

EAAE4005

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The young mathematician: exploration and problem solving

Section one: Activity plan

Cynllun Gweithgaredd		
Activity Plan		
Activity: Math relay		
Number of children: 16	Age of children: 5/6 years old	Number of adults: 2
Location: indoors (sports hall)	Preparation time: 7 minuets	Activity time: 10
Resources: • Plastic cones • White board pen		
Aim/s of activity: • To promote teamwork • To promote problem solving • For children to recognize sums quickly through games • To improve a child's social interaction by learning from other children around them (lower ability learning from higher ability).		
Links to outcomes: “use ‘counting on’ strategies to add two collections, starting with the larger number, e.g. $8 + 5$”. (Welsh Government, 2015, p.32) “use a range of strategies to mentally solve problems within 10” (Welsh Government, 2015, p.32). “understand and use the mathematician symbols for addition, subtraction and equals” (Welsh Government, 2015, p.33).		
Differentiation: • Lower ability -smaller numbers (numbers up to 5) • Higher ability -use multiplication and division		
Health and safety: • suitable footwear • suitable clothing • clear surfaces • check for spillages • enough space for the ratio of the children		
Role of adult/adults:		

- to observe children
- explain instructions
- encouragement

The activity:

1. Allow children to get dressed into suitable clothing and footwear.
2. Explain the purpose of the game (to recognize sums quickly)
3. Explain task (use two children from each team as a demonstration).

Task overview –

- *Split the 16 children in to two groups of 8 (groups must be mixed ability)*
- *Put the two groups to sit behind either line*
- *Either team will have a practitioner monitor them*
- *Start the timer and blow the whistle*
- *The first two children flip two cones of their choice, there will be a number on each cone*
- *The child will then have to add the two numbers together (add larger number first) and shout out the answer to the practitioner on their team. Until the answer is correct the child will not be able to go back to their team.*
- *Once the child gets the answer the right, they run back to join their team and the next child goes.*
- *The quickest team to complete wins.*

Section 2: Evaluation

This evaluation will discuss the positives and negatives of the activity plan. This activity has been set following the suitable mathematic requirements for children aged 5/6 (year 1) from the Foundation Phase Framework, Welsh Government (2020). Rutherford, (2020) states by carrying out mathematical games it will promote strategic mathematical thinking and it allow the child to become more understanding of their numbers. Foundation Education (2018) states carrying out mathematics through the use of games promotes holistic development in the early years. Foundation Education (2018) are convinced by this as it does not only promote intellectual development through-out the activity, it addresses physical development as the children will be using a form of aerobic exercise. The activity also encourages social and emotional growth as children will have to work together in a team, Foundation Education (2018).

The action plan states that it will use two adults to carry-out the activity when working with the children, this allows an appropriate level of supervision for the ratio of children, NSPCC (2010). However, to improve the action plan SMHP (No Date) states that by having extra support it allows staff to have more time to help children who require assistance. Sendiass Gloucestershire (2019) states that having extra support when carrying out activities, will allow the children to benefit in several different ways. It allows every child to have an equal opportunity to learn as more support is provided. Contact for families with disabled children (2020) states a child with disabilities should have a keyworker, this is an adult who takes full responsibility of the child (one to one), by having this in place it will allow ALN/SEN students to feel involved in the activity. It will also encourage lower ability students to look up to higher ability, as Hurst et al. (2013) states this is a form of social interaction and it will improve the child's knowledge and promote critical thinking and problem-solving skills which are required in the task.

Howe, (No Date) suggests cameras are a powerful tool to practitioners as it encourages reflection on the child. Through photographic images, it allows practitioners to widen their understanding of what the child is doing and captures work that the child might not be able to write in their book. Carrying on, Unison (No Date) states teaching assistants prepare the classroom for activities and put away equipment after lessons, in this activity by having 3 teachers instead of 2, this will allow the preparation to be smooth.

The activity lasts for 10 minutes however to improve the activity plan. Perform (2020) states that five-year old's concentrate up to 5 minutes at a time. This suggests that using short activities will benefit the child as they will get what needs to be done in the concentrated time, allowing them not to go off task, Perform (2020).

CCMIT (No Date) suggests keeping activities short promotes problem solving skills, these are beneficial to children as if they make a mistake, the child will learn, they will then start to see an improvement in their learning. Ivy Prep Early Learning Academy (2018) also states problem solving is a superior part of a child's development. Through-out the foundation stages, many milestones will arise. This will allow children to learn about the academic world around them.

Olsen, (2015) mentions that shortening tasks promotes mental maths, there are several reasons to why this is beneficial. First of all, a child being able to do mental math results in fluency and confidence in any activity, resulting in the student being more successful. Secondly, children using mental maths methods adds connections in the brain, which often make individual tasks such as homework easier as it allows children to understand new concepts quicker. Finally, mental math is useful in everyday life. For example, working out how much your shopping will come to, comparing product prices or working out sale prices, these are everyday needs. Overall, the relay activity promotes all of these everyday skills which children will be required to know in later years, Olsen, (2015). (Welsh Government, 2015, p.32) states children need to "use a range of strategies to mentally solve problems within 10" this activity also follows the Foundation Phase requirements for year 1 students.

The relay activity is based indoors in the school hall however, Hwb Wales (No Date) states that theorist McMillan believed that children achieve their full potential outdoors through active learning. The activity includes "use 'counting on' strategies to add two collections, starting with the larger number, e.g. $8 + 5$ ". (Welsh Government, 2015, p.32) this is a classroom activity that has been turned in to a physical task, which promotes active learning, (Suttie, 2018).

Cambridge Assessment International Education (No Date) states active learning challenges student's problem-solving skills as they play the biggest role in their learning process. It is down to the teacher to provide information for the relay activity but then for the students to problem solve and build their knowledge and understanding of the task, the proposed outcome is for the year one students to be able more independent after the activity, Cambridge Assessment International Education (No Date). This links to Vygotsky's theory which is what the student can achieve without support and what the student can achieve with guidance from the teacher, Cambridge Assessment International Education (No Date). This claims that problem solving promotes practitioners to encourage children with intellectual challenges, without doing the work for them which plays an important role in Key Stage 2 mathematics, National Council of Teachers of Mathematics (2020).

This activity takes place outdoors, Froebel believes that outdoor activities allow children to develop an understanding of the natural world. This is due to children having space and freedom to move around and explore and engage 'with key concepts such a gradient, gravity, speed and energy', Tovey,

(No Date, p.4). Furthermore, working in the outdoors allows children learning opportunities which cover all areas of the curriculum, Tovey, (No Date).

The natural environment is superior for children as Victoria State Government, (2019, p.1). are convinced that children being in the outdoors promotes ‘creativity, symbolic play, problem solving and intellectual development’, the activity promotes all these skills.

The activity is going to use natural objects, Pupil Voice Wales (No Date) believe instead of using plastic for the cones, wood is a better resource as it can be reclaimed and reused.

The activity has 3 links to outcome following the suitable mathematic requirements for children aged 5/6 (year 1) from the Foundation Phase Framework, Welsh Government (2020). (Welsh Government, 2015, p.32) states the first link to outcome is “use ‘counting on’ strategies to add two collections, starting with the larger number, e.g. $8 + 5$ ”. The relay activity is adding together two numbers, using the largest number first, this promotes children meeting the Foundation Phase links. Secondly, “use a range of strategies to mentally solve problems within 10” (Welsh Government, 2015, p.32). The relay activity adds together two numbers, both numbers are 10 and under, this promotes meeting the Foundation Phase requirements. Lastly, “understand and use the mathematician symbols for addition, subtraction and equals” (Welsh Government, 2015, p.33). The relay activity is recognising the addition and equals symbols, his promotes children meeting the Foundation Phase links.

When carrying-out the activity outdoors, it is important that health and safety is considered. Firstly, Health and Safety Executive (No Date) states risk assessments are required to be up to date and should be re-done every year. Furthermore, Department for Education and Employment (No Date) states that it is vital that there is a qualified first aider present.

The activity plan includes differentiation. Differentiation has been used due to Victoria State government (2019) ensuring that students all learn using different learning techniques at a different pace however, making adjustments it allows practitioners to deliver different parts of the curriculum to the child’s ability. Using differentiation in the activity allows children to master the activity and to continually grow. Victoria State government (2019) further states that this allows all children who are not at the same starting level to eventually achieve the same curriculum outcome but just through using different learning techniques.

Henderlong, J. and Lepper, M. (2002) states that praise should be used in all activities that practitioners set when working with children. If praise is received in the relay activity it will have a beneficial effect on children. This will motivate and encourage a child, which results in their

performance improving. Henderlong, J. and Lepper, M. (2002) also believes it is the role of the adult to praise the child for their accomplishments. This will boost the child's self-esteem in the activity. A child having a positive self-esteem will allow them to feel more confident, giving it's all in the activity, allowing practitioners to see the child's ability, Better Health (2020). Practitioners also need to be motivated when carrying out this activity as Kotherja (No Date) states teachers need to be motivated, as children will thrive off positive learning techniques which they find effective in their education. This will also allow children to feel motivated to learn, which is needed in the relay activity.

PennState (No Date) states it is important that the role of the adult in the activity monitors how well the child is doing. Observation is a vital piece of information for a child's progress and continuous quality improvement. Through-out the relay activity practitioners need to observe a child's ability of adding together two numbers and working out the answer. PennState (No Date) states that observation is important to practitioners as they receive an objective view of the child and where they are at in their development. By carrying-out the mathematical relay game, it will allow the practitioner to understand the child, helping "to plan individualized and developmentally informed activities" PennState (No Date, p.1). The maths relay game will have a third adult, this is a good way to monitor a child's progress, Institute of Education (2020). The relay activity has a third adult which is going to be used to observe, this is to see if children are hitting their milestones. These observations will be carried-out by video, note and photo taking, British Council (2020).

The relay activity is an independent mathematical activity for practitioners to see where the child is at in their development, PennState (No Date). However, practitioners are required to support the child by scaffolding them, providing enough information on the task, breaking down the sum without giving the answer, Community Connections (2012), this links to Vygotsky's theory encouraging the child to progress further. This also promotes Siraj Blatchford 2002 sustained shared thinking theory as the teacher will talk through the activity and the children will intellectually solve the problem, providing an opportunity for the students to think more deeply about how to work out the sum, Community Connections (2012).

Section 3

Tucker (2016) believes that the natural environment plays a huge part in the child's growth as a self-regulated learner as it is considered an important part of early years education. It's proven that the outdoors helps a child's self-esteem and encourages independent learning, these are skills that are required in education, especially mathematics to benefit their future success, Higher Education Academy (2018). Tucker (2016) also states that children are more engaged when working outdoors due to them experiencing different opportunities and atmosphere.

Tucker (2016) believes that using the environment for physical activities allows children to feel motivated and inspired. Natural Council of Teachers of Mathematics (2020) state motivation is key in maths, if children are motivated, they will stay on task and use various strategies to work out the answers, this also promotes being independent. Theorist Mcmillan believes that children achieve their full potential through using the outdoors and that fresh air is important, Hwb (No Date). Montessori is also convinced that being in the outdoors is important for a child's growth, Montessori Group (No Date).

Tovey (No Date) believes that the outdoors positively encourage risk taking. Risk taking in the early years is important as it promotes a 'have a go' attitude which will allow children to enjoy challenges rather than fear them. Risk taking is an important part of mathematics as children will learn from mistakes, Sharma (2015).

Tucker (No Date, p.7.) claims that natural resources are often seen as open-ended materials by children. Some of the benefits are that they allow children to promote their feelings and ideas, this shows a child's mathematical knowledge through aesthetic aspects which are seen through "pattern, shape and symmetry". Another benefit to using natural materials are that they are accessible, this means schools don't have to dig into their budget, Government of South Australia (2014). This is an advantage as budget cuts effect opportunities for children, CBPP (No Date). NRMD (No Date) states natural resources are better than plastic as their disposal does not cause harm to the environment.

Government of South Australia (2014) points out that natural materials promote sensory development, this is down to them being different shape and size, VKRP (No Date). This promotes mathematics as understanding how to compose and decompose shapes broadens other area's such as numbers and arithmetic.

Section 4- The role of the adult

Reid (2016) believes that early numeracy skills can be supported by young children and their teachers/family members. It is vital that adults understand the importance of numeracy so that they can involve maths in their day to day interactions, which will develop a child's mathematical thinking. Carrying on, Reid (2016) is convinced that family members play a huge part in the child's mathematical development. It states that if parents don't positively influence maths in everyday practise such as baking a cake, where the child would need to weigh out flour and count how many eggs need to be used, the child could be negatively influenced, resulting in the child's mathematical knowledge being fragile.

It is important that adults understand Vygotsky's theory when teaching mathematics. The theory is that children learn from others around them, Manchester University (No Date). AQA (2020) states a benefit of mixed ability grouping is that teachers are able to set the same expectations, as children can work together to interact, stronger students should support weaker students. Bremner (2008) believes that lower ability to look up to higher ability students, this can be done through watching what they are doing or joining in with the discussion, so by encouraging mixed ability, it has a positive impact on a child's mathematical learning.

Cairns (2015) states in order for a child to learn and have an interest in mathematics, adults must provide a positive attitude towards the subject. Adults need to be confident when teaching mathematics, as children will be more likely to learn. However, if adults face barriers in this subject, this will influence the child, making them feel reluctant to learn as they will not feel confident. Pound (2006) are also convinced that adults need to become more confident on their mathematical abilities, as insecurity can allow them to feel un-confident. Children look at adults as their role models so it is vital that they are confident, as it will set the child in to the way they look at maths. The role of the adult is to encourage mathematics to children as National Numeracy (2020) state that maths is used in every aspect of a child's life and most decisions are based on numerical information, so good numeracy is essential.

Pound (2006) believes that adults should be aware of where the child's mathematical ability is at, looking on how they can support them, this re-visits the curriculum as adults need to observe to know the child's ability is at and try to effectively teach them to meet societies expectations, Alsubaie (2016). Due to children having different abilities it is important that an adult observes, tests, revisits and reviews the child to find out the best approach to support students, by carrying out these observations, practitioners should see a base for the child and look at how they will develop and explore new elements to their knowledge. This will allow the child to be more interested, resulting in them being engaged in the mathematical activity, Pound (2006).

This also supports the Foundation Phase. It is vital that adults undertake elements from the Foundation Phase pedagogy, Hwb (2008). Foundation Phase (No Date) states that it supports active learning, this is important as it provides opportunities that are built on the child's previous experiences which allow them to become independent thinkers and learners. Another benefit to active learning is that children are able to use their imagination which promotes creativity, Foundation Phase (No Date). Overall, Tientongdee (2018) believes that that active learning is a good technique as it encourages a child to problem solve and discuss with other peers and children.

Reference list

Anon, (2020). [online] Available at: <https://www.cambridge-community.org.uk/professional-development/gswal/index.html> [Accessed 17 Feb. 2020].

Anon, (2020). [online] Available at: <https://www.cbpp.org/research/state-budget-and-tax/a-punishing-decade-for-school-funding> [Accessed 24 Feb. 2020].

Aqa.org.uk. (2020). *Teaching guide: maximising mixed ability classes*. [online] Available at: <https://www.aqa.org.uk/resources/languages/gcse/teach/mixed-ability-classes> [Accessed 24 Feb. 2020].

Assets.publishing.service.gov.uk. (2020). [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/306370/guidance_on_first_aid_for_schools.pdf [Accessed 17 Feb. 2020].

Betterhealth.vic.gov.au. (2020). *Self esteem*. [online] Available at: <https://www.betterhealth.vic.gov.au/health/healthyliving/self-esteem> [Accessed 24 Feb. 2020].

Better Kid Care (Penn State Extension). (2020). *Why Observe Children? (Better Kid Care)*. [online] Available at: <https://extension.psu.edu/programs/betterkidcare/news/2018/why-observe-children> [Accessed 24 Feb. 2020].

Bingschool.stanford.edu. (2020). *Cameras in the Early Childhood Classroom: A Powerful Tool for Documentation and Reflection | Bing Nursery School*. [online] Available at: <https://bingschool.stanford.edu/news/cameras-early-childhood-classroom-powerful-tool-documentation-and-reflection> [Accessed 16 Feb. 2020].

Britishcouncil.org. (2020). *Every child is capable of learning maths | British Council*. [online] Available at: <https://www.britishcouncil.org/voices-magazine/every-child-capable-learning-maths> [Accessed 24 Feb. 2020].

Britishcouncil.org. (2020). *How observing other teachers can improve your teaching | British Council*. [online] Available at: <https://www.britishcouncil.org/voices-magazine/how-observing-other-teachers-can-improve-your-teaching> [Accessed 24 Feb. 2020].

Ccmit.mit.edu. (2020). *CCMIT*. [online] Available at: <https://ccmit.mit.edu> [Accessed 17 Feb. 2020].

Ceebl.manchester.ac.uk. (2020). [online] Available at: <http://www.ceebl.manchester.ac.uk/events/archive/aligningcollaborativelearning/Vygotsky.pdf> [Accessed 24 Feb. 2020].

Contact.org.uk. (2020). *Support in the early years | Contact*. [online] Available at: <https://contact.org.uk/advice-and-support/education-learning/support-in-the-early-years/> [Accessed 16 Feb. 2020].

Core.ac.uk. (2020). [online] Available at: <https://core.ac.uk/download/pdf/152488196.pdf> [Accessed 24 Feb. 2020].

Education.vic.gov.au. (2020). *High impact teaching strategies in action: Differentiated teaching*. [online] Available at: <https://www.education.vic.gov.au/school/teachers/classrooms/Pages/approacheshitsdifferentiation.aspx> [Accessed 24 Feb. 2020].

Eycp.essex.gov.uk. (2020). [online] Available at: https://eycp.essex.gov.uk/media/1181/positiverelationships-understanding_sustained_shared_thinking.pdf [Accessed 24 Feb. 2020].

Files.eric.ed.gov. (2020). [online] Available at: <https://files.eric.ed.gov/fulltext/EJ1095725.pdf> [Accessed 24 Feb. 2020].

Google.co.uk. (2020). *why are natural resources beneficial to childcare - Google Search*. [online] Available at: https://www.google.co.uk/search?client=safari&sxsrf=ALeKk01RsGO4RgzWt3-nI8DvHJOHtZpquw%3A1582566375587&ei=5wtUXpm-I-CGhbIPmuCC0As&q=why+are+natural+resources+beneficial+to+childcare&oq=why+are+natural+resources+beneficial+to+child&gs_l=psy-ab.3.0.33i22i29i30.29650.31051..33018...0.2..0.117.580.3j3.....0....1..gws-wiz.....0i71j35i39.ws76Aw5w2Xw [Accessed 24 Feb. 2020].

Greater Good. (2020). *The Surprising Benefits of Teaching a Class Outside*. [online] Available at: https://greatergood.berkeley.edu/article/item/the_surprising_benefits_of_teaching_a_class_outside [Accessed 17 Feb. 2020].

Heacademy.ac.uk. (2020). *New research shows benefits of independent learning | Higher Education Academy*. [online] Available at: <https://www.heacademy.ac.uk/about/news/new-research-shows-benefits-independent-learning> [Accessed 24 Feb. 2020]

Hse.gov.uk. (2020). *Case 339 - School risk assessments to be re-done every year*. [online] Available at: <https://www.hse.gov.uk/myth/myth-busting/2014/case339-school-risk-assessments-to-be-redone-every-year.htm> [Accessed 17 Feb. 2020].

<https://www.cbpp.org/research/state-budget-and-tax/a-punishing-decade-for-school-funding>

Hwb.gov.wales. (2020). [online] Available at: <https://hwb.gov.wales/storage/8f0b360f-f1f6-4bec-b11a-df88168007f9/learning-and-teaching-pedagogy.pdf> [Accessed 24 Feb. 2020].

Institute of Education. (2020). *Are SEN teaching assistants effective?*. [online] Available at: <https://www.ucl.ac.uk/ioe/research-projects/2019/nov/are-sen-teaching-assistants-effective> [Accessed 24 Feb. 2020].

Iopscience.iop.org. (2020). [online] Available at: <https://iopscience.iop.org/article/10.1088/1742-6596/1144/1/012002/pdf> [Accessed 24 Feb. 2020].

Montessori St Nicholas. (2020). *The Montessori Learning Environment - Montessori St Nicholas*. [online] Available at: <https://www.montessori.org.uk/about-us/what-is-montessori/the-montessori-learning-environment> [Accessed 24 Feb. 2020].

National Numeracy. (2020). *Why is numeracy important?*. [online] Available at: <https://www.nationalnumeracy.org.uk/why-numeracy-important> [Accessed 24 Feb. 2020].

Nctm.org. (2020). *Motivation Matters! - National Council of Teachers of Mathematics*. [online] Available at: https://www.nctm.org/News-and-Calendar/Messages-from-the-President/Archive/Linda-M_-Gojak/Motivation-Matters!/ [Accessed 24 Feb. 2020].

Nctm.org. (2020). *Problem Solving - National Council of Teachers of Mathematics*. [online] Available at: <https://www.nctm.org/Research-and-Advocacy/Research-Brief-and-Clips/Problem-Solving/> [Accessed 17 Feb. 2020].

Nctm.org. (2020). *Why Play Math Games? - National Council of Teachers of Mathematics*. [online] Available at: https://www.nctm.org/publications/teaching-children-mathematics/blog/why-play-math-games_/ [Accessed 16 Feb. 2020].

NSPCC Learning. (2020). *Recommended adult to child ratios for working with children | NSPCC Learning*. [online] Available at: <https://learning.nspcc.org.uk/research-resources/briefings/recommended-adult-child-ratios-working-with-children/> [Accessed 16 Feb. 2020].

Oslen, J. (2015) 'Five Keys for Teaching Mental Math', *Mathematics Teacher* vol.108, p.7.

Perform.org.uk. (2020). *Helping Your Child to Concentrate | Perform*. [online] Available at: <https://www.perform.org.uk/about-perform/meet-lucy/blog2/2010/07/helping-your-child-to-concentrate/> [Accessed 16 Feb. 2020].

Pound, L. (2006). *Supporting mathematical development in the early years* (2nd ed., Supporting early learning). Maidenhead: Open University Press.

Pupil Voice Wales. (2020). *The Importance of Recycling and Reusing Plastics - Pupil Voice Wales*. [online] Available at: <http://www.pupilvoicewales.org.uk/the-importance-of-recycling-and-reusing-plastics/> [Accessed 24 Feb. 2020].

Reed.edu. (2020). [online] Available at: <https://www.reed.edu/motivation/docs/PraiseReview.pdf> [Accessed 24 Feb. 2020].

Resources.hwb.wales.gov.uk. (2020). *English Text*. [online] Available at: <http://resources.hwb.wales.gov.uk/VTC/2008-09/14-19/cache/testun/testunSaesneg3.htm> [Accessed 24 Feb. 2020].

Scholarworks.wmich.edu. (2020). [online] Available at: https://scholarworks.wmich.edu/cgi/viewcontent.cgi?article=3105&context=reading_horizons [Accessed 16 Feb. 2020]

Scilt.org.uk. (2020). [online] Available at: https://scilt.org.uk/Portals/24/Library/slr/issues/18/18_bremner.pdf [Accessed 24 Feb. 2020].

Sendiassglos.org.uk. (2020). *Role of the Teaching Assistant | SENDIASS Gloucestershire | Special Educational Needs & Disability Information, Advice & Support Service*. [online] Available at: <https://sendiassglos.org.uk/role-of-the-teaching-assistant/> [Accessed 16 Feb. 2020].

Sharma, S. (2015). Promoting risk taking in mathematics classrooms: The importance of creating a safe learning environment. *Mathematics Enthusiast*, 12(1-3), 290–306

Skillsforschools.org.uk. (2020). *Home*. [online] Available at: <http://www.skillsforschools.org.uk> [Accessed 16 Feb. 2020].

Smhp.psych.ucla.edu. (2020). [online] Available at: <http://smhp.psych.ucla.edu/pdfdocs/vols.pdf> [Accessed 16 Feb. 2020].

Teachingcommons.stanford.edu. (2020). *Promoting Active Learning | Teaching Commons*. [online] Available at: <https://teachingcommons.stanford.edu/resources/learning-resources/promoting-active-learning> [Accessed 17 Feb. 2020].

Tovey, H. (No Date) *A Froebelian Approach Outdoor Play and Exploration*. London: Solutions Design Consultants Limited.

Vkrponline.org. (2020). [online] Available at: http://vkrponline.org/blog/wp-content/uploads/2018/04/VKRP_SHAPE_5_2_SVL_final.pdf [Accessed 24 Feb. 2020].

Welsh Government (2015) *Foundation Phase Framework (revised 2015)*. Cardiff: Welsh Government.