REF2021

Institution: University of Sheffield
Unit of Assessment: C-23 Education
Title of case study: Transforming children's digital literacy practices in formal and non-formal learning spaces
Period when the underpinning research was undertaken: 2005–2020
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:
Jackie Marsh	Professor of education	2000–present
Alison Buxton	Educational Developer for Makerspace Pro	2019–present
Liz Chesworth	Lecturer in Educational Studies: Early	2016–present
Louise Kay	Lecturer in Education	2018–present
Yinka Olusoga	Lecturer in Education	2019–present
Becky Parry	Lecturer in Digital Literacies	2018–present
Fiona Scott	Lecturer in Digital Literacies	2018–present

Period when the claimed impact occurred: 2014–2020
Is this case study continued from a case study submitted in 2014? N

1. Summary of the impact (indicative maximum 100 words)

Marsh has undertaken pioneering studies that have transformed understanding of children's digital literacy practices. These studies have identified the nature of children's early literacy development in the digital age in homes, early years settings, and schools. Building on this, they have enhanced the pedagogical approaches that can support children's digital literacy development, significantly impacting on international education policy and global education programmes including those delivered by LEGO Education. Marsh's research has improved practice in early years settings and schools. Her work with the Department for Digital, Culture, Media & Sport (DCMS) has enhanced practice in libraries and museums.

2. Underpinning research (indicative maximum 500 words)

Sheffield research has forged vital new understandings of how children develop digital literacy skills and practices. The findings from various projects conducted by Sheffield researchers can be clustered into two key themes (linked to research outputs R1-6):

1. The research has illuminated how young children develop a range of literacy skills and knowledge when using digital technology, and how education systems can most effectively support and extend these learning processes [R1, R2, R3].

2. Multimodal production in makerspaces enhances digital literacy and STEM skills and knowledge and develops the Characteristics of Effective Learning (COEL) that are embedded in the Early Years Framework [R4, R5, R6].

Theme 1: Literacy skills and how education systems can support

Marsh's initial studies into children and digital literacy included the Department of Education funded *'Children and young people's home use of information and communications technology (ICT) for educational purposes: The impact on attainment at Key Stages 1-4'* in 2005 and *'Digital beginnings: Young children's use of popular culture, media and new technologies'* funded by the Esmée Fairbairn Foundation and BBC Worldwide in 2005. These studies identified the extent to which children's literacy practices were rapidly changing due to advances in technology and led to advances in pedagogical approaches to digital literacies [R2, R3].

For the Horizon 2020 funded COST (Cooperation with Science and Technology) Action '*The Digital Literacy and Multimodal Practices of Young Children (DigiLitEY)'* (2014-19) Marsh brought together an international network of researchers. This ensured that findings could inform European and wider international policy and practice. Marsh was chair and grant holder of DigiLitEY, which convened a network of researchers from 36 EU/COST countries and two international partner countries (Australia and Brazil).

DigiLitEY research findings [R1] identified that there is a need to attend to the digital literacy practices of young children from birth, across homes, schools, and communities if they are to flourish as learners in a digital world [R1]. DigiLitEY also identified that using innovative pedagogies that focus on production are key to teaching digital literacies. Therefore, Marsh's next study brought together researchers from seven European countries and the USA to examine the potential use of makerspaces to develop digital literacy and creativity.

Theme 2: Multimodal production and makerspaces enhances digital literacy in children

The '*Makerspaces in early childhood: enhancing digital literacy and creativity'* (MakEY) study was funded by the EU Commission, Horizon 2020 in 2017. MakEY led to new insights about the value of engaging children in makerspaces, spaces that offer a range of tools and resources for design and multimodal making [R4, R5, R6]. In this work, she has built a team of researchers at Sheffield (Buxton, Chesworth, Kay, Scott, Olusoga, and Parry) who are all engaged in the follow-up programme to this project, Maker{Futures} (https://makerfutures.org), which will ensure long-term sustainability of the work.

Based on her innovative and pioneering work in researching young children's digital practices, Professor Marsh was invited to join The Academy of Social Sciences in 2017.

3. References to the research (indicative maximum of six references)

R1. Marsh, J. and Bishop, J. C. (2014). *Changing Play: Play, Media and Commercial Culture from the 1950s to the Present Day*. Open University Press. Available by request.

R2. Marsh, J., Plowman, L., Yamada-Rice, D., Bishop, J., Lahmar, J., & Scott, F. (2018). Play and creativity in young children's use of apps. *British Journal of Educational Technology*, *49*(5), 870–882. https://doi.org/10.1111/bjet.12622

R3. Marsh, J., Law, L., Lahmar, J., Yamada-Rice, D., Parry, B., Scott, F., Robinson, P., Nutbrown, B., Scholey, E., Baldi, P., McKeown, K., Swanson, A., Bardill, R. (2019). *Social Media, Television and Children.* University of Sheffield. Available at: https://www.stac-study.org/downloads/STAC_Full_Report.pdf

R4. Marsh, J. (2017). The Internet of Toys: A posthuman and multimodal analysis of connected play. *Teachers College Record*, 119. Available at: http://www.tcrecord.org/Content.asp?ContentID=22073

R5. Marsh, J., Plowman, L., Yamada-Rice, D., Bishop, J., & Scott, F. (2016). Digital play: a new classification. *Early Years*, *36*(3), 242–253. https://doi.org/10.1080/09575146.2016.1167675

R6. Marsh, J., Murris, K., Ng'ambi, D., Parry, R., Scott, F., Thomsen, B.S., Bishop, J., Bannister, C., Dixon, K., Giorza, T., Peers, J., Titus, S., Da Silva, H., Doyle, G., Driscoll, A., Hall, L., Hetherington, A., Krönke, M., Margary, T., Morris, A., Nutbrown, B., Rashid, S., Santos, J., Scholey, E., Souza, L., and Woodgate, A. (2020). *Children, Technology and Play*. Billund, Denmark: The LEGO Foundation. Available at: https://www.legofoundation.com/en/learn-how/knowledge-base/children-tech-play/

4. Details of the impact (indicative maximum 750 words)

Marsh's pioneering research has led to impacts on global education programmes seeking to develop children's digital literacy, STEM skills and well-being online, on international educational policy, and on practice in formal and non-formal educational settings.

Influenced global education programmes

Marsh's research [R4, R2, R5, R6] informed the development of the LEGO Discovery Challenge Programme, an out-of-school programme that develops young children's STEM skills and knowledge. The programme has reached 7500 teams in 103 countries [S1], impacting on their learning. The Head of Programme Development, LEGO Education stated

"Professor Marsh had a profound impact on the programme by offering her advice, knowledge, feedback, and suggestions. We have incorporated her work into our resources for practitioners and children and thus ensured the programme is accessible, educational, and fun" [S1].

Power of Zero is an international campaign in partnership with Scholastic, an American multinational publishing, education, and media company. The campaign is supported by UNESCO, Microsoft, Facebook, and Hasbro. It seeks to minimise the negative impacts of cyberbullying by equipping children with the tools to be more resilient online and better digital citizens. Marsh's research [R2, R3] has informed the development of this programme [S2]. Founder and Chief Executive Officer states:

"We have drawn from her extensive knowledge of the digital lives of children aged from birth to eight, based on her longstanding research in the field, which has helped to shape our organisation's approach to this important area of work" [S2].

As of September 2020, the learning materials Marsh contributed had reached over 500,000 children in the US and beyond [S2].

Ensured inclusion of young children's digital literacy education in international policy

Marsh's research [R1, R2, R3] contributed to the Council of Europe's work on digital citizenship [S3] and the EU Commission's work on makerspaces [S4]. Based on Marsh's work, the Council of Europe included reference to the early years in their recommendation: "*Digital literacy education should be included in the basic education curriculum from the earliest years, taking*

into account children's evolving capacities" (Council of Europe, Recommendation CM/Rec (2018)7) [S3].

The recommendation was approved in 2019 by the Council of Ministers representing 47 Member States and adopted by the Committee of Ministers' Deputies in November 2019.

The advisor leading this work stated: *"Professor Marsh was one of very few people conducting research into digital literacy and young children…[her] input has been invaluable."* Findings from DigilitEY [R1] made *"…the documents supporting the Recommendation…more meaningful for educators and ministries across Europe"* [S3].

Improved educational practice and knowledge in early years settings and schools and for the producers of educational products

The research [R4, R5, R6] on multimodal production in makerspaces, and accompanying resources, informed early years settings and schools both nationally and internationally [S5, S6, S7].

Findings and resources have been used by settings in five local authorities (Barnsley, Bassetlaw, Doncaster, Rotherham, and Sheffield) by 122 teachers with over 3,000 children [S5].

Practitioners undertook case studies of 480 children, identifying the impact of their use of the materials on the Characteristics of Effective Learning (COEL). Initially trialled in Barnsley, the project had a significant impact on children's speaking and listening, imagination, and fine motor skills. Children demonstrated twice as many COEL when undertaking the maker activities than non-maker activities [S5]. 100% of practitioners who completed an evaluation survey agreed that the project had developed their understanding of STEM and of makerspaces and had transformed their practice. All of the schools stated they now incorporated maker activities and makerspaces in their provision [S5].

The approach has now been taken up by other settings, for example, the Victoria Trust Academy. Head of EYFS: *"This research, and accompanying resources, [...]has impacted upon my own practice and that of practitioners in the academy trust. We now have Makerspaces in each setting and staff are increasingly confident in running these activities"* [S7].

Impacted on strategies for engaging families and children in community centres, libraries, and museums

Marsh has impacted on staff practice and children's access to STEM activities in non-formal education settings such as libraries, community centres, and museums.

The Libraries Taskforce, the government unit overseeing public libraries in England, commissioned Chesworth and Marsh to deliver training based on their research findings [R5, R6] to three local authorities covering twenty libraries [S8]. The project involved 448 children from disadvantaged communities in a range of creative STEM and STE(A)M (Science, technology, engineering, *art*, and maths) experiences in 30 makerspaces in their local libraries. The workshops impacted on children's problem solving, access to new materials, and engagement. Additionally, the project impacted on what libraries offer, with all three local authorities committing to continuing to run makerspaces within their libraries; prior to the project none had run a makerspace for children in the early years. The project increased library staff confidence and increased footfall into the library [S8]. Chesworth and Marsh's work is referred to in DCMS Guidance '*Libraries and makerspaces*' (October 2018) [S8].

Additionally, Marsh set up an after-school makerspace in a deprived area of Sheffield, engaging with 64 children and over 40 parents. The project impacted on the children's COEL, particularly in problem solving and collaborative working. For practitioners in the community centre, it enabled them to engage with new families [S9].

Marsh's findings [R4, R5, R6] have informed the work of museums. The Victoria and Albert Museum (V&A) invited Marsh to speak at two national conferences, and subsequently invited her to lead on the development of a makerspace for under 5s for the major exhibition 'Alice: Curiouser and Curiouser' [S10]. According to the Team Leader for Children and Families at the V&A: *"Currently our digital making events and those events aimed at early years are lighttouch, they are short drop-in activities. Professor Marsh's research enabled us to identify how we could build on these to help children develop their skills further."*

Marsh and team have run makerspaces and STEAM activities in galleries and museums in Sheffield including Millennium Gallery, Weston Park, and the Site Gallery for 300 children aged under 5 and their parents/carers. This work impacted Museum Sheffield's strategy for the provision of STEAM activities for under 5s [S10]. The Fitzwilliam Museum in Cambridge, inspired by MakEY, organised a Digital Maker Residency across the University of Cambridge museums. This work is important in ensuring that museum education extends its provision to include STEM-based makerspaces for 0–8-year-olds, offering significant learning opportunities for young children in the digital age.

5. Sources to corroborate the impact (indicative maximum of 10 references)

S1. Testimonial from Head of Programme Development, LEGO Education.

S2. Power of Zero report October 2018 p.3 and Testimonial Founder and Chief Executive Officer of Power of Zero.

S3. Testimonial of Janice Richardson on behalf of Council of Europe and Council of Europe Recommendation CM/Rec (2018)7.

S4. Report on 'MakEY in the Community' Project (https://bit.ly/3ctaWS7).

S5. Report on Barnsley Mini-Makers project (https://bit.ly/38z95tF).

S6. Article from School Education Gateway October 2019 that describes modifying learning environments which highlights the range of environments MakEY has been used in (nationally and internationally) http://bit.ly/3ewJt4H and testimonial from researcher, lecturer in digital citizenship expert and Ministry of Education Teacher trainer, Portugal.

S7. Statement from Head of Early Years at the Victoria Trust Academy.

S8. MakEY in Libraries: The Libraries Taskforce Commissioned Report evaluating the project MakEY in Libraries Chesworth, L., Marsh, J. and Nutbrown, B. (2018). MakEY in Libraries; Project Report. Sheffield: University of Sheffield. https://makerfutures.org/wp-content/uploads/2018/12/MIL.pdf and DCMS Guidance that refers to Marsh and Chesworth https://www.gov.uk/government/publications/libraries-and-makerspaces/libraries-and-makerspaces

S9. Report evaluating the MakEY in the Community Project: Marsh, J., Kay, L. and Bradley, K. (2018). MakEY in the Community: Project Report. Sheffield: University of Sheffield. https://makeyproject.eu/resources/report-on-makey-in-the-community-project/

S10. Evidence from Museums: Testimonial Team Leader for Children and Families, V&A and Testimonial Head of Learning & Participation, Museums Sheffield.