Remote learning: Rapid Evidence Assessment

Introduction and background

This report was written by a team from the Education Endowment Foundation (EEF) and Durham University. It is based on a rapid evidence assessment aimed to investigate methods that schools might use to support remote learning during the current school closures. Using 60 existing research reviews, the assessment looked for the best evidence behind the wide number of approaches that schools might choose to adopt. Findings are divided into 5 categories - general teaching and learning (10 reviews), blended learning (5 reviews), computer assisted collaboration (5 reviews), computer aided instruction (29 reviews) and digital learning games (14 reviews).

The EEF acknowledges that this evidence assessment has some limitations. Many of the reviews combine evaluations from school-aged learners, university students and adult learners. Care is therefore needed in assessing transferability of some approaches to school contexts. Furthermore, the rapid nature of the review does not provide statistical analysis or comparisons between different approaches.

When exploring remote teaching, it is always important to consider safeguarding. The NSPCC has produced a useful list of resources on safeguarding during remote teaching
https://learning.nspcc.org.uk/news/2020/march/undertaking-remote-teaching-safely

The full report lists all the reviews which were included in the assessment and also provides a comprehensive list of resources for online teaching which have been produced by the EEF.

Key findings

Remote teaching and learning

- This section examines the reviews that have examined remote learning generally – it includes studies that have tried to measure the impact of combined approaches to distance learning and teaching through video conferencing software or other methods of online tuition.
- Although there is a limited amount of rigorous evidence, reviews that have examined the impact of distance learning found that results are equivalent or slightly higher for pupils who have been taught through distance instruction rather than traditional face to face instruction. A study by Means et al. (2013) found that results are higher when blended and online learning are analysed together; when online teaching was examined individually the impact was found to be no different from traditional instruction.
- A review by Bernard et al. (2009) examined different types of interaction within distance learning, comparing student-student, student-teacher, and student-content, interaction. It found that student-student interaction had the largest impact on student outcomes. This finding is corroborated by the review by Means et al. (2013), which also found a positive impact for interaction with peers, whether in real time (synchronous) or via online channels without real-time interaction (asynchronous). Another review (Borokhvski et al. 2012) found that when student-student interaction was designed int the distance learning the impact was even greater. These findings should be treated with caution for a school context, as the evidence was drawn from higher education studies.
- Several reviews explored different ways of presenting information and teaching. Means et al. (2013) found no evidence that adding multimedia to online instruction had any impact on learning outcomes, concluding that the teaching was more important than the medium itself. There was, however, evidence that supporting learners to reflect on their own learning had positive impacts.
- Zhao et al. (2005) found evidence that a combination of asynchronous and synchronous learning was most beneficial to outcomes. This finding is, however, not found in other reviews, which discovered no evidence to differentiate between asynchronous or synchronous instruction.

Blended learning

- Blended learning combines online instruction with classroom teaching, meaning that the evidence may not be directly applicable to schools during periods of shutdown. These studies have, however, been included to explore successful implementation of the distance components of blended learning approaches.
- The one review which measured the impact of blended learning approaches on learning found a positive result (Means et al 2013).
- As with the general reviews of remote learning, the value of communication between pupils was a highlighted by a number of the reviews (Means et al. 2013, Poirer et al. 2019, Cui and Zheng 2018). In a narrative summary of different blended learning approaches, Poirer et al. noted that one feature of some of the positive evaluations was

the facilitation of peer to peer communication, examples including message platforms or online forums.

- Cui and Zheng (2018) examined peer evaluation more systematically across blended learning environments and found a positive effect. One of the interesting findings of the Cui and Zheng analysis is that anonymous peer marking of work had a high effect size for pupil outcomes as did peer reviewing, which was supported by teachers.
- Rasheed et al. (2020) conducted a systematic review of implementation challenges of the online component of blended learning. Some of the highlighted challenges included supporting teachers' professional development in implementing online aspects of blended learning and supporting the digital literacy of pupils. Another challenge was supporting the self-regulated learning of pupils during online teaching and preventing feelings of isolation from pupils. Technological challenges were also identified as a barrier.

Computer-supported collaborative learning

- In computer-supported collaborative learning (CSCL) approaches, collaboration may occur a variety of means including video, chat, discussion boards or knowledge forums. Specific tools such as Google Docs or Slack are often used for co-construction of work. Such approaches may well be relevant during school closures.
- Some of the reviews examined may be limited in terms of their transferability, either because their focus is very narrow, or because they focus on a specific subject (such as Lin Huifen's review(2014) which focussed on second language learning).
- The evidence for computer-supported collaborative learning (CSCL) approaches is consistently positive across the included reviews. Even when just examining school aged pupils, Chen et al. (2019) found significant positive results when comparing collaborative learning with independent learning using computer-based instruction.
- Several reviews highlighted the way CSCL appears to have been used in specific subjects. Chen et al. (2019) found that at primary school, all of the studies focused on using CSCL for science, maths or language instruction. At secondary level, all studies were focused on maths or science. Jeong et al. (2019) found that CSCL had positive impacts for STEM subjects, while Huifen (2014) found a positive impact for second language learning.
- In terms of successful implementation strategies, Chen et al (2018) found that peer assessment and feedback strategies led to positive learning outcomes.
- Jeong et al.(2019) found that the combination of technology was particularly important. For example, video conferencing had a large positive impact when paired with shared online workspaces, for example, Google docs. When video conferencing was only supported by email communication, there was no evidence of impact.

Computer-assisted instruction

- Computer-assisted instruction (CAI) involves pupils receiving instruction through digital technology. Some Common approaches include computer-based interventions that scaffold practice and intelligent tutoring systems that often give adaptive feedback to learners as they work.
- In response to Covid-19, many companies are offering digital learning applications or programmes in which pupils learn independently. This is why it includes reviews of CAI approaches.
- Although the overall impact of computer-assisted instruction approaches varies, there is clear evidence that

CAI approaches have the potential to improve learner outcomes, with many of the reviews finding positive impacts.

- Intelligent tutoring systems (ITS) aim to deliver personalised instruction or feedback to learners. Ma et al. (2014) found that when compared to whole class teaching, ITS had a high impact, but when compared to one to one human instruction impacts were negative and nonsignificant. However, Xu et al. (2019) found positive results even when compared to human tutoring.
- Several reviews, including Gerald et al. (2015), Belland et al. (2015) and Kim et al. (2018), identify scaffolding and feedback as important ingredients of successful CAI approaches. Verschaffel et. al (2019) find several studies indicating that specifically metacognitive scaffolding – for example, prompts from teachers or built into the technology that encourage learners to think about successful strategies for learning or when to request help – is an important component of successful CAI. Elaborated feedback in CAI has been found to lead to higher outcomes than simply informing pupils of their results.
- A further characteristic of successful ITS approaches identified in the study was its use by teachers to supplement teaching rather than as a direct replacement. Therefore, if schools introduce new technology during periods of closure, they should consider how to make sure approaches are implemented successfully and supplement existing learning approaches.

Games for learning

- Games for learning (GL) are often described as 'serious games' and are designed for educational purposes. They are often played on computers with learning taking place individually. They are contrasted with entertainment games, in which the aim is to provide entertainment rather than improving learning outcomes.
- The two studies with the highest impacts (Tsai and Tsai 2018, Chen et al. 2018) both examine the impact of digital games on foreign language learning and found that GL may be particularly effective for learning and memorising vocabulary from foreign languages.
- Despite some limitations, the 7 meta-analyses of GL that calculate an average impact all find the approach to be positive, showing that using games for learning has the potential to improve pupil outcomes.
- Wouters and van Oostendorp (2013) found a positive impact for instructional support being provided within games. Other aspects of games that were found to be linked with positive outcomes were reflection, modelling, feedback and personalisation.
- Several reviews discussed the characteristics of successful games. Boyle et al. (2016) value of rewards in games. Aquah and Katz (2020) highlighted the importance of games being easy to use, providing instant feedback and having a clearly defined goal. They also highlighted the benefits of player interaction. An important limitation pointed out by the review is that games being engaging did not seem to correlate with positive learning outcomes, i.e. a game may be entertaining but fail to provide learning benefits.