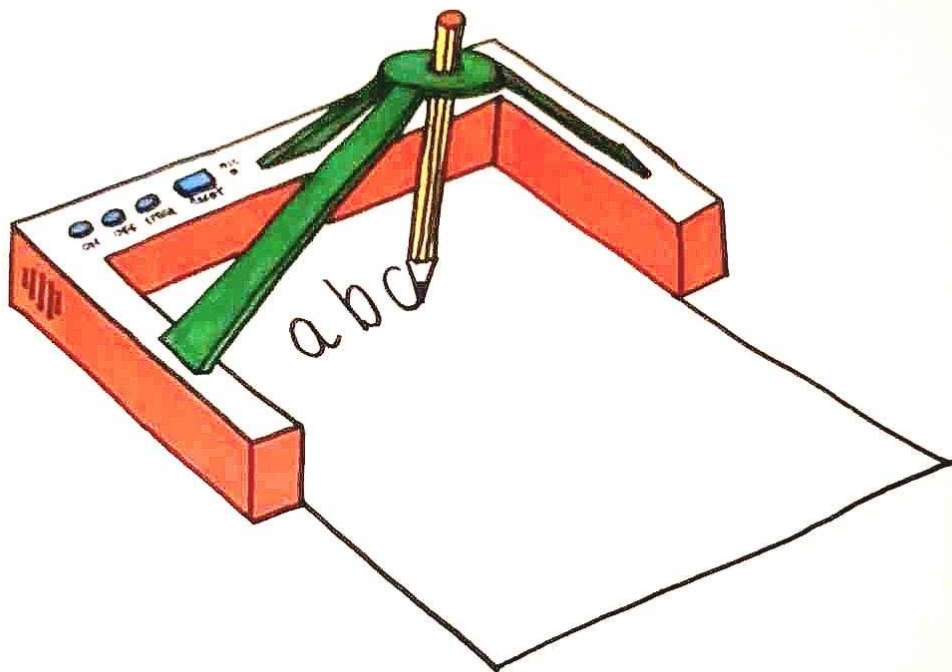


The Wriggly Writer

‘Wriggle your fingers and
wriggle your toes, the more
you write the more it flows’



Part 1

What is the 'Wriggly Writer?'

I have created a writing machine called the 'Wriggly Writer' that aids children to form their letters and numbers in the correct way. It supports them to start and finish them at the correct point. The machine has a button that you can press and speak into to tell it what the child needs support with or the child can dictate this independently. For example, a practitioner or a child may hold the button down and say "write a 'g' or a 'number 9'". The child can then slot their pencil into the holder, with the opportunity to grip the pencil appropriately underneath before it goes onto the paper and moves in the correct way to form a 'g' or a '9'. It then moves across the page so children can write it numerous times with the opportunity at the end to take the pencil out and try it without support. For more able children they may progress to write sentences like 'The boy was sad.' or sums like '6+4=10'.

Who is this product suitable for?

This product is aimed at children between the ages of 3 and 7 or children with Additional Learning Needs such as Autism and Dyslexia that would benefit from a writing aid. According to Welsh Government (2019a) and Barton *et al.* (2017) technology-aided instruction and interventions (TAII) had a positive effect on children with Autism Spectrum Disorder. TAII is when technology is used to support children's learning. This product will also benefit practitioners and parents as it will be a device that their children can use both with support and independently and it will develop the children's writing abilities. Speldewinde and Campbell (2023) and Teichert and Salman (2021) suggest that opportunities to engage with technology enables children to gain an understanding of the world around them. This product would be suitable for Primary Schools, Nursery Settings, Special Educational Needs settings and families that wish to support their children's writing development at home. Therefore, it is aimed at a broad audience.

Why am I a good seller for this product?

I have worked in a Primary School as a Teaching Assistant for twelve years, consequently I have a wealth of experience in both Key Stage two and in the Foundation Phase. Over the years I have observed many children struggling with the

skill of writing. Also, our school is in the process of implementing the New Curriculum for Wales which has given me a broad understanding of the importance of children learning to write, this is what inspired me to create this product. As stated by Welsh Government (2023b) one of the progression steps in the Curriculum for Wales is to use an appropriate pencil grip and begin to form letters correctly.

Why is this idea innovative?

From carrying out market research I have concluded that this product is unique and believe that a product like this is in demand due to many children struggling with the skill of learning to write. Hebert *et al.* (2018) and Sumner, Connelly and Barnett (2014) maintain that many children with dyslexia experience writing difficulties. Good transcription skills, executive function and working memory affect a child's ability to write. These skills can be hard for the children, resulting in low overall writing quality. Santrock (2009, cited in Rahmat *et al.*, 2017) and Fuente, Kauffman and Boruchovitch (2023) state that Bandura created the social cognitive theory. The theory places emphasis on the symbiotic relationship between environment, behaviour and cognitive factors which can all influence children's writing abilities. I believe that the 'Wriggly Writer' will boost children's confidence and support them to feel success when writing, with the hope that it will be used in positive learning environments which will in turn affect the behaviour of the learner. This will result in children developing their writing skills and holistic development.

There are other writing aids on the market like slant boards and pencil grips which will be useful for children after using the 'Wriggly Writer' when their confidence improves, and they can write with more independence. Furthermore, there are also writing interventions such as triangular prism shaped sensorised pencils, tablet stylus' and haptic guidance which are not always proven to be effective, these will be discussed in depth in the critical evaluation in part two. The 'Wriggly Writer' brings unique benefits that other writing interventions do not carry. The machine is quite small, therefore light and easy for both children and the adults to transport which is essential in a school setting due to working in different areas.

How does it link to the early years?

The 'Wriggly Writer' has many developmental benefits for children that use it. The main outcome of this machine is to improve both letter and number formation which

aids their writing skills. Stagg Peterson *et al.* (2018) and Kim *et al.* (2015, cited in Guo *et al.*, 2021) maintain that literacy development later in childhood will have been impacted by the quality and quantity of children's early writing. Also, learning to write improves children's reading skills. Due to the focus on the appropriate pencil grip, it has a positive influence on their fine motor skills. According to Welsh Government (2023a) and Bindman *et al.* (2014) fine motor manipulation is important, the more time and opportunities the children are given to perfect these fine motor skills the more smoothly co-ordinated and refined they become. This will in turn develop increasing independence.

Due to the need to speak into the machine to articulate what they need to practice children's speech and language skills will be developed. Welsh Government (2022) and Davidson and Randhawa (2020) state that children should experience activities that develop their speaking and communication skills as effective communication and language is key to learning. Learning to write improves their creativity and imagination whilst encouraging self-expression. Bingol (2023) says that writing improves children's creative thinking by encouraging them to use their imaginations and foster's individual expression by giving them opportunities to express their feelings, ideas and experiences. Letter formation and early writing will frame these more formal writing experiences later in life.

Possible barriers and how can we overcome the barriers?

Equipment and materials to create the product will need to be purchased which will be at a cost and then the product will be created by specialists which will be an additional cost. However, I believe that I will easily make this money back due to the product being unique and the benefits it holds. This product is very well made and would be a great investment with the benefits on children's development outweighing the cost of production. There are many childcare settings and schools around the United Kingdom that would benefit from this product, I feel the popularity of this product will soar. Parents may also purchase this for their children to practice their writing in the home environment.

As a young woman starting up my own business, I am aware of the impact of gender inequality within this industry and the need to access finance. Welsh Government (2019b) and Leitch, Welter and Henry (2018) point out that to enable women to start

up and lead a business they will need access to finance. They will not only need finance to start up their business but also to help invest for growth. Initially I am going to apply for a start-up loan, Welsh Government (2024a) maintain that there is a government backed scheme called The Start Up Loans Company that can provide people over the age of eighteen with a repayable loan if they have no access to finance but a viable business idea.

Conclusion

To conclude the 'Wriggly Writer' has the potential to be a successful product that will improve children's holistic development with a special focus on writing skills. The slogan for my product is:

"Wriggle your fingers and wriggle your toes, the more you write the more it flows".

Part 2

Learning to write is an important skill for children to develop from a young age. According to Puranik, Petscher and Lonigan (2014) the first thing children do when completing conventional writing is learn to write the letters of the alphabet in the correct format. Empirical research suggests that the capacity to write letters is a strong predictor of early spelling, a word-level writing skill. Fitzgerald and Shanahan (2000, cited in Jouhar and Rupley, 2021) state that the reading-writing connections bidirectional view posits that reading and writing are independent but reciprocal processes due to sharing common knowledge and skills. Ray *et al.* (2021) say that word reading accuracy and fluency is improved when children learn to write. Furthermore, Karlsdottir and Stefansson (2002, cited in Hong *et al.*, 2020) and Cruz, Urgilés and Salamanca (2022) maintain that academic achievement can be adversely affected by difficulties in handwriting and this can have negative consequences on academic performance. One of the hardest challenges that children face during education is learning to write and read.

According to Cruz, Urgilés and Salamanca (2022) many children are diagnosed with dyslexia after the sensitive period for language development which is the first seven years of life. The earlier interventions are put into place the more effective the results will be because it would be functioning in tandem with the child's natural biological and cognitive development. However, according to Fien, Chard and Baker (2021) recently state legislation was published which recommended that schools provide early screening and intervention for dyslexia, unfortunately these practices have not been implemented at scale. Mather (2022, cited in Fischer, 2023) points out that strong right hemispheric cerebral dominance leads to mirror writing both spatial letter and sequential letter types, this in turn interferes with children's normal reading development and confuses them. He believed that by delaying learning to write until the age of eight years dyslexia may be prevented. Fischer (2023) disagrees and says that teaching writing later can delay children learning to read. Writing activities give teachers and children opportunities to identify and correct writing reversal errors which are more visible in writing and easier to detect than in reading instruction. The 'Wiggly Writer' would be a beneficial intervention for children to practice their writing skills during their sensitive period for language development. It enables them to work on their letter formation, extend their sentences and aid writing reversal errors.

Welsh Government (2023) say that one of the progression steps in the New Curriculum for Wales is to use an appropriate pencil grip and begin to form letters correctly. Van Hartingsveldt *et al.* (2011, cited in Hong *et al.*, 2020) point out that children partake in fine motor tasks and writing by hand for thirty-one to sixty percent of the school day. Liu, Hoffmann and Hamilton (2015) and Denton and Germino-Hausken (2000, cited in Dinehart and Manfra, 2013) maintain that children with low socioeconomic status have considerable delays in fine and gross motor skills in comparison to their typically developing age-matched peers. This places emphasis on the importance of early variations in fine motor skills which can positively influence academic achievement in later life. According to Kamińska (2016) Bruner and Vygotsky believed that children develop academically through interactions with the physical environment. Children from more deprived areas may have less opportunities to explore diverse environments and partake in rich learning experiences that develop motor skills.

Gross (2017, p.5) believes that technology can be used to support speech and language development. Ofsted (2009, cited in Gross, 2017, p.2) state that rich opportunities for speaking and listening in the classroom took place in the most effective schools they visited, this improved the overall writing standards. Welsh Government (2020) say that for children to have a positive education and good health and wellbeing their speech, language and communication skills must be developed. Oral language skills serve as the foundation for literacy development, promoting speech and language development can also lessen the impact of social disadvantage throughout life. According to Basit *et al.* (2014) if young children struggle to acquire speech and language skills often their academic performance is poorer compared to other children their age and sometimes continues to be so throughout their school life. The 'Wriggly Writer' supports speech and language development due to the children speaking into the machine, articulating what they want to write or need support with.

Serpa-Andrade (2020) maintains that an experiment was carried out with a triangular prism shaped sensorised pencil which provided significant improvements in children both with and without Special Educational Needs when learning to write. However, it is not advantageous to introduce this pencil to children that have already mastered their handwriting skills or consolidated bad habits. The Wriggly Writer is suitable for

children to use at any stage of their handwriting development, it re-enforces correct formation and there are opportunities to strengthen current handwriting abilities whilst extending their writing development further. Park *et al.* (2021) state that a study was carried out investigating the effect of haptic guidance on teaching handwriting to children that experience fine motor and cognitive delays. The results showed that haptic guidance is ineffective for low to medium motor complexity and visually unfamiliar activities, leading to poorer performance. The Wiggly Writer will benefit children with low to medium motor abilities due to working on their basic fine motor skills such as gripping the pencil. It would not affect a child if the activity was visually unfamiliar due to the machine guiding the child to form the letters, words or sentences that they aim to write.

Mayer *et al.* (2019) say that results of a study show that the influence of using a tablet stylus on writing performance is poor. They believe this is because the tablet surface is slippery therefore handwriting with a stylus is challenging due to the high demands it places on motor control. This may affect the quality of motor and visual memory traces and result in production of poorly written letters. When children use the 'Wiggly Writer' they use a pencil and paper which prepares them for writing experiences that they will regularly partake in during the school day. Cullen, Richards, & Lawless-Frank (2008, cited in Dawson *et al.*, 2018) point out that assistive technology (AT) can support children with Dyslexia. Talking word processors which translate written material into spoken text, as well as speech-to-text programmes that allow pupils to convert spoken language to writing can help students improve their spelling and writing skills. Furthermore, Dawson *et al.* (2018) maintain that it is important that both AT implementation and intervention strategies are used for children with Dyslexia, AT cannot be replaced with effective intervention strategies in writing and reading.

A possible barrier to the 'Wiggly Writer' is that practitioners and parents may rely on it to keep the children quiet or busy and they may not support the children when using it which extends their learning. Children should have opportunities to use the machine independently and with support. According to Lentz, Seo and Gruner (2014) caregivers and educators should ensure that technology is not always used to occupy the children without adult interaction. Extending the child's interactions with new technology might be as simple as expressing enthusiasm while the child utilises

the tool, or it can include modelling or directions that allow the child to fully explore the device and extend their learning. Similarly, Simin and Heidari (2013, cited in Pazilah, Hashim and Yunus, 2019) believe that the speaking communication between students and teachers may decrease when technology is used, this limits their overall communication skills and can result in poor communication which makes it harder to build positive relationships. Vygotsky (1998, cited in Neumann, 2023) states that if the child is assisted by an adult when completing a task, the practitioner can aim to get the children to reach the next zone in their Zone of Proximal Development by scaffolding their learning.

Another challenge may be that practitioners do not want the children to rely on the use of technology to aid their writing. They may also not feel confident when using technology due to lack of experience and training therefore do not promote it. Teichert and Salman (2021) point out that children need to engage with technology to become fully literate in society. Despite this many caregivers, parents and practitioner's express concerns about children using digital tools. Children need opportunities to use digital technology to operate and negotiate meaning. Additionally, Saulsburry *et al.* (2015) maintain that technology can boost student involvement, support writing instruction and improve engagement of struggling or reluctant writers. Nonetheless, Daniels *et al.* (2019) say that many teachers that teach children between the ages of zero and eleven are reluctant to promote digital literacies in their settings. This could be because they feel that professional development in this area is lacking. Furthermore, Jack and Higgins (2019) believe that limited use of technology in schools can be due to a variety of extrinsic barriers such as lack of technical support, training and money to purchase equipment. Also, intrinsic barriers which involve beliefs and attitudes.

According to Mariotti and Glackin (2016, p.250) there is a one-time expense when starting a business which is known as the seed capital or the start-up investment. When creating a product, a prototype of the item may need to be created which would make the start-up cost more. Darnihamedani *et al.* (2018) point out that there is a one-off start-up cost that increases the difficulty of becoming an entrepreneur, these can be known as registration costs or notary charges. Often low entrepreneurship rates are associated with high start-up costs. Welsh Government (2024b) and Grozdanovska, Bojkovska and Jankulovski (2017) state that the

entrepreneur should have sufficient financial planning which is ensuring that there is enough money to be able to grow the business and meet the needs of it. They need to keep financial control which entails monitoring how much money is going into and out of the business. They also need to make financial decisions which involves analysing accurate information to make decisions about the business that are informed and meaningful.

For a product to be successful there needs to be effective marketing for it. Barringer and Ireland (2021, p.421- 422) and Nuseir and Madanat (2015) maintain that entrepreneurs need a marketing mix which are often split into four categories and known as the 4Ps; product, price, promotion and place. Nevertheless, Londhe (2014) believes that the 4Ps are outdated due to the focus being on the provider's viewpoint rather than the customer's perspective. Kassab (2023) points out that the structure of the 4Ps was viewed as limited and simplistic. As organisational settings and market dynamics change it's important to reevaluate the controllable components of the marketing mix, especially for digital organisations.

To conclude, the 'Wriggly Writer' has the potential to be implemented across the early years field. Cardon, Glauser and Murnieks (2017) maintain that entrepreneurs that are passionate about their endeavours are more committed and dedicated to their ventures. They have the ability to stay fully engaged in their actions and persist in pursuing venture related activities and goals. The entrepreneur has plans to offer this product in various designs and colours when the product is successful, making it more visually appealing for the children and will create a website to sell them. The 'Wriggly Writer' presents future opportunities to create more smart technologies to support children's development. Alli (2018) states that a successful new product entails not only meeting user preferences and requirements, but also following a methodical approach. The creator of the 'Wriggly Writer' is passionate about developing products to support children's learning and has the motivation to make the 'Wriggly Writer' a successful product.

Reference List

Alli, H. (2018) 'Evaluation theories of product definition method for a successful new product', *Alam Cipta*, 11(2), pp. 52-56. Available at: http://psasir.upm.edu.my/id/eprint/66125/1/20181224114136artikel_07.pdf (Accessed: 25 February 2024).

Barringer, B.R. and Ireland, R.D. (2021) *Entrepreneurship : successfully launching new ventures*. 6th edn. Harlow, England: Pearson.

Barton, E.E., Pustejovsky, J.E., Maggin, D.M. and Reichow, B. (2017) 'Technology-Aided Instruction and Intervention for Students With ASD: A Meta-Analysis Using Novel Methods of Estimating Effect Sizes for Single-Case Research', *Remedial and special education*, 38(6), pp. 371–386. Available at: <https://doi.org/10.1177/0741932517729508> (Accessed: 28 February 2024).

Basit, T.N., Hughes, A., Iqbal, Z. and Cooper, J. (2015) 'The influence of socio-economic status and ethnicity on speech and language development', *International journal of early years education*, 23(1), pp. 115–133. Available at: <https://doi.org/10.1080/09669760.2014.973838> (Accessed: 26 February 2024).

Bindman, S.W., Skibbe, L. E., Hindman, A. H., Aram, D. and Morrison, F.J. (2014) 'Parental writing support and preschoolers' early literacy, language, and fine motor skills', *Early childhood research quarterly*, 29(4), pp. 614–624. Available at: <https://doi.org/10.1016/j.ecresq.2014.07.002> (Accessed: 29 February 2024).

Bingol, M. (2023) 'The Influence of Writing Prompts on Student Creativity and Expression', *International journal of social sciences & educational studies*, 10(3), pp. 348–354. Available at: <https://doi.org/10.23918/ijsses.v10i3p348> (Accessed: 09 February 2024).

Cardon, M.S., Glauser, M. and Murnieks, C.Y. (2017) 'Passion for what? Expanding the domains of entrepreneurial passion', *Journal of Business Venturing Insights*, 8, pp. 24–32. Available at: <https://doi.org/10.1016/j.jbvi.2017.05.004> (Accessed: 25 February 2024).

Daniels, K., Bower, K., Burnett, C., Escott, H., Hatton, A., Ehiyazaryan-White, E. and Monkhouse, J. (2020) 'Early years teachers and digital literacies: Navigating a kaleidoscope of discourses', *Education and information technologies*, 25(4), pp. 2415–2426. Available at: <https://doi.org/10.1007/s10639-019-10047-9> (Accessed: 22 February 2024).

Darnihamedani, P., Block, J.H., Hessels, J. and Simonyan, A. (2018) 'Taxes, start-up costs, and innovative entrepreneurship', *Small business economics*, 51(2), pp. 355–369. Available at: <https://doi.org/10.1007/s11187-018-0005-9> (Accessed: 25 February 2024).

Davidson, R. and Randhawa, G. (2020) 'The Sign 4 Little Talkers Intervention to Improve Listening, Understanding, Speaking, and Behavior in Hearing Preschool Children: Outcome Evaluation', *JMIR pediatrics and parenting*, 3(1), pp. e15348–e15348. Available at: <https://doi.org/10.2196/15348> (Accessed: 29 February 2024).

Dawson, K., Antonenko, P., Lane, H. and Zhu, J. (2019) 'Assistive Technologies to Support Students With Dyslexia', *Teaching exceptional children*, 51(3), pp. 226–239. Available at: <https://doi.org/10.1177/0040059918794027> (Accessed: 24 February 2024).

De la Fuente, J., Kauffman, D.F. and Boruchovitch, E. (2023) 'Editorial: Past, present and future contributions from the social cognitive theory (Albert

Bandura)', *Frontiers in psychology*, 14, pp. 1-2. Available at:
<https://doi.org/10.3389/fpsyg.2023.1258249> (Accessed: 28 February 2024).

Dinehart, L. and Manfra, L. (2013) 'Associations Between Low-Income Children's Fine Motor Skills in Preschool and Academic Performance in Second Grade', *Early education and development*, 24(2), pp. 138–161. Available at:
<https://doi.org/10.1080/10409289.2011.636729> (Accessed: 13 February 2024).

Fien H., Chard D. J. and Baker S. K. (2021) 'Can the evidence revolution and multi-tiered systems of support improve education equity and reading achievement?', *Reading Research Quarterly*, 56, pp. S105–S118. Available at:
<https://doi.org/10.1002/rrq.391> (Accessed: 24 February 2024).

Fischer, J-P. (2023) 'Preventing the Development of Dyslexia: A Reply to Mather', *Perceptual and motor skills*, 130(4), pp. 1415–1432. Available at:
<https://doi.org/10.1177/00315125231179780> (Accessed: 21 February 2024).

Gross, J. (2018) *Time to talk : implementing outstanding practice in speech, language and communication*. 2nd edn. London: Routledge, Taylor & Francis Group.

Grozdanovska, V., Bojkovska, K. and Jankulovski, N. (2017) 'Financial Management and Financial Planning in the organizations', *European Journal of Business and Management*, 9(2), pp. 120-125. Available at:
https://www.researchgate.net/profile/Nikolche-Jankulovski/publication/372861746_FINANCIAL_MANAGEMENT_AND_FINANCIAL_PLANNING_IN_THE_ORGANIZATIONS/links/64cb76b2d394182ab3a03003/FINANCIAL-MANAGEMENT-AND-FINANCIAL-PLANNING-IN-THE-ORGANIZATIONS.pdf (Accessed: 25 February 2024).

Guo, Y., Puranik, C., Kelcey, B., Sun, J., Dinnesen, M.S. and Breit-Smith, A. (2021) 'The Role of Home Literacy Practices in Kindergarten Children's Early Writing Development: A One-Year Longitudinal Study', *Early education and development*, 32(2), pp. 209–227. Available at: <https://doi.org/10.1080/10409289.2020.1746618> (Accessed: 28 February 2024).

Hebert, M., Kearns, D.M., Hayes, J.B., Bazis, P. and Cooper, S. (2018) 'Why Children with Dyslexia Struggle with Writing and How to Help Them', *Language, speech & hearing services in schools*, 49(4), pp. 843–863. Available at: https://doi.org/10.1044/2018_LSHSS-DYSLC-18-0024 (Accessed: 09 February 2024).

Hong, Q., Jiang, B., Xu, Q., Zhang, L., Ou, J., Zhang, Q., Li, N., Wang, J., Xie, Y., Hua, J., Guo, X., Tong, M. and Chi, X. (2020) 'Reliability and validity of Handwriting Test for Preschool Children (HT-PRE): A new tool to assess the handwriting ability of preschool children aged 5-6 years old in Mainland China', *PloS one*, 15(3), pp. e0229786–e0229786. Available at: <https://doi.org/10.1371/journal.pone.0229786> (Accessed: 13 February 2024).

Jack, C. and Higgins, S. (2019) 'Embedding educational technologies in early years education', *Research in learning technology*, 27, pp. 1–17. Available at: <https://doi.org/10.25304/rlt.v27.2033> (Accessed: 22 February 2024).

Jouhar, M.R. and Rupley, W.H. (2021) 'The Reading-Writing Connection based on Independent Reading and Writing: A Systematic Review', *Reading & writing quarterly*, 37(2), pp. 136–156. Available at: <https://doi.org/10.1080/10573569.2020.1740632> (Accessed: 24 February 2024).

Kamińska, A. (2016) 'Encouraging dialogue between teachers and students in the environment of elementary school education: the sociocultural conceptions of Vygotsky and Bruner', *Edukacja Elementarna w Teorii i Praktyce*, 8(29/3), pp. 23-32. Available at: <https://czasopisma.ignatianum.edu.pl/eetp/article/view/262/521> (Accessed: 15 February 2024).

Kassab, A. (2023) *Emerging Trends in Marketing Strategy: A Comprehensive Analysis of 4PS*. Available at: https://www.theseus.fi/bitstream/handle/10024/802512/Kassab_Ata.pdf?sequence=2&isAllowed=y (Accessed: 25 February 2024).

Leitch, C., Welter, F. and Henry, C. (2018) 'Women entrepreneurs' financing revisited: taking stock and looking forward: New perspectives on women entrepreneurs and finance (Special Issue)', *Venture capital*, 20(2), pp. 103–114. Available at: <https://doi.org/10.1080/13691066.2018.1418624> (Accessed: 29 February 2024).

Lentz, C.L., Seo, K.K-J. and Gruner, B. (2014) 'Revisiting the Early Use of Technology: A Critical Shift from 'How Young Is Too Young?' to 'How Much Is "Just Right"?'', *Dimensions of early childhood*, 42(1), pp. 15-23. Available at: <https://files.eric.ed.gov/fulltext/EJ1044096.pdf> (Accessed: 21 February 2024).

Liu, T., Hoffmann, C. and Hamilton, M. (2017) 'Motor Skill Performance by Low SES Preschool and Typically Developing Children on the PDMS-2', *Early childhood education journal*, 45(1), pp. 53–60. Available at: <https://doi.org/10.1007/s10643-015-0755-9> (Accessed: 13 February 2024).

Londhe, B.R. (2014) 'Marketing Mix for Next Generation Marketing', *Procedia economics and finance*, 11, pp. 335–340. Available at:

[https://doi.org/10.1016/S2212-5671\(14\)00201-9](https://doi.org/10.1016/S2212-5671(14)00201-9) (Accessed: 20 February 2024).

Mariotti, S. and Glackin, C. (2016) *Entrepreneurship : starting and operating a small business*. 4th edn. Boston: Pearson.

Mayer, C., Wallner, S., Budde-Spengler, N., Braunert, S., Arndt, P. and Kiefer, M. (2020) 'Literacy Training of Kindergarten Children With Pencil, Keyboard or Tablet Stylus: The Influence of the Writing Tool on Reading and Writing Performance at the Letter and Word Level', *Frontiers in psychology*, 10. Available at: <https://doi.org/10.3389/fpsyg.2019.03054> (Accessed: 23 February 2024).

Neumann, M. M. (2023) 'Exploring and mapping young children's digital emergent writing on tablets', *Early Years*, 43(4–5), pp. 697–711. Available at: <https://doi.org/10.1080/09575146.2021.1999214> (Accessed: 03 February 2024).

Nuseir, M.T. and Madanat, H. (2015) '4Ps: A Strategy to Secure Customers' Loyalty via Customer Satisfaction', *International Journal of Marketing Studies*, 7(4), pp. 78-87. DOI:10.5539/ijms.v7n4p78

Park, W., Babushkin, V., Tahir, S. and Eid, M. (2021) 'Haptic Guidance to Support Handwriting for Children With Cognitive and Fine Motor Delays', *IEEE transactions on haptics*, 14(3), pp. 626–634. Available at: <https://doi.org/10.1109/TOH.2021.3068786> (Accessed: 15 February 2024).

Pazilah, F.N., Hashim, H. and Yunus, M.M. (2019) 'Using Technology in ESL Classroom: Highlights and Challenges', *Creative Education*, 10, pp. 3205-3212. Available at: <https://doi.org/10.4236/ce.2019.1012244> (Accessed: 24 February 2024).

Puranik, C.S., Petscher, Y. and Lonigan, C.J. (2014) 'Learning to write letters: Examination of student and letter factors', *Journal of experimental child psychology*, 128, pp. 152–170. Available at: <https://doi.org/10.1016/j.jecp.2014.07.009> (Accessed: 12 February 2024).

Rahmat, N., Arepin, M., Yunus, D. and Rahman, S. (2017) 'Analyzing Perceived Writing Difficulties through the Social Cognitive Theory', *PEOPLE: International Journal of Social Sciences*, 3(2), pp. 1487-1499. Available at: <https://doi.org/10.20319/pijss.2017.32.14871499> (Accessed: 11 February 2024).

Ray, K., Dally, K., Colyvas, K. and Lane, A.E. (2021) 'The Effects of a Whole-Class Kindergarten Handwriting Intervention on Early Reading Skills', *Reading research quarterly*, 56(S1), pp. S193–S207. Available at: <https://doi.org/10.1002/rrq.395> (Accessed: 12 February 2024).

Sánchez Cruz, L., Ordóñez Urgilés, J.A. and Bustamante Salamanca, M. (2022) 'Early detection of difficulties in the reading-writing process of four-year-old infants', *Revista MENDIVE*, 20(3), pp. 944–952. Available at: <https://mendive.upr.edu.cu/index.php/MendiveUPR/article/view/3038> (Accessed: 13 February 2024).

Saulsburry, R., Kilpatrick, J., Wolbers, K. and Dostal, H. (2015) 'Getting students excited about learning: Incorporating digital tools to support the writing process', *Odyssey*, 16, pp. 30-34. Available at: <https://files.eric.ed.gov/fulltext/ED602764.pdf> (Accessed: 24 February 2024).

Serpa-Andrade, L.J., Pazos-Arias, J.J., López-Nores, M. and Robles-Bykbaev, V.E. (2020) 'Sensorised Low-Cost Pencils for Developing Countries: A Quantitative Analysis of Handwriting Learning Progress in Children with/without Disabilities

from a Sustainable Perspective', *Sustainability*, 12(24), pp. 10682-. Available at: <https://doi.org/10.3390/su122410682> (Accessed: 15 February 2024).

Speldewinde, C. and Campbell, C. (2023) 'Bush kinders': developing early years learners technology and engineering understandings', *International journal of technology and design education*, 33(3), pp. 775–792. Available at: <https://doi.org/10.1007/s10798-022-09758-x> (Accessed: 11 February 2024).

Stagg Peterson, S., Parr, J., Lindgren, E. and Kaufman, D. (2018) 'Conceptualizations of writing in early years curricula and standards documents: international perspectives', *Curriculum journal*, 29(4), pp. 499–521. Available at: <https://doi.org/10.1080/09585176.2018.1500489> (Accessed: 09 February 2024).

Sumner, E., Connelly, V. and Barnett, A.L. (2016) 'The Influence of Spelling Ability on Vocabulary Choices When Writing for Children With Dyslexia', *Journal of learning disabilities*, 49(3), pp. 293–304. Available at: <https://doi.org/10.1177/0022219414552018> (Accessed: 28 February 2024).

Teichert, L. and Salman, M. (2021) 'Digital Technology in the Early Years: A Reflection', *McGill journal of education*, 56(2–3), pp. 292–313. Available at: <https://doi.org/10.7202/1096456ar> (Accessed: 22 February 2024).

Welsh Government (2019a) *Support for Children and Young People with Autistic Spectrum Disorder (ASD) in educational settings*. Available at: <https://www.gov.wales/sites/default/files/publications/2023-12/ways-of-supporting-learners-with-autistic-spectrum-disorder-asd.pdf> (Accessed: 09 February 2024).

Welsh Government (2019b) *Supporting Entrepreneurial Women in Wales: Good Practice Guide*. Available at:

<https://www.gov.wales/sites/default/files/publications/2020-01/supporting-entrepreneurial-women-wales-approach.pdf> (Accessed: 09 February 2024).

Welsh Government (2020) *Siarad Gyda Fi: Talk With Me*. Available at: <https://www.gov.wales/sites/default/files/publications/2020-11/talk-with-me.pdf> (Accessed: 26 February 2024).

Welsh Government (2022) *A curriculum for funded non-maintained nursery settings*. Available at: <https://hwb.gov.wales/api/storage/b1801d78-38c3-4320-9818-d9996c21aef8/220914-a-curriculum-for-funded-non-maintained-nursery-settings.pdf> (Accessed: 09 February 2024).

Welsh Government (2023a) *Curriculum for Wales: Enabling Learning*. Available at: <https://hwb.gov.wales/curriculum-for-wales/designing-your-curriculum/enabling-learning/> (Accessed: 09 February 2024).

Welsh Government (2023b) *Curriculum for Wales: Languages, Literacy and Communication*. Available at: <https://hwb.gov.wales/curriculum-for-wales/languages-literacy-and-communication/descriptions-of-learning/> (Accessed: 02 February 2024).

Welsh Government (2024a) *Finance: Start Up Loans*. Available at: <https://businesswales.gov.wales/businessfinance/types-finance-and-how-apply/start-loans#guides-tabs--0> (Accessed: 09 February 2024).

Welsh Government (2024b) *Understanding the basics*. Available at: <https://businesswales.gov.wales/starting-up/managing-your-finances/understanding-basics> (Accessed: 25 February 2024).