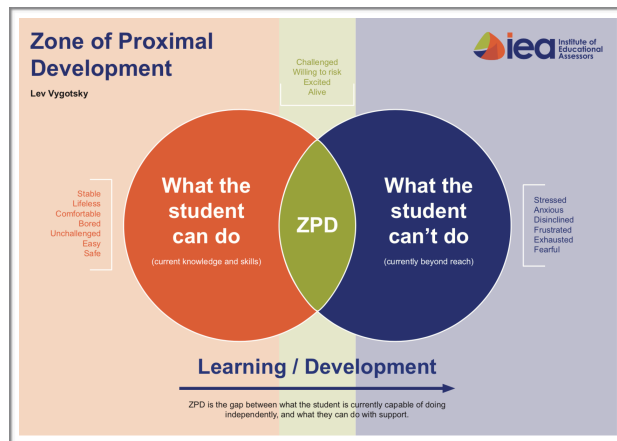


Explain why teacher subject knowledge is important in relation to teaching Language and Mathematics in primary schools in Wales.

Historically, the role of the teacher has been to teach generic skills that can be transferred throughout the classroom and that children could use outside the classroom correspondingly. The subjects taught were used to introduce these skills and act as a means of helping the teachers project these skills to their pupils. This was echoed in the national curriculum limited of specific content and secluded from developments at the “frontiers of the subject” (Marsden, 1997). However, in recent years there has been a growth in the awareness of teacher subject knowledge and the importance of the knowledge of the teacher. In a contemporary audit of research into the effective methods of teaching, Coe et al (2014) found that “a teacher’s subject knowledge, and their understanding of how pupils handle this subject, has strong evidence of impact on student outcomes.” Subject knowledge of mathematics and language is of particular importance as these are at the heart of most subjects across curriculum. Therefore, the Welsh Government (2019) have set strict minimum entry requirements which you must achieve prior to enrolling as a trainee teacher. A minimum of “a GCSE Grade B or above (or equivalent) in both Mathematics and English Language or English Literature” must be achieved before commencing the trainee teacher course (Welsh Government, 2019). They have set these strict guidelines to ensure that individuals with prospects of studying to become a teacher have the competent mathematical and language skills needed to teach the core subjects. The National Curriculum is about to undertake a process of change. Donaldson (2015) suggests that with the new curriculum there will be greater focus on teacher subject knowledge. Donaldson set out 68 recommendations which will help the curriculum succeed. One of the recommendations is: “An extensive and sustained programme of professional learning should be developed to ensure that the implications of the Review recommendations for the skills and knowledge of teachers and other practitioners are fully met.” This shows the direction the Education sector is going as a result of the new curriculum, moving towards and even greater emphasis on the importance of teacher subject knowledge. This can only be beneficial as it will provide children with greater knowledge which will help to ensure their development. During this assignment the pedagogical knowledge of teachers observed while on PTE will be discussed and also the Mathematics and Language lessons that were observed and taught will be evaluated.

The chosen focus skill for Mathematics was the use of different mental strategies to work out addition and subtraction sums. I had the chance to teach this during PTE 1 where I was situated in Year 6. The class consisted of 24 children with 6 having Additional Learning Needs. The class had 3 tables ranging from More Able and Talented (MAT) to Lower ability children. Therefore, activities had to be differentiated for each ability group. The class topic for the experience was ‘Ancient Egypt’ and as part of the Mathematics Programme of Study mental addition and subtraction was concentrated on. Welsh Government (2016, p.5) state that learners should be able to “add and subtract numbers using whole numbers and decimals”. The children had prior knowledge of mental addition and subtraction and most of the children were competent when using smaller numbers. However, a large proportion of the class struggled when working with larger numbers and needed to use a column sum. This was due to the fact that the children did not understand the methods that could be used to achieve the answer mentally. Therefore, I introduced the different methods, such as rounding, using number facts, partitioning and adding parts of numbers. As this was the first time that many of the children had used these strategies, they required a form of scaffolding. “Scaffolding refers to the steps taken to reduce the degrees of freedom in carrying out some task so that the child can concentrate on the difficult skill she is in the process of acquiring” (Bruner, 1978, p. 19). Bruner believed that when children are tasked with something alien they will require the guidance of an adult figure or knowledgeable other to help them to understand what they have been set and how to overcome the task. Therefore, this suggests that teacher subject knowledge is critical in ensuring that the children understand what they are being taught. I

felt competent in using these strategies which helped to effectively introduce and teach the methods. Firstly, I worked with the children in their ability groups as part of a carousel activity. Fisher and Ellis (1990) emphasise that “most of the definitions of a group indicate the sharing element among members as the key factor which defines the existence of a group”. The inclusion of group work was taken due to the fact that there is a feeling that children learn better when working in a smaller group. Jaques (2004) argues that “the purposes and benefits of group learning coincide closely with the goals of higher education in general”. Furthermore, research from McKeachie & Kulik (1975) suggests that “when looking at long term retention, the ability to apply knowledge and solve problems, critical thinking and development of positive attitudes, results consistently favour small discussion classes”. I feel that working in groups worked well to introduce the different methods that be used to mentally add and subtract. Another form of scaffolding taken was differentiating the activities that the children completed. As mentioned, the children were working in their ability groups therefore I tried to ensure that the work that they were completing was tailored to their needs. I explained each of the methods however with the lower ability and Basic Skills groups I focused on the method they found the easiest to understand, which was partitioning. However, with the Higher ability group I focused on the method they found easiest to understand but tried to link the other methods, to challenge them further. In addition, the groups had activities to complete relating to the mental addition and subtraction and these were differentiated also. Each group had a different sheet consisting of 7 questions ranging from higher ability to lower ability. Furthermore, if the children finished their activity they would attempt the more challenging sheets as a form of an extension. (All work sheets can be found in the appendix). In addition, another TA was used as another form of support for the Lower ability group. The TA was mainly focusing on the pupil who requires one-on-one support, however she was on hand for some of the other children who were struggling if I was working with another child. Most of the children struggled with some of the questions, therefore it worked well having another adult on hand to provide extra support. While teaching these tasks I tried to implement the scaffolding strategies mentioned and I feel they worked well towards the success of the task; however I attempted to implement strands of independent learning to ensure that the children understand fully. For example, the children worked independently to solve the introductory equations using any method of mental addition/subtraction. Furthermore, the higher ability mainly worked independently during the main activity, unless they were unable to complete the question, then they would either ask the teacher or work with their partner, exchanging ideas and solutions to solve the equation. However, with the lower ability they struggled with more of the questions, therefore the opportunities for independent learning for this group were limited. Nonetheless, I tried to find the appropriate combination of understanding and challenging the pupils to achieve the optimum learning experience. This relates to the Zone of Proximal Development (ZPD). Vygotsky (1978, p.86) defines the ZPD as “the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem-solving under adult guidance, or in collaboration with more capable peers”. In terms of education the ZPD refers to the area of advancement in which the learner is more likely to gain a greater understanding. Figure 1 shows that the ZPD identifies the gap between what a child is able to do independently and what the child can do with the encouragement and aid from a teacher or a knowledgeable other. Therefore, the model suggests that if the pupil is not supported in the ZPD they will struggle to make improvements in their development. The support mentioned refers to Bruner’s (1978) theory of scaffolding. Therefore, both Bruner’s (1978) and Vygotsky’s (1978) work are related. They both follow the Constructivism theory of learning. Pritchard (2009) states that “Constructivists view learning as the result of mental construction. That is, learning takes place when new information is built into and added onto an individual's current structure of knowledge, understanding and skills”. Therefore, constructivists believe that learning is a result of the child’s examination of and interaction with the environment.



(Figure 1- diagram explaining the Zone of Proximal Development)

There is a common perception that “mathematics should be taught with understanding” (Hiebert & Lefevre, 1986). However, Dickson, Brown & Gibson (1984) suggest that “pupils tend to rely on the use of formulae with little understanding of the mathematical concepts involved” suggesting that children accept what they are being taught and as a result lack a deeper understanding of the reasoning behind the theory. This proposes that the children do not fully understand the mathematical concepts that they are being taught. Furthermore, there is also “evidence that student teachers have a similar reliance on formulae” (Baturu & Nason, 1996). During my time on PTE I feel that I encountered both of these situations. I found that the most of the children were solely interested in the result and not the mathematical concepts behind the formula which I feel had an affect on their understanding. However, I feel as a student teacher I relied too heavily on the use of formulae and I lacked the deeper understanding of the concepts being taught. This is due to the fact I attempted to ensure that the children understood the task at hand without over complicating, which I feel I achieved and the children completed and understood the tasks. However, in relation to teacher subject knowledge, I could have expanded my knowledge of the subject to ensure the optimum learning experience for the children.

The chosen focus skill for English was reading across the curriculum and more specifically establishing connections between sounds to make words. Welsh government (2016) state that pupils should be able to:

“recognise that words are constructed from phonemes (sounds) and that phonemes are represented by graphemes (written letters):

- blend combinations of letters
- segment combinations of letters”- (Welsh Government, 2016)

I had the chance to observe this skill being taught as well as having an assigned group whom I worked with during my time on PTE in a class of 30 in Reception. The class completed phonics activities everyday in their ability groups and I worked with the Higher ability group. The subject knowledge needed from the

teacher was less due to the fact that the learning expectations for the children are lower as they must be taught the basic skills which they then can build and improve on. The skill of reading was highlighted as one of the most important elements by the class teacher, therefore many aspects of the day involved the use of phonics to improve their level of language and reading skills. Reading was seen as an important skill throughout the Foundation Phase in the school and this can be seen on the Estyn report. Estyn (2012) state that “in the Foundation Phase, most pupils use appropriate strategies for decoding unfamiliar words and younger pupils use picture clues well to help them with the meaning of words”. This suggests that the level of teaching in relation to reading and phonics is of a high standard in the school. I feel that I encountered such levels of teaching while on PTE and the standards set by the teacher were echoed throughout the class, which had a positive affect on the TAs and myself while teaching, especially during Phonics and language work. Therefore, I feel that teacher subject knowledge is an important factor in terms of improving the language skills of the children especially at such an early age. The Department for Education (DfE) (2011) suggest that “If teaching early reading, demonstrate a clear understanding of systematic synthetic phonics”. I feel that during my time working in the Reception class and specifically teaching phonics and English the importance of having the basic knowledge of the different sounds and the variety of patterns was seen. However, on the other hand the effective methods of teaching used in the classroom when teaching phonics could be seen as the catalyst for the success of the teaching of phonics in the school and the high standards set by the children when working with phonics.

The importance of teacher subject knowledge is clearly an influential factor in the growth and development of children especially when working with phonics. Kyriacou (1991:5) identified three elements of effective teaching and outlined subject knowledge as one of these elements. Kyriacou (1991) states: “comprising the teacher's knowledge about the subject, pupils, curriculum, teaching methods, the influence on teaching and learning of other factors, and knowledge about one's teaching skills”. When teaching phonics, knowledge of the subject is no different. Waugh and Jolliffe (2012) state that “as a teacher, you need to ensure that you understand the terminology relating to phonics teaching and that you are able to teach children how to use phonic knowledge to decode unfamiliar words”. This suggests that the key to the effective teaching of phonics is ensuring that the teacher has the appropriate knowledge and skills allowing them to efficiently teach and implement these ideas to the children. I feel that this is particularly decisive when discussing the teaching of phonics in the Early years such as Reception. This is due to the fact that children of this age are at the stage of their development where they are introduced to the variety of letters and sounds. I believe that it is critical that children are exposed to the best level of teaching of phonics at this age to ensure that they are given the best chance to succeed in higher education. Teacher subject knowledge has a considerable role to play. The teacher needs to be able to transfer their knowledge to the children effectively, to adequately expand their knowledge and promote development. Furthermore, Waugh and Jolliffe (2012) state that “the levels of subject knowledge required to teach children about language are now considerably greater than many of us acquired during our secondary schooling, and even during teacher training”. This suggests that there is a higher demand on teacher subject knowledge in the contemporary society, resulting in more strain on the trainee and student teachers. Waugh and Jolliffe (2012) suggest that one of the main worries for student teachers when teaching English is “understanding how to teach reading”. I feel this statement is relatable to my experiences while on PTE. Overall, I feel that the proportion of PTE where I was teaching phonics went well, however I felt that during my first experiences I did not possess the level of knowledge needed to teach phonics effectively. Nonetheless, I felt that my confidence and ability to teach grew the more time I spent in the class. Also, I believe that my knowledge of language improved the more I taught it which allowed me to transfer the appropriate skills to the children more effectively, as a more informed individual. This refers to the ZPD where children need support from a “more knowledgeable other”. (Vygotsky, 1978)

Figure 1 shows that as pupils are introduced to a new skill they will need support from a teacher or a significant other as a form of scaffolding to expand their knowledge.

In conclusion, the importance of teacher subject knowledge is clearly unprecedented. This is supported by the work of Ball and Bass (2000) as they state: “ sound content and pedagogical content knowledge provides the resources for an on-the-spot synthesis of actions, thinking, theories, and principles within classroom episodes”. However, this being said the teacher must be able to build relationships with the children to be able to plan sessions that are tailored to the needs of the children. Also, the teacher’s ability to apply their knowledge is another critical factor in establishing a positive classroom environment. A prime example of this is teaching in the Early years. The level and expectation of the children is lower compared to older children, this means that the subject knowledge required is less in comparison. Therefore, I feel that the ability to transfer the ideas to the children outweighs the importance of Teacher subject knowledge in the Early years classes in schools, this ensures that the children understand the basic skills which they can then build on as they progress in their academic career. However, from my experience on PTE I found that when working with older children, they rely more on a good subject knowledge set by the teacher, to ensure they can develop intellectually. Sir John Holman (2014) states that “specialist knowledge was vital to inspire a love of science in pupils, particularly at primary level”. This suggests that the greater the subject knowledge that the teacher possesses, enjoyment in the subject from the class will increase and ultimately drive their passion for learning which can only help in relation to their development.

References

Ball, D., & Bass, H. (2000) Interweaving content and pedagogy in teaching and learning to teach: Knowing and using mathematics.

Bruner, J. S. (1978, p.19). The role of dialogue in language acquisition. In A. Sinclair, R., J. Jarvella, and W. J.M. Levelt (eds.) *The Child's Concept of Language*. New York: Springer-Verlag.

Coe R, Aloisi C and Higgins S (2014) *What Makes Great Teaching? Review of the Underpinning Research. Sutton Trust.*

Department for Education (2011) *Standards for Teaching: Subject knowledge*

http://www.inspiringleaderstoday.com/ILTMaterials/LEVEL3_LIT-v4.0-2014_08_08-11_54_0/leading-and-improving-teaching/lit-s4/lit-s4-t05.html

Dickson L, Brown M, Gibson O, (1984), Children learning Mathematics. Cassell

Donaldson (2015) ‘Successful Futures’: Independent Review of Curriculum and Assessment Arrangements in Wales. OGL: Crown Copyright 2015

Estyn (2012) 'A report on Townhill Community Primary School'. Available at:

[illegible]

Fisher, B. A., & Ellis, D. G. (1990). *Small group decision making: Communication and the group process*. New York: McGraw-Hill.

Hiebert, J., & Lefevre, P. (1986). Conceptual and Procedural Knowledge in Mathematics: An Introductory Analysis. In J. Hiebert (Ed.), *Conceptual and Procedural Knowledge: The Case of Mathematics*. Hillsdale, NJ: Lawrence Erlbaum Associates.

JAQUES, D (2004) *Small Group Teaching*, Oxford Centre for Staff and Learning Development, UK.

Kyriacou, C. (1991:5). *Essential teaching skills*. Oxford: Blackwell [rp. Simon and Schuster].

Marsden B (1997) On taking the geography out of geography education: Some historical pointers. *Geography* 82(3): 241–252.

McKEACHIE, W.J. & KULIK, J.A. (1975) *Effective College Teaching*. In F.N. Kerlinger (ed.) *Review of Research in Education*. Itaska, Ill. Peacock.

Pritchard (2009) Ways of Learning. London: Routledge

Simply psychology (2019). What is the Zone of Proximal Development (Online)
Available at:

<https://www.simplypsychology.org/Zone-of-Proximal-Development.html>

Sir John Holman (2014) (Online) Available at:

<https://www.tes.com/news/subject-knowledge-prime-factor-good-teaching-experts-say>

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Waugh , D.W & Jolliffe, W.J (2012). *English 5-11: A Guide for Teachers*. : Routledge.

Welsh Government (2016) National Literacy and Numeracy Framework. Available at:

<https://learning.gov.wales/resources/browse-all/nlnf/framework?lang=en>

Welsh Government (2019): Initial Teacher Education (ITE)

Available at:

<https://gov.wales/initial-teacher-education-ite>

Appendix

Resource Sheet 946a answers

Red table additions (Answers)

$3012 + 601$ $= 3613$	$13250 + 4007$ $= 17257$
$10.05 + 2.8$ $= 12.85$	$16.34 + 0.105$ $= 16.445$
$6\,000\,050 + 33\,500$ $= 6\,033\,550$	$13\,204 + 390$ $= 13\,594$
$8500.5 + 322$ $= 8822.5$	

© John Wiley & Sons, Inc. All rights reserved. 11/10/2017

Resource Sheet 946b answers

Blue table additions (Answers)

$11.99 + 6.08$ $= 18.07$	$456 + 799$ $= 1255$
$10\,075 + 49$ $= 10\,124$	$12.84 + 13.9$ $= 26.74$
$69 + 274$ $= 343$	$280 + 499$ $= 779$
$16.9 + 12.7$ $= 29.6$	

© John Wiley & Sons, Inc. All rights reserved. 11/10/2017

Resource Sheet 946c answers

Green table additions (Answers)

$83 + 62$ $= 145$	$94 + 28$ $= 122$
$59 + 85$ $= 144$	$76 + 67$ $= 143$
$48 + 71$ $= 119$	$83 + 66$ $= 149$
$35 + 57$ $= 92$	

© John Wiley & Sons, Inc. All rights reserved. 11/10/2017

Resource Sheet 946d answers

Yellow table additions (Answers)

$536 + 82$ $= 618$	$927 + 927$ $= 1854$
$350 + 390$ $= 740$	$3400 + 2800$ $= 6200$
$56\,000 + 27\,000$ $= 83\,000$	$730 + 270$ $= 1000$
$8.7 + 8.8$ $= 17.5$	

© John Wiley & Sons, Inc. All rights reserved. 11/10/2017