EVIDENCE FOR LEARNING

Commentary

Remote Learning
A Commentary on the Education Endowment Foundation's Rapid Evidence Assessment

April 2020

This Commentary summarises the key findings of the review and raises considerations for the Australian context. It is a companion document to the EEF Review and not a replacement for reading the report itself.

Introduction

The coronavirus pandemic has impacted education systems and schools worldwide, leading to near or total school closures. With teaching moving online, schools and teachers need the best evidence to support their decisions about the approaches that might work in their context to ensure their students receive support in their learning during this time, especially those in vulnerable circumstances.

The UK's Education Endowment Foundation (EEF) has published a rapid evidence assessment of remote learning to support teaching and learning of students during the coronavirus pandemic. This EEF Review summarises global evidence from 60 relevant systematic reviews and meta-analyses on approaches which may combine remote, online and in-person classroom teaching.

Findings

1. **Teaching quality is more important than how lessons are delivered.**

   The evidence shows that there are positive learning outcomes from remote instruction when teachers incorporate elements that are effective in the classroom such as clear explanations, scaffolding and feedback to build on students' prior knowledge. This is more important than whether it is delivered using video or other computer-assisted learning such as online tutoring systems or digital reading or maths games. For example, teachers should ensure concepts are clearly explained in whole-class online lessons and clarify students' prior knowledge during online class discussions.

2. **Access to technology is necessary, but not sufficient.**

   Ensuring access to technology is critical for successful remote instruction. The evidence shows that technology gaps are a significant barrier to learning for students from disadvantaged backgrounds who may have no or little access to technological devices or poorer internet access to support their learning remotely. However, it is not just about access – both students and teachers need good guidance to use platforms and technology and have support to resolve issues quickly. For example, if teachers are relying on a newly introduced online tool for feedback which is different to that used in the classroom, both student and teacher need to understand and be trained in how to use the tool properly.

3. **Peer interactions matter to quality learning.**

   Evidence shows that peer interactions improve students' learning during remote instruction. Strategies such as peer marking, feedback and opportunities for real-time discussions of content motivate students and clarify questions they encounter in learning collaboratively. However, schools need to consider these strategies carefully if adopting them for younger learners as the studies involved older learners in higher education and more work is needed to understand what is effective for them in peer interactions online.

4. **Support students to work independently – it's possible to make a virtue of the current challenge.**

   Multiple reviews identify the value of strategies that support independent work. For example, prompting students to reflect on their work or to consider the strategies they will use if they get stuck in learning a concept have been highlighted as particularly valuable. Students with less classroom supervision need better strategies when they encounter a problem or task they can't complete, including knowing when to move onto another task to ensure valuable learning time is well spent. Wider evidence related to metacognition and self-regulation suggests that students from disadvantaged backgrounds are likely to particularly benefit from explicit support to help them work independently, for example by providing checklists or daily plans.

5. **Different approaches are needed for different students, content and skills.**

   The evidence shows that approaches to remote learning vary widely and have different strengths and weaknesses. Teachers should be supported to consider which approaches are best suited to the content they are teaching and the age of their students. For example, digital games have high impacts for vocabulary learning in foreign languages but are likely to be less well suited to other subjects. Many of the reviews however did not calculate the impact of games for learning on student outcomes and there is a limitation on the quality of evaluations on this topic.

Considerations

Due to the rapid nature of this work, the EEF Review is limited by a number of factors that should be considered when determining the relevance for your context.

- The EEF Review summarises evidence to support teachers delivering remote instruction through complete school closure in the UK. This is different to Australia, where schools are open for some students and learning is being delivered in-person, remotely and sometimes a combination of both. Educators should use professional judgement in determining the relevance of the findings to their specific remote learning model.
- The aim of the EEF Review was to report on the available evidence from meta-analyses (considered the highest level of research design). Of note, 45 out of 60 reviews were rated as "low" in the quality assessment.
- The EEF Review did not perform additional analyses on specific types of remote learning and cannot apply quality criteria to individual studies. Further research could investigate the quality of the individual studies included in the meta-analyses and better understand the pedagogical techniques and methods in successful and effective online instruction.
- Despite the EEF Review searching for school-aged studies, the evidence for online and blended learning interventions existed largely from higher education. For example, studies that found high impact in the use of online peer evaluation and student-to-student interaction combined school-aged students with older learners, higher education and adult learners. Careful consideration is needed to transfer these findings to younger students.

- Some of the evidence on computer-assisted programs were actually delivered in school settings but still have potential high value in both remote and blended learning. For example, intelligent tutoring systems which often give adaptive feedback to learners as they work on complex tasks and problems were found to be effective when scaffolded with practice within school environments for school-age students with teacher support present.
- The scope of the EEF Review was limited to systematic reviews and meta-analyses from 2005 or later, as technology-based approaches prior to 2005 are unlikely to be relevant to current online learning approaches. However, many of these studies are prior to 2015 so may not consider recent technological changes.

Evidence summary

The following table summarises the reported findings from the 60 systematic reviews and meta-analyses from the EEF Review under five key areas of 1) General remote teaching and learning, 2) Blended learning, 3) Computer-supported collaborative learning, 4) Computer-assisted instruction and 5) Educational games. Some reviews covered multiple categories and are included in multiple sections.

The legend and description of the reported impact below is based on the EEF and E4L's translation of effect sizes.

Table 1. Description of the level of reported impact

Legend	Effect size range	Description of the reported impact
●●●●	0.70 - >1.0	Very High
●●●	0.45 - 0.69	High
●●	0.19 - 0.44	Moderate
●	0.02 - 0.18	Low
-	-0.01 - 0.01	Very Low

Table 2. Summary of reviews included and reported impact

Review	Review focus	Number of studies	Reported impact
REMOTE TEACHING AND LEARNING			
Bernard et al (2009)	An effect is provided for general distance learning. The review examines the impacts of different types of interaction in distance learning (for example, student-student or student-teacher).	74	●● 0.38
Brorokhovsk et al. (2012)	An effect is provided for general distance learning. The review then examines the differences in types of student-student interaction in distance learning.	36	●● 0.31
Chauhan (2017)	The meta-analysis covers technology impacts on education more generally. There is a specific focus on e-learning and the extracted effect size is for learning in informal settings, and not the overall impact of technology.	21 (for non-formal education settings, e.g. home)	●●●● 0.70

Darabi et al. (2013)	This meta-analysis examined the impact of planned discussions as part of online teaching. The reported effect compares the impact of strategic discussion compared with conventional discussion in online learning.	8	●●● 0.50
Jopling (2012)	This paper reviews the literature for online one-to-one tuition.	17	N/A
Means et al. (2009)	This review combined a meta-analysis of distance learning and blended learning approaches with a qualitative review of remote learning approaches that took place exclusively with school-aged students.	45	●● 0.24†
Means et al. (2013)	This review updates Means et al. (2009) removing coding errors in the earlier analysis and providing additional moderator analysis.	45	●● 0.20
Sandy-Hanson (2006)	This review looked generally at the use of technology in supporting students learning but contained separate analysis of remote learning.	5 (distance education)	●● 0.26
Vasquez III; Straub (2016)	This review examined the studies located by Means et al (2009) to identify the impacts of remote learning approaches for students with special educational needs (SEN).	4	●● 0.38
Zhao et al. (2005)	This meta-analysis examines distance learning in comparison to face-to-face education. It combines solely online approaches and blended learning approaches.	51	● 0.10
BLENDED LEARNING			
Cui and Zheng (2018)	This review focuses specifically on using peer evaluation – typically sharing essays with peers for feedback - in blended learning environments.	23	●●● 0.68
Means et al. (2009)	This review combined a meta-analysis of distance learning and blended learning approaches with a qualitative review of remote learning approaches that took place exclusively with school-aged students.	46	●● 0.24
Means et al. (2013)	This review updates Means et al. (2009) removing coding errors in the earlier analysis and providing additional moderator analysis.	46	●● 0.20 (0.35 for just blended instruction)
Poirier et al. (2019)	This review provides a narrative summary of different blended learning approaches.	11	N/A
Rasheed et al. (2020)	This review summarises barriers to implementing blended learning approaches effectively.	30	N/A
COMPUTER-SUPPORTED COLLABORATIVE LEARNING			
Chen et al (2018)	This review examines the impact of collaborative learning in computer environments. The headline impact compares CSCL with independent computer use.	84	●● 0.42
Chen et al. (2019)	This review is an extension of Chen et al (2018) which adds extra moderator analysis. All other aspects of the review are the same.	84	N/A
Jeong et al. (2019)	This review examines the impact of CSCL in STEM subjects.	143	●●● 0.49
Lin Huifen;(2014)	This review examines CSCL for second language learning – primarily examining directly communicating in a second language online.	59	●● 0.441

Wecker and Fischer (2014)	This review does not compare CSCL with traditional teaching, but instead compares the impact of using argumentation or not within CSCL environments.	12	0. 00
COMPUTER-ASSISTED INSTRUCTION			
Abrami et al. (2019)	The review examined the impact of ABRACADABRA – a balanced approach to early literacy instruction.	17	●● 0.26
Batdi (2015)	This meta-analysis measured the impact of computer-based teaching on learners' academic success.	78	●●●● 1.31
Belland et al. (2017)	This Bayesian meta-analysis measured the within subject impact of computer scaffolding approaches. The outcome described is for STEM subjects in primary school.	56	●●●● 0.74
Belland et at (2017b)	This review measures the impact of computer-based scaffolding on STEM outcomes.	114	●●● 0.46
Cheung and Slavin (2013)	This review is a general review of digital technology. The effect size described is specific to computer-assisted Computer assisted instruction the focus of impact.	74	● 0.16 (for computer-assisted instruction)
Chiu (2013)	This meta-analysis summarises the impact of computer mediated instruction for language learning and teaching.	16	●●●● 0.75
der Kleij et al. (2015)	This meta-analysis focuses specifically on providing feedback in computer-based environments. Multiple outcomes are described – the reported impact is for elaborated feedback vs knowledge of correct results.	40	●● 0.39 (this is for elaborated feedback vs knowledge of correct results - multiple primary effects are described)
Fang et al (2019)	This review measures the impact of the ALEKS intelligent tutoring system.	15	● 0.10
Gerard et al. (2015)	This paper examined the impact of automated guidance on school-aged students' learning outcomes.	41	●● 0.34
Karich et al. (2014)	This meta-analysis measured the impact of learner control within computer assisted instruction.	29	● 0.05
Kim et al (2018)	This review examined the impact of computer-based scaffolding when applied to problem-based learning.	21	●● 0.39
Kulik and Fletcher (2016)	This meta-analysis measured the impact of intelligent tutoring systems.	50	●●● 0.62
Kunkel (2015)	This review measured the impact of instruction provided by an application rather than a teacher or classroom aide.	13	● 0.14
Ma et al. (2014)	This review measured the impact of intelligent tutoring systems.	107	●● 0.41
Ok et al. (2019)	This review examined computer assisted instruction of maths for students with learning disabilities.	20	N/A
Rigney et al. (2020)	This review examined digital technology more generally, the impact summarised is specific to computer-based instruction.	6	N/A

Sandy-Hanson (2006)	This review examined digital technology more generally, the impact summarised is specific to computer-based instruction.	13 (for CAI)	●●● 0.52
Sharifi et al. (2018)	This review measured the impact of computer assisted instruction on language outcomes.	140	●●● 0.50
Slavin et al. (2008)	This review examines approaches to improve reading in primary and middle school generally. The impact described is specific to computer assisted instruction.	8	● 0.10
Steenbergen-Hu and Cooper (2013)	This meta-analysis measures the impact of intelligent tutoring systems.	26	● 0.09
Strong et al. (2011)	This meta-analysis summarises the impact of the Fast For Word program.	6	-0.26
ter Beek et al. (2018)	This review examines the impact of computer supported scaffolding of reading comprehension.	5	N/A
Thomas et al (2013)	This meta-analysis compares the impact of interactive and didactic learning within computer assisted instruction.	40	● 0.18
Verschaffel et al (2019)	This review examines the use of metacognitive scaffolding in ICT based learning environments.	22	N/A
Weng Pei-Lin et al. (2014)	This meta-analysis measures the impact of computer-assisted instruction for SEND students.	8	●● 0.35
What Works Clearinghouse (2009)	Earobics - interactive software providing instruction in early literacy skills.	4	●●● 0.49
What Works Clearinghouse (2007)	This report summarises the evidence for the Read Naturally program.	2	N/A
Williams and Beam (2019)	This review examines the use of technology to teach writing skills.	29	N/A
Xu et al. (2019)	This meta-analysis measures the impact of intelligent tutoring systems.	19	●●● 0.60
GAMES FOR LEARNING			
Acquah and Katz (2020)	This review examines digital based games learning and L2 language learning.	26	N/A
Boyle et al (2016)	This systematic review examines game-based approaches to learning overall.	143	N/A
Byun and Joung (2018)	This meta-analysis measures the impact of digital game-based learning in mathematics.	33	●● 0.37
Chen et al. (2018)	This meta-analysis measures the impact of digital game-based learning of vocabulary.	10	●●●● 1.027
Girard et al. (2013)	This review summarises the evidence for serious games.	11	N/A
Hainey et al. (2016)	This review summarises the evidence for game-based learning.	45	N/A
Hussein et al. (2019)	This review summarises the literature of game-based learning on science outcomes for primary school students.	17	N/A

Martinez-Garza et al. (2013)	This review summarises the literature of game-based learning on science outcomes.	56	N/A
Riopel et al. (2019)	This meta-analysis summarises the impact of serious games on natural sciences outcomes.	79	●● 0.34
Tokac et al. (2019)	This review measures the impact of game-based learning on mathematics outcomes in school-aged students.	24	● 0.13
Tsai and Tsai (2018)	This meta-analysis measures the impact of digital vocabulary learning games on vocabulary outcomes of foreign language students.	26	●●●● 0.986
Wouters et al. (2013)	This review measures the impact of serious games on motivation and learning. The outcome summarised is for learning.	39	●● 0.29
Wouters and van Oostendorp (2013)	This meta-analysis compares the impact of games that feature instructional support with games that do not.	29	●● 0.33
Zou et al. (2019)	This review examines the evidence for digital game-based learning of vocabulary.	21	N/A

† This effect size had been updated in Means et al 2013 to remove coding errors. The effect size is reported here for record but is superseded by the later study.