

GUIDING PRINCIPLES OF RECENT IMPLEMENTATIONS OF E-LEARNING - A SYSTEMATIC LITERATURE REVIEW (2020-2024)

April 2024

ABSTRACT

Background: Circumstances over the last decade have maintained the popularity of research into e-learning, and technological developments have made more ambitious implementations of e-learning feasible.

Aims: This study assesses the scope of guiding principles behind implementations of e-learning described in recent studies, whilst following PRISMA guidelines for quality assurance.

Results: The study found a range of instructional models influencing studies, with social constructivism, gamification and formative feedback being the most influential.

Conclusions: I recommend more research into personalised learning tools.

KEYWORDS

e-learning, instructional models, educational technology

INTRODUCTION

RATIONALE

During the covid-19 pandemic, schools around the world were forced to implement e-learning systems in order to continue educating pupils when they were forced to stay at home. Naturally, research continued exploring computerised systems that benefit education, which in some form has been traced back to at least the 1950's (Aparcio et al, 2016). Since the covid-19 pandemic, technological developments and trends enable even more ambitious implementation of e-learning than ever before. This study explores the most recent research implementations of e-learning and the guiding principles leading them.

The meaning of the term 'e-learning' is subject to opinion, but Valverde-Berrocoso et al (2020) identify a multitude of perspectives on the term. These perspectives are influenced by genera such as the use of technology, the delivery of education, the facilitation of online interactivity, and the support of educational methods. In this study I use the following definition:

e-learning; the use of application software that provides activities which fit instructional models, by students.

From this definition, the meaning of the term 'implementation of e-learning' refers to either 'the implementation of software', or 'the implementation of instructional model using application software'.

OBJECTIVES

This study aims to answer the following research question:

RQ1) What instructional models have shaped implementations of e-learning?

METHODS

ELIGIBILITY CRITERIA

Literature was eligible for inclusion in this systematic literature review if it met all of the following criteria:

- The literature is published sometime after December 2019.
- The literature is published in a peer-reviewed journal
- The literature is published in a journal that is either recommended in another study, or has a high bibliometric performance indicator.
- The literature content is written in English.
- The literature content includes explicit research questions.
- The literature content includes enough details to make explicit the research process from data collection to data analysis and research aim fulfilment.

The literature also needed to meet at least one of the following criteria:

- The literature content explores the implementation details of e-learning software.
- The literature content explores the implementation of an instructional model using software.

INFORMATION SOURCES

Information was sourced from two sets of peer-reviewed journals. The first set of journals had been recommended by researchers. The second set of journals had been selected for having the highest bibliometric performance according to journal archival services. Any journal that hadn't published since January, 2020 was excluded.

Only one published study was found that explicitly recommended a set of educational technology journals through systematic reasoning, namely; the study by Perkins & Lowenthal (2016). On the other hand, multiple archival services tracked bibliometric metrics. In this study I opted to use Google Scholar's H5-index as a factor when selecting information sources, which indicates recent performance of journals. Those journals are also conveniently indexed according to theme, with one being 'educational technology'. This ensured suitability of the information sources for finding articles that meet the eligibility criteria. Google Scholar bibliometric database was consulted in April, 2024.

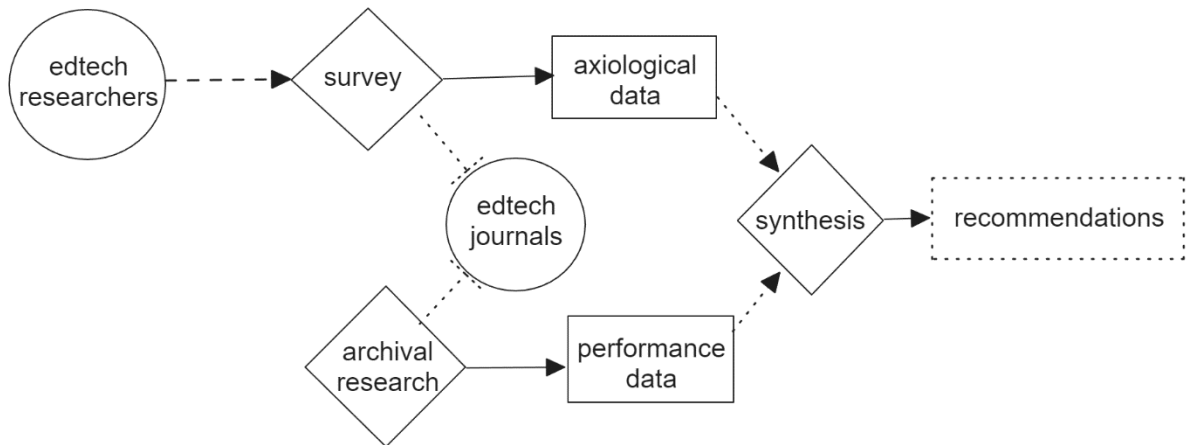


Figure 1. The process used by Perkins & Lowenthal (2016) to create a list of recommended edtech journals.

Journal Name	Latest Volume & Issue	Top 25 EdTech Journal according to Perkins & Lowenthal (2016)	Top 20 EdTech Journal according to H5-index
Australasian Journal of Educational Technology (AJET)	40(1)	yes	yes
British Journal of Educational Technology (BJET)	55(3)	-	yes
Canadian Journal of Learning and Technology (CJLT)	49(4)	yes	-
Computer Assisted Language Learning	37(1)	-	yes
Computers & Education	216(1)	-	yes
Distance Education	45(1)	-	yes
Education and Information Technologies (EAIT)	29(5)	-	yes
Educational Technology & Society (ET&S)	27(2)	yes	yes
Educational Technology Research and Development	72(1)	-	yes
Electronic Journal of e-Learning (EJEL)	22(1)	yes	-
European Journal of Open, Distance and E-Learning (EURODL)	26(1)	yes	-
First Monday	29(4)	yes	-
IEEE Transactions on Learning Technologies (TLT)	17(1)	yes	-
Interactive Learning Environments	32(2)	-	yes

International Journal of Artificial Intelligence in Education (IJAIED)	32(1)	yes	-
International Journal of Designs for Learning (IJDL)	15(1)	yes	-
International Journal of Educational Technology in Higher Education	21(1)	-	yes
International Journal of Emerging Technologies in Learning (IJET)	19(3)	-	yes
International Journal of Instruction	17(2)	-	yes
International Review of Research in Open and Distributed Learning (IRRODL)	25(1)	yes	yes
Journal of Computer Assisted Learning (JCAL)	40(2)	-	yes
Journal of Computer-Mediated Communication (JCMC)	29(2)	yes	-
Journal of Distance Education (JDE)	38(1)	yes	-
Journal of Educational Computing Research	62(2)	-	yes
Journal of Technology Education (JTE)	35(1)	yes	-
Kairos	28(1)	yes	-
Language Learning & Technology (LLT)	28(1)	-	yes
Learning, Media and Technology	49(1)	-	yes
Online Journal of Distance Learning Administration (OJDLA)	27(1)	yes	-
Research in Learning Technology (RLT)	32(1)	yes	-
TechTrends	68(2)	-	yes
The Internet and Higher Education	62(1)	-	yes
Turkish Journal of Educational Technology (TOJET)	23(2)	yes	-
Turkish Online Journal of Distance Education	25(2)	yes	-

Figure 2. The list of information sources for this review and reason for inclusion.

SEARCH STRATEGY

For this study, only the latest published issue of each journal, as of April, 2024; was consulted. The decision to only consult the latest issue of each journal was made to provide recency, without sacrificing the diversity of quality journals that might have occurred due to differing publishing schedules between the journals. The decision was also made to avoid the traditional search strategy of typing word

combinations into a search engine using a search engines particular search syntax, and researcher specific semantics. Instead, the chosen search strategy minimises complexity bias and snapshots information / tool availability.

The first screening phase of the study involved checking for the existence of research aims, and deciding if articles were relevant by the details included in the title/abstract of the article. Any ambiguity was settled through further examination of any methodology sections in the article in order to determine whether there was an implementation of e-learning present. The second screening phase involved searching for references to instructional models.

SELECTION PROCESS

The selection process was fully conducted by one person without the use of automation tools.

DATA COLLECTION PROCESS

During the first and second screening phases, the software 'Notion' was used to provide some automation. Specifically, it was used as a database to record details of articles, such as bibliometric and open coding annotations, which could then be presented as different views of the stored information automatically. Crafted views included a kanban board for tracking progress during the annotation phase, and table views of articles that shared characteristics to aid axial coding. I was the only person involved in this process.

DATA ITEMS

Categories of the data items that were annotated to answer the research questions, are outlined below:

Instructional models

- Ordinary instructional models
- Partial instructional models
 - Models of learning
 - Models of teaching

STUDY BIAS ASSESSMENT

This complete study only involved one person. The decision to involve only one person is the result of the context of this study, which is the study being an individual academic assignment. Nonetheless, some bias was mitigated by minimising the amount interpretation used in the annotation process. This was achieved by only annotating explicit mentions of instructional models to the extent of the categories mentioned previously. No annotations were identified through implications of the studies.

SYNTHESIS METHODS

Whilst creating the annotations, the method of open coding was used, which gave a large range of codes suitable for answering the research questions. The codes were then compared to find similarities

and identify axial codes. The axial codes enabled the grouping of studies to identify trends and problems to be discussed.

REPORTING BIAS ASSESMENT

Whilst axial coding, axial codes were created component-wise. Codes related to the topical components, i.e. instructional models, user interaction and experience, technology, and quality measures; were identified independently of each other. An open code could fit multiple axes but could only fit one axial code per axis. The freedom to fit an open code to multiple axes removed any underlying bias of the priority of each research question.

CERTAINTY ASSESSMENT

Confidence of the axial codes is based on the independence of each code within each axis.

RESULTS

STUDY SELECTION

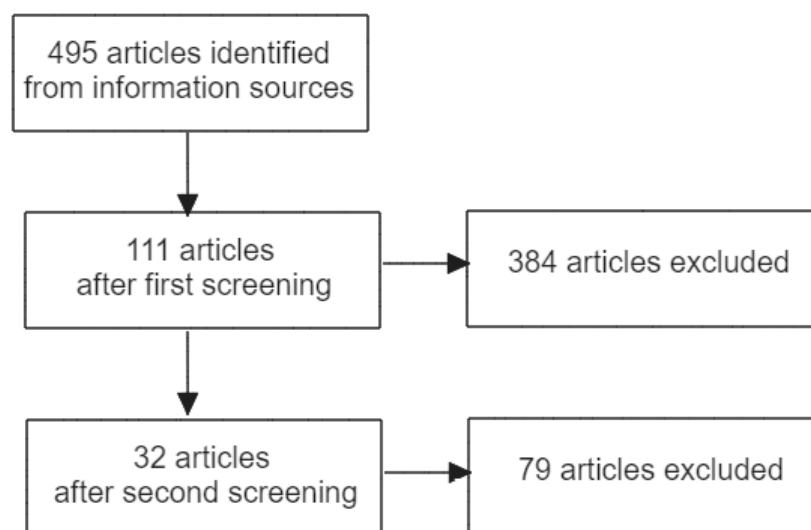


Figure 3. Flow diagram of the selection process.

STUDY CHARACTERISTICS

Instructional Models	Categorised Studies
Adaptive Instruction	Duan et al., 2024; Zanellati et al., 2024; Zhu et al., 2023;
Aesthetic Instruction	Chen et al., 2024;
Cultural Constructivism	Luo & Gao, 2022;
Flipped Instruction	Abdolmaleki & Saeedi, 2024;
Formative Assessment	Alvarez & Villamane, 2022; Banihashem, et al., 2024; Israel-Fischelson & Kohen-Vacs, 2023; Fu et al, 2022; Lin et al., 2023; Reid & Drysdale, 2024; Richards, 2024; Whalen et al., 2023;
Gamification	Hou et al., 2022; Ke et al., 2023; Lan et al., 2024; Lin & Hou, 2022; Ongoro & Fanjiang, 2023; Qiao et al., 2024; Rijgersberg-Peter et al., 2023; Ucel et al., 2024; Udeozer et al., 2023;
Reflective Learning	Chen, 2024; Khezrlou, 2022; Sergent et al., 2024;
Social Constructivism	Burchart & Haake, 2024; Cacciamani et al., 2023; Cerezo et al., 2024; Kerman et al., 2022; Li et al., 2024; Lyu & Lai., 2022; Ouyang et al., 2024; Ryan et al., 2023; Sanchez, 2022; Timpe-Laughlin, 2022;

Figure 4. Study Characteristics – Instructional Models.

RISK OF BIAS IN STUDIES

The biases of individual studies didn't affect this research as no meta-analysis took place, so the methodological details were irrelevant to the research beyond the selection process.

REPORTING BIASES

There is unforeseen bias in this study due to the removal of research questions during the study. Many annotations related to user interaction / experience, implemented technologies, and quality measures which were not reported due to time constraints.

CERTAINTY OF EVIDENCE

A decision was made to remove research questions part way through the axial coding stage to ensure high quality of the results that did get reported. The study characteristics outlined above were found systematically, so high confidence is given to them.

DISCUSSION

The results of this study found that the most influential instructional models on recent research into e-learning are formative assessment, gamification, and social constructivism. I'd recommend more effort is placed into interpretations of adaptive instruction, aesthetic instruction, cultural constructivism, flipped instruction and reflective learning, and the implementation of them through digital means.

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