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## ANTECEDENTS AND CONSEQUENCES OF DIGITAL SKILLS

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### Introduction

What actors and factors shape children and young people's digital skills? And how do their digital skills impact the rest of their lives? These are the two research questions addressed in this paper, along with an analysis of how the research literature to date has measured digital skills.

The findings reported here come from a systematic evidence review of the antecedents and consequences of digital skills (Haddon, Cino, Doyle, Livingstone, Mascheroni and Stoilova, forthcoming) as part of the ySKILLS project funded by the EU's Horizon 2020 programme.

### Systematic evidence review procedure

The databases searched were Web of Science and Scopus, International Bibliography of the Social Sciences, Communication and Mass Media, ERIC, PsychINFO, EMBASE and SocINDEX. The inclusion criteria were that studies should examine children's digital skills, use quantitative methods, cover children aged 12-17 years old, involve high-quality, methodologically robust research and be published in English between 2010 and January 2020. These criteria produced 110 studies from 64 countries, which is the material upon which the analysis below is based.

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## **Skills**

There was considerable variation in how digital skills were measured in the studies reviewed. For example, skills were measured by asking about general self-efficacy, particular knowledge claims ('I can do X'), demonstrating skills by actions taken and skill performance tests.

The most common measures involved self-reported skills, usually using a Likert scale. Some questions asked the child to evaluate very specific instrumental competences with varying degrees of complexity, such as their ability open an attachment. Other questions still focused on particular activities but also required the child to evaluate elements like their social skills ('Can you write a polite email?') or judgemental skills ('Can you judge if the information on a website is true or false?'). Yet other questions were more general measures of self-efficacy. About a third (37/110) of the reviewed studies included a performance test, which also adopted diverse formats.

Lastly, skill levels were operationalised in very different ways. For example, there were studies distinguishing between 'basic skills' and 'advanced skills', although drawing the boundary between them differently. 'Functional skills' could include basic skills but they can also be complex in the sense that a beginner could not achieve this goal. Meanwhile, 'critical skills' were often a version of 'advanced skills' but implying some interpretation is taking place, more akin to media literacy.

## **Antecedents to digital skills**

In order to provide some structure to the systematic review, material collected was divided in the following categories:

Ascribed personal attributes: the age of the child (26 studies), gender (36), ethnicity (7), health problems (4), personality types (4) and cognitive abilities and styles (8).

Achieved personal attributes: educational attainment (6), approaches to learning (5), leisure activities (2), interests (3), and perceptions and attitudes (5).

Digital personal attributes: attitudes to and perceptions of ICTs (12), digital self-efficacy (9) and other ICT related attributes (4).

Social context: socio-economic status of the family (SES) (21 studies), parenting (mediation, attitudes, etc.) (14), educational social context (teacher, pupil experience, school) (28), and peer, urban-rural and community factors (10).

The ICT environment: ICT availability (15 studies), amount of ICT use (14), age of first use of ICTs (7) and diversity, number and location of devices used (3).

Digital activities and experiences: gaming (3 studies), the use of social media/SNS for social communication (5), some other digital experiences (4) and negative online experiences (2).

The final antecedent was country differences.

## **Consequences**

The consequences covered wellbeing (6 studies), learning outcomes (7), approaches to learning and leisure (5), offline activities (e.g. civic engagement) (3), online activities (14), approach to digital technology (e.g. privacy behaviour) (3) and risk of harm (14 studies).

## **Discussion**

The literature was multi-disciplinary, meaning studies in this systematic review used a broad range of methods, measurements and definitions of digital skills. However, researchers selected from, adapted and added to measures used in previous studies, where there were different principles behind the various measurements. Often studies justified their choices of measurement in relation to their particular goals. But the overall effect was to produce a striking diversity of measures, meaning that it could be a challenge to make comparisons and sometimes results could not be taken at face value.

The influence of measurement was illustrated when comparing gender differences in performance tests of skills and self-reported skills. Overall, more studies found more digital skills amongst boys, but it looks as though this was a product of measurement, with boys overclaiming relative to girls when skills are self-reported. There was more of a gender balance in studies using performance tests.

Most studies in the systematic review considered the antecedents to digital skills. There are few surprises in the findings overall; for instance, as may be expected, children who are older, who have positive attitudes towards ICTs, and who have ICT access at home tend to have higher skill levels. The interesting results were mostly in the detail, such as evidence that the influence of age may flatten as children get older, the cases when ethnic minorities might have more of certain digital skills (e.g. being more critical of what they encounter online) or how the influence of SES depends on how whether it was measured by parental education or income – all of which suggest further lines of research. There are only a few studies that found evidence of how teachers influenced digital skills, which was surprising given the aspirations of educators.

There were far fewer studies of the consequences of digital skills, which is significant given claims about the importance of digital skills for children's lives. The overall patterns were again understandable (especially that skills influence other online activities). But once more the insights lay in the details. For example, digital skills often seemed to have a bearing on other learning outcomes, but it depended on what the skill was and what was being learnt; and while some skills influence offline activities, it is necessary to focus on which digital skills have this effect rather than looking at digital skills in general.

One challenge with this literature is that it is difficult to be certain about the direction of causality. This direction may be clearer in the case of ascribed attributes and the 16 studies that entailed interventions, but the majority of the studies reviewed were cross-sectional surveys looking for correlations. Another problem was that the majority of the studies focused on whether there was a statistically significant correlation between digital skills and particular antecedents and consequences,

without looking at the interrelationship of a range of variables. Only about 10% of studies developed models using multiple variables. More approaches using such statistical path analyses would be welcome.

### **Bibliography**

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