than ever when it comes to developing numeracy skills in pupils, but if they are not confident themselves in numeracy then this could be a stumbling block. Robust and directive training is needed to instill confidence into support staff. Consistency is key for pupils with ALN and a best practice log should be kept so it can be accessed by all staff with the school. This could include lesson plans and even observations of targets being met by pupils when not in class. With regards to attainment is formative assessment good enough? Observation has always been a contentious way of measurement. We still need summative assessment as that is how we communicate our success, failings or stability with the world using PISA. The UK needs to provide more funding into researching why the top performing countries are better than us at numeracy and learn from them. As discussed in this essay there is a great financial cost to the UK because of innumeracy and it is an issue that needs to be addressed. The question is will Wales's new curriculum help to improve numeracy. As it is still in the stages of development it cannot be proved. The whole underpinning of the new curriculum relies on the quality of teaching experiences and pedagogy. Senior leadership within schools have a large responsibility to ensure that teachers are providing these valuable experiences and there needs to be robust methods of monitoring teacher's performances. Will there be guidelines for this? Maybe the government could look to the Chilean system of performance management which has several facets and includes "a structured portfolio, a peer interview, supervisor questionnaires, and a self-assessment" (Taut, 2014, p1). To get numeracy right in schools all teachers and support staff need to relate it to everyday experiences for children. Making the link between learning and experience is key and only time will tell if the new curriculum will improve numeracy for children and young people across Wales.

Reference list

- Ashdown, R., Carpenter, B. & Bovair, K. (1991) *The Curriculum Challenge. Access to the National Curriculum for pupils with learning difficulties*. London: Falmer.
- Bowe, R., Ball, S.J. & Gold, A. (1992) *Reforming Education and Changing Schools. Case studies in policy sociology*. London: Routledge.
- Bradshaw, J., Ager, R., Burge, B. and Wheater, R. (2010). *PISA 2009: Achievement of 15-Year-Olds in Wales*. Slough: NFER.
- Carter, Marilyn. (2015). *Challenges in embedding numeracy throughout the curriculum in three Queensland secondary schools*. Australian Educational Researcher (Springer Science & Business Media B.V.), 42(5), 595-612.
- Department for Education and Skills (2013) *National Literacy and Numeracy Framework: To support schools in introducing the National Literacy and Numeracy Framework*. Available at: <https://hwb.gov.wales/curriculum-for-wales-2008/national-literacy-and-numeracy-framework-curriculum-for-wales-2008-version/national-literacy-and-numeracy-framework-to-support-schools-in-introducing-the-national-literacy-and-numeracy-framework/> (accessed 2 January 2020).
- DfEE(1999) *The Framework for Teaching Mathematics from Reception to Year 6*. London: Department for Education and Employment
- Donaldson, G (2015) *Successful Futures: Independent review of Curriculum and Assessment Arrangements in Wales*. Available at: <https://gov.wales/sites/default/files/publications/2018-03/successful-futures.pdf> (Accessed 3 January 2020)
- Esposito, D. (1973). *Homogeneous and heterogeneous ability grouping: Principal findings and implications for evaluating and designing more effective educational environments*. Review of Educational Research, 43, 163
Available at: <https://journals.sagepub.com/doi/10.3102/00346543043002163> (Accessed 5 January 2020)
- Fielder, S. (2007) *The Teaching Assistant's Guide to Numeracy*. Continuum,
- Good, T. L., & Marshall, S. (1984). *Do students learn more in heterogeneous or homogeneous groups?* In P. E. Peterson, L. C. Wilkinson, & M. T. Hallinan (Eds.), *Student diversity and the organization, process, and use of instructional groups in the classroom*. New York: Academic Press
- Great Britain, C., & Cockcroft, W. (1982). *Mathematics counts: Report of the Committee of Inquiry into the Teaching of Mathematics in Schools under the Chairmanship of W.H. Cockcroft*. London: H.M.S.O. Available at: <http://www.educationengland.org.uk/documents/cockcroft/cockcroft1982.html#02> (Accessed 3 January 2020)
- Hughes, A. (2009). *Problem solving, reasoning and numeracy in the early years foundation stage* (Practical guidance in the EYFS). London: Routledge.
- Miller, R. (1992). *What are schools for: Holistic education in American culture (2nd ed.)*, Brandon, VT: Holistic Education Press
- National Numeracy (2014) *Cost of outcomes associated with low levels of adult numeracy in the UK*. Available at: <https://www.nationalnumeracy.org.uk/cost-outcomes-associated-low-levels-adult-numeracy-uk-2014> (Accessed 2 January 2020).
- Rosenbaum, J. E. (1980). *Social implications of educational grouping*. In D. C. Berliner (Ed.), *Review of research in education* (Vol. 8, pp. 361-401). Washington, DC: American Educational Research Association.

William, D. (2011). *What is assessment for learning?* Studies in Educational Evaluation, 37(1), 3-14. Available at: <https://www.sciencedirect.com/science/article/pii/S0191491X11000149?via%3Dihub> (Accessed 5 January 2020)