

Impact case study (REF3)

Institution: Royal Holloway, University of London		
Unit of Assessment: 4 Psychology, Psychiatry and Neuroscience		
Title of case study: Using the science of reading to change literacy policy and practice		
Period when the underpinning research was undertaken: 2002-2020		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Kathy Rastle	Professor	2002-date
Period when the claimed impact occurred: 2016-2020		
Is this case study continued from a case study submitted in 2014? N		
1. Summary of the impact		
<p>Poor literacy brings profound social and economic costs for individuals, communities, and nations. Even amongst high-income countries, over 15% of children leave school with poor reading skills. Research at RHUL led by Professor Rastle has transformed understanding of the neurocognitive processes involved in reading. Her research has also translated the science of reading into concrete recommendations for reading instruction. These recommendations benefit all levels of the literacy ecosystem: teachers and schools; educational leadership organisations; literacy advocacy groups and dyslexia charities; educational publishers; and policy. Rastle's research has underpinned three sets of impacts on how children around the world are taught to read: (a) influences on practitioner knowledge, capacity, and practice; (b) changes to literacy policy in Australia and the USA; and (c) shaping the 10-year literacy strategy of the World Bank.</p>		
2. Underpinning research		
<p>Reading is a multi-faceted problem requiring interactions between multiple subsystems that operate at different units of analysis. The process of reading acquisition arises over many years. Further, the requirements of developing reading skill vary across writing systems. Thus, it is unsurprising that there is widespread confusion, uncertainty, and debate about how reading should be taught. Professor Rastle has been at the forefront of uncovering the neurocognitive processes that underpin skilled reading and reading acquisition, and translating the science of reading so that it can be embedded in literacy policy and practice.</p> <p>Professor Rastle joined the Department of Psychology in 2002, and has led multiple projects that use experimental, computational modelling and neuroscientific methods to identify how single printed words are mapped to spoken language. Rastle's work originally focused on the processes involved in <i>skilled</i> reading (i.e. the outcome of learning). She developed one of the field's most influential theoretical models of skilled reading (the dual-route cascaded model; over 4,000 citations) at a previous institution. At RHUL, she has used this model to understand new phenomena (R1), to interrogate the neural basis of reading (R2), and to understand reading in other alphabetic writing systems (R3).</p> <p>More recently, Professor Rastle has turned to the problem of how instruction facilitates reading <i>acquisition</i>. In work that won the BPS Cognitive Section Prize (2018; R4), Rastle combined brain imaging with a laboratory analogue of reading acquisition, in which adults learned the meanings of new words printed in an unfamiliar alphabet. This work showed that instruction on the <i>sounds</i> of new words improved reading aloud performance more than instruction on the <i>meanings</i> of new words. These methods of reading instruction improved reading comprehension to the same degree. Crucially, the brain imaging data provided understanding of <i>why</i> these instruction effects were observed. This work was important because it provided a neurocognitive basis for phonics</p>		

instruction in alphabetic writing systems. Phonics instruction is explicit teaching of the relationship between spellings and sounds. It has been debated vigorously for over 30 years but this debate has often reflected entrenched philosophical positions rather than science. This piece of work (**R4**) was reported extensively in the education press (e.g. *Tes*, *Schools Week*), and helped to bring neurocognitive evidence into the debate around reading instruction.

Professor Rastle's work has also articulated how we develop reading fluency beyond the period of initial instruction. Though instruction on the relationship between spellings and sounds is appropriate in the first stages of learning to read, models of skilled reading suggest that ultimately a pathway linking spellings directly to meanings is required. Rastle has proposed that morphology provides a basis for this pathway. Morphological relationships are patterns in which particular visual forms are consistently associated with the same meaning (e.g. the *-er* in *teacher*, *builder*, *publisher*). Rastle's work has shown how readers take advantage of these statistical regularities in the writing system (**R5**) to develop a direct pathway between spelling and meaning that permits rapid analysis of printed words (**R3**). This work has inspired substantial research on morphological learning and processing in other writing systems.

Professor Rastle integrated these empirical findings into a major research article that brought the science of reading into discussions about literacy policy and practice (**R6**). This work offers a new formulation for thinking about the process of reading acquisition that is unique in its breadth. It spans a child's first experiences with print to the development of fluent word recognition and higher-level text comprehension. This article provides a highly accessible account of reading acquisition from novice to expert, and offers specific evidence-based recommendations for teachers and teaching. In so doing, it puts forward an agenda for literacy policy and practice that is developmentally informed, and based on deep understanding of languages and writing systems. This article has already been cited over 300 times (since its publication in 2018), and received substantial coverage in the education press including a 4-page feature article in *Tes*.

3. References to the research

The following are all published in peer-reviewed journals with high standing in the field, a clear indicator that the research is significant, and conducted with high levels of rigour and originality. We report citations from Google Scholar from the date of publication to 31.12.2020, along with other quality indicators where relevant.

R1. Rastle, K., & Brysbaert, M. (2006). Masked phonological priming effects in English: Are they real? Do they matter? *Cognitive Psychology*, 53(2), 97-145. <https://doi.org/10.1016/j.cogpsych.2006.01.002>. 242 citations, included in RAE 2008.

R2. Taylor, J. S. H., Rastle, K., & Davis, M. H. (2013). Can cognitive models explain brain activation during word and pseudoword reading? A meta-analysis of 36 neuroimaging studies. *Psychological Bulletin*, 139(4), 766-791. <https://doi.org/10.1037/a0030266>. 242 citations, included in REF 2014. Full Article available from HEI on Request.

R3. Rastle, K. (2019). EPS mid-career prize lecture 2017: Writing systems, reading, and language. *Quarterly Journal of Experimental Psychology*, 72(4), 677-692. <https://doi.org/10.1177/1747021819829696>. 8 citations, invited EPS Mid-Career Prize paper.

R4. Taylor, J.S.H., Davis, M.H. & Rastle, K. (2017). Comparing and validating methods of reading instruction using behavioural and neural findings in an artificial orthography. *Journal of Experimental Psychology: General*, 146(6), 826-858. <https://doi.org/10.1037/xge0000301>. 48 citations, won the BPS Cognitive Section Prize (2018), included in REF 2021.

R5. Ulicheva, A., Harvey, H., Aronoff, M., & Rastle, K. (2020). Skilled readers' sensitivity to meaningful regularities in English writing. *Cognition*, 195, 103810. <https://doi.org/10.1016/j.cognition.2018.09.013>. 14 citations.

R6. Castles, A., Rastle, K. & Nation, K. (2018). Ending the Reading Wars: Reading acquisition from novice to expert. *Psychological Science in the Public Interest*, 19(1), 5-51. <https://doi.org/10.1177/1529100618772271>. 309 citations.

4. Details of the impact

The ongoing failure to translate reading science to policy and practice is a major contributor to low literacy around the world. Over 15% of children in high income countries leave school with poor reading skills, and the figure is closer to 50% in low income countries. Professor Rastle's research has influenced how stakeholders from across the literacy ecosystem are addressing the challenge of teaching children to read, as evidenced by the ESRC 'Celebrating Impact' Prize for Outstanding International Impact awarded in 2020. On their website **(E1)**, they state: *'Research outlining the science behind how children learn to read is transforming the way reading is taught in classrooms around the world and helping potentially millions of children improve their life chances through better literacy skills.'*

Professor Rastle's research informs scientific understanding of word reading, and her synthesis of the 'science of reading' **(R6)** has provided tangible recommendations for policy and professional practice. There are three major areas of impact: **(a) influences on practitioner knowledge, capacity, and practice; (b) changes to literacy policy in Australia and the USA; and (c) shaping the 10-year literacy strategy of the World Bank.**

(a) Influences on practitioner knowledge, capacity, and practice

Professor Rastle's research has shaped **knowledge** of the psychological basis of reading across a wide range of stakeholder groups that influence teaching practice **(E2)**. The work is discussed on the websites of parent advocacy groups (e.g. MomsRising USA, with over 1,000,000 members); dyslexia charities (e.g. International Dyslexia Association UK; Reading is Fundamental USA); and educational publishers (e.g. Lexia Learning; Reading Rockets, ABOUND, Piper Books) **(E2)**. Mandy Nayton, CEO of the charity AUSPELD, writes that the research *'was instrumental in changing attitudes, beliefs and teaching practices, in the area of reading instruction'* **(E3)**.

Rastle's research was debated in the Scottish Parliament in 2019, and her findings are cited in key educational policy documents within Australia and the UK. These include the *Inquiry into the Status of the Teaching Profession* (Australia - 2019) and the *Secondary Literacy Guidance* (UK - 2019). Rastle's research informed All Party Parliamentary Group on Literacy (UK - 2019) and is cited in their report, *Language Unlocks Reading* **(E2)**.

Professor Rastle's research has enhanced the **capacity** of literacy professionals to communicate reading science within their networks **(E2)**. Twelve major educational leadership organisations have discussed Rastle's work on their websites, bringing reading science to hundreds of thousands of literacy professionals. These organisations include the Thomas B. Fordham Institute (USA), The Reading League (USA), and ASCD (USA; alone has over 113,000 members in 129 countries) **(E2)**. High-profile teachers in the USA, Netherlands, UK, and Australia have written about the research in blogs and books **(E2)**. For example, Alex Quigley, National Content Manager at the Educational Endowment Foundation, cited the work in his acclaimed new book "Closing the Reading Gap". He engages with over 14,000 schools in England and states **(E3)** that Rastle's work is *'integrated into our literacy training... informing high quality professional development in reading instruction.'* One of Rastle's articles **(R6)** has been shared over 3,000 times on Twitter and reached over 4,400,000 individuals.

The traction of this research across different sectors of the global literacy community is yielding demonstrable changes in educational **practice**. Benjamin Riley, founder of Deans for Impact, states **(E3)** that Rastle's research *'is quite literally transforming the academic and political landscape in this country' (US)... and '...driving transformative change to our expectation of what future teachers need to know about how children learn to read and how to apply this knowledge to their practice.'* Deans for Impact is a US non-profit organisation working with over 50 teacher education programmes to drive improvements in teacher knowledge and preparedness, reaching over 10,000 future teachers annually. The impact of Rastle's work on practitioner understanding of literacy is articulated by award-winning education journalist Emily

Hanford (USA), who states **(E3)** ‘...the international conversation going on right now about reading instruction is ...taking place in part because of this article’.

Professor Rastle’s work is cited in the curriculum plans of a minimum of nine primary schools in the UK **(E4)**. Rastle has also given practitioner talks and training sessions related to this work, with audiences amassing over 2,000 attendees during the period, most of whom were teachers. In cases where feedback has been obtained **(E5)**, 70% of attendees have indicated that the presentation has changed their understanding of reading and underpinning skills, or will impact their practice. Megan Dixon, of the Aspire Educational Trust, states “I frequently use this paper with groups of teachers, student teachers, head teachers and system leaders when working across the UK, delivering training into how to effectively teach children to read. The paper is a key reading for the students on the Aspire Teaching School initial teacher training course ... I use extracts in seminars and short briefings to highlight both the importance and complexity of the reading process.” **(E3)**.

(b) Changes to literacy policy in Australia and the USA

Professor Rastle’s research has led directly to **policy changes in Australia**. In 2020, it was announced that state-wide phonics screening would be introduced in New South Wales, Australia **(E6)**. This change has been linked explicitly to Rastle’s research **(E6)**. Phonics screening provides an assessment of the degree to which children have acquired the foundations of literacy, and identifies those in need of further support. Evidence indicates that this policy will have a significant impact on teaching practice and outcomes for children: preliminary trials in Australia have indicated large increases from 43% to 63% in the number of children reaching the expected standard over three years **(E7)**. Jennifer Buckingham, key educational advisor to the Australian government, states **(E8)**, Rastle’s research ‘has been invaluable in reducing the research to practice gap that has long beleaguered progress in improving literacy levels in Australian schools’.

Professor Rastle’s work has also led to major **policy change in the USA**. In 2020, the Massachusetts Department of Elementary and Secondary Education launched ‘Mass Literacy’, which entails substantial state-wide changes to the literacy curriculum from Kindergarten to Grade 3. Rastle’s research is cited in the Mass Literacy curriculum, and she was a research advisor to the programme (the only non-US advisor acknowledged on the Massachusetts Department for Education website; **E9**).

(c) Shaping the 10-year literacy strategy of the World Bank

Professor Rastle’s work has influenced the **global literacy strategy of the World Bank**. The World Bank’s *Ending Learning Poverty* strategy to halve global illiteracy by 2030 cites Rastle’s research **(R6)**. Rastle has also worked closely with the World Bank to operationalise this strategy across countries in the developing world; for example, by developing structured pedagogies suitable for children learning to read in different alphabetic writing systems. Testimonial from Michael Crawford, the World Bank’s global lead for Curriculum, Instruction, and Learning **(E10)** states: ‘the Bank’s work on early grade reading in Angola, Mozambique, the Democratic Republic of the Congo, and in other countries is benefitting from her [Rastle’s] generosity in sharing her expertise and her commitment to translating research findings into policy actions’. Michael Crawford summarises the impact of Rastle’s research **(R6)** by writing: ‘In my twenty-five year tenure at the World Bank, I have not seen an instance where our actions have been more clearly influenced by social science research.... The clear and thorough consolidation of decades of research on reading, and the inclusion of policy- and classroom-implications especially allowed the Bank to adopt its goal and strategy.’ **(E10)**.

5. Sources to corroborate the impact

E1. ESRC announcement of 2020 ‘Celebrating Impact’ Prizes:

[PDF containing screenshot and link for website detailing the prize winners for 2020.](#)

E2. Document containing all links for E2. PDF document containing screenshots and links

from parent advocacy groups, dyslexia charities, educational publishers, policy documents, educational leadership organisations, high-profile teacher websites.

***E3. Testimonials establishing Rastle's role in changing educational knowledge, capacity and practice around the world, including:**

- 1) Letter from Mandy Nayton OAM, President of the Australian Federation of Specific Educational Learning Difficulties Associations (03/2020).
- 2) Letter from Alex Quigley, National Content Manager for the Education Endowment Foundation (2020).
- 3) Letter from Benjamin Riley, founder and CEO of Deans of Impact (03/2020).
- 4) Letter from Emily Hanford, senior correspondent and producer for American Public Media (03/2020).
- 5) Letter from Megan Dixon, Director, Literacy for Aspire Educational Trust (03/2020).

E4. Changes to school curriculum. Document containing screenshots and weblinks to nine UK schools citing Rastle's research in their curriculum plans

E5. Practitioner feedback. Feedback on training sessions given by Rastle

E6. Phonics in Australia, including:

- 1) Announcement by New South Wales government, Australia, about introduction of the phonics screen, screenshot and weblink
- 2) New South Wales Department of Education – Literacy and Numeracy, in addition 'In conversation with Anne Castles: systematic and explicit phonics instruction: podcast'. Podcast where New South Wales Department of Education link phonics screen introduction to **R6**. Document contains screenshot of website detailing Rastle's contribution and the recording via this link: <https://soundcloud.com/user-770146497/in-conversation-with-anne-castles-systematic-and-explicit-phonics-instruction> .

E7. Evaluation of phonics screen UK (2015) and summary of Australian trials

Document containing screenshots and weblinks of the Australian phonics screen check trials including the 2020 Phonics Screening Check Report, Phonics screening check for student understanding of letters and sounds, South Australia Department for Education and the Department for Education, Phonics screening Check Evaluation, Final Report, June 2015.

***E8. Jennifer Buckingham testimonial.** Testimonial letter from Jennifer Buckingham, Director of Strategy and Senior Research Fellow, MultiLit, Founder and director, Five from Five, Board member, Australian Institute for Teaching and School Leadership, Board member, The Centre for Independent Studies (3/2020).

E9. Massachusetts evidence. Massachusetts strategic literacy plan and website detailing Rastle's involvement

***E10. Michael Crawford testimonial.** Letter from Michael Crawford, Lead Education Specialist, Human Development Vice Presidency, Global Education Practice, World Bank (03/2020).

*These sources of evidence were submitted to the Economic and Social Research Council in support of Rastle's application that won the 2020 Outstanding International Impact prize.