




## Review Article

## Transfer of workplace e-learning: A systematic literature review

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## ARTICLE INFO

**Keywords:**  
e-learning  
Workplace  
Transfer  
Effectiveness

## ABSTRACT

The paper describes a systematic review of literature published between January 2000 and October 2024 dealing with transfer of workplace e-learning. The review focused on theoretical frameworks, types of transfer being studied, and the types of transfer measurements employed to identify gaps in current knowledge and suggest directions for future research.

Following a discussion of transfer of training, the paper discusses how e-learning differs from traditional face-to-face training. The factors differentiating workplace learning from learning in institutes of education are also explored, thereby establishing workplace e-learning, and its transfer, as a distinct area of study.

The paper describes the search and filtering methodology used to identify relevant literature. The final corpus of thirty-one documents was studied to classify the type of transfer discussed in each document using six binary sub-categories of near and far transfer. In addition, transfer measurements were classified as self-reports, third-party reports, or objective measurements, and theoretical frameworks were recorded when the information was available. The information was examined to assess whether researchers used similar methodologies in approaching the topic of transfer of workplace e-learning.

The results of the study show that there is not yet a broadly agreed approach for conducting research into transfer of workplace e-learning. There is no common scale or methodology used to describe and classify transfer, and the most common approach to measuring transfer is self-reports, which are subject to bias. These factors point to a need for further research to develop a robust academic framework for the subject, ideally supported by empirical research.

## 1. Introduction

Skilled employees play an important role in productivity and innovation, and organizations that invest in training can gain a competitive advantage (Long & Smith, 2004). However, to benefit from training, the trained competence must be applied by the employee in the workplace. This application of a trained competence is known as “transfer”.

Baldwin and Ford (1988) described transfer as having two components, generalisation and maintenance: i.e. what was learned in the specific context of training must be applied in a more general workplace context, and must continue over time. The so-called ‘transfer problem’ refers to the fact that not all training is successfully transferred to the workplace.

E-learning is now an integral part of the training landscape. A Chartered Institute of Personnel and Development survey indicated that just 9 percent of companies did not use any technology-based training in 2023, down from 15 percent in 2020 (Overton, 2023).

Given the importance of e-learning in workplace training, and the

requirement for transfer for workplace e-learning to be effective, a synopsis of recent studies dealing with workplace e-learning transfer will be a useful foundation for future research. This paper therefore sets out to answer the following questions:

RQ1: Is there a common theoretical framework guiding research into the transfer of workplace e-learning?

RQ2: What types of transfer have been addressed in recent studies of workplace e-learning?

RQ3: What types of transfer measures have been used when examining the transfer of workplace e-learning?

Answering these questions will help identify gaps in current knowledge about the transfer of workplace e-learning that can be addressed by future research.

The next section discusses the concept of transfer, followed by a section discussing workplace e-learning, differentiating it from other types of learning. Then, the research methodology is described, followed by results and findings. A discussion of the results is followed by a description of the research limitations, recommendations for future

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<https://doi.org/10.1016/j.ssaho.2025.101407>

Received 8 August 2024; Received in revised form 22 February 2025; Accepted 4 March 2025

Available online 11 March 2025

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research directions, and a brief conclusion.

1.1. What is transfer?

Transfer means applying a competence in a different situation than the one in which it was learned. However, transfer has many aspects. Lateral transfer occurs when the training is applied to similar tasks, whereas vertical transfer occurs when the training is applied to more complex tasks (Barnett & Ceci, 2002; Ford et al. 2018). Gagné (1965), cited in Royer (1979), alternatively describes vertical transfer as a process where a subordinate competence leads directly to the acquisition of a superordinate competence. Royer (1979) also differentiates between specific and non-specific transfer, with specific transfer involving a similarity between the learning and application tasks, and non-specific transfer showing no obvious connection between them. Additionally, Royer (1979, p. 8) discusses literal and figural transfer, with literal transfer involving an exact transfer of a learned skill to a task, and figural transfer involving “the use of some segment of our world knowledge as a tool for thinking about, or learning about, a particular problem or issue”. Perkins and Salomon (1988) distinguish between “low road” transfer, where there is an almost automatic application of skills learned in one context to a similar, but different, context – they compare learning to drive a car and applying the skills driving a truck – and “high road” transfer where there is a deliberate abstraction of competence learned in one context so that it can be applied in another. Haskell (2001) described six levels of transfer based on the similarities between the learning and application situations, ranging from nonspecific transfer, where new learning is simply based on past learning, to displacement or creative transfer involving discovering or creating a new concept based an insight gained from previous learning.

1.2. Near and far transfer

Researchers differentiate between near transfer, when the performed competence is similar to the training, and far transfer, when the trained competence is used in a situation not covered by the training (e.g. Barnett & Ceci, 2002; Royer, 1979; Sala et al. 2019). Thorndike and Woodworth (1901) found that transfer was more likely when the training material and the practice material were similar. This “common elements theory”, which has been supported by many scholars (e.g. Anderson & Singley, 1993; Detterman, 1993; Ritchie et al. 2015) indicates that far transfer is infrequent and difficult to achieve. Indeed, there is a school of thought that far transfer does not exist (e.g. Melby-Lervåg et al. 2016; Mosing et al. 2016; Sala & Gobet, 2017). In a recent second-order meta-analysis, Sala et al. (2019) found effectively zero evidence for the presence of far transfer.

However, Yelon and Ford (1999) point out that some tasks involve closed skills, where the task must be performed the same way each time, and others involve open skills, where the worker has freedom to decide how to use the skill. Additionally, some roles are highly supervised, with the worker always following defined instructions, while others are autonomous, with the worker free to decide how to complete their tasks. Training for a role that is autonomous and uses open skills will clearly be different than training for a highly supervised, closed skill role.

Haskell (2001, p. 30) opined that “there is no simple way to say if something is a case of near transfer or far transfer” due to a lack of quantitative measurement. Barnett and Ceci (2002) suggested that the conflicting evidence regarding the existence or effectiveness of far transfer could be due to lack of consistency in the type of transfer being measured, leading to different types of transfer being incorrectly grouped together as though they were similar. They proposed a taxonomy based on the type of content that is transferred and the context of the learning and transfer. The type of content has three dimensions: the specificity or generality of the skill, the type of performance change, and the demands on memory. Each dimension has sub-categories as shown

in Table 1.

Likewise, Barnett and Ceci (2002) subdivided the transfer context into six categories: the knowledge domain, the physical context, the temporal context, the functional context, the social context, and the modality, each of which has a continuum from near to far transfer. Barnett and Ceci (2002) provided examples of points along these continua, shown in Table 2, while pointing out that the examples are not evenly spaced, and that the scales are subjective.

1.3. Workplace e-learning

E-learning is “instruction facilitated by technology, designed to enable a learner to achieve a specific learning goal without the requirement for the learner and the instructor to be in the same physical location” (O'Neill, 2024), and can be differentiated from traditional face-to-face learning in several respects. E-learning lets learners access the learning material at a time and at a pace that is convenient for them (e.g. Chen, 2008; Strother, 2002). E-learning is often unidirectional, in that the learner engages only with the learning material, and does not have direct communication with an instructor (e.g. Clark & Mayer, 2016; Warner, 2019). In many cases, workplace e-learning is conducted at the learner’s own desk during working hours, rather than at a specific time dedicated to training in a location like a training room where training is the main focus (e.g. Baldwin-Evans, 2004; Eidson, 1999).

Workplace learning can be differentiated from learning in institutes of education. Schools, colleges, and universities exist to provide education and expand the boundaries of knowledge, whereas the function of a workplace is to deliver a product or service (Fuller & Unwin, 2004; Illeris, 2011). In workplaces, learning is of secondary importance to business objectives, with the function of training being to facilitate organisational performance (Lewis & Thornhill, 1994). While learning in school or college follows a defined curriculum, learning in the workplace tends to be more informal, with individuals choosing what they learn based on their needs (Eraut, 2004). Resnick (1987) observed that learning in school is generalised, focusing on principles, whereas in other learning situations the focus is on situation-specific competencies.

As e-learning grows in importance, researchers need to understand the factors that promote its transfer. Shukla et al. (2023) proposed a taxonomy of factors that affect the transfer of e-learning: learning design and planning, the learning environment and organisational support, individual learner characteristics, and computer literacy/attitudes. While the first three categories are relevant to both e-learning and to traditional learning (e.g. Baldwin & Ford, 1988; Ford et al. 2018), computer literacy and attitudes is unique to e-learning.

The next section outlines the methodology used to identify and classify the types of transfer studied in recent papers dealing with workplace e-learning.

2. Methodology

The standards of the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) (Page et al. 2021) were used for reporting this systematic literature review. While PRISMA was initially proposed for use with medical studies, the approach has also been used for studies in other fields, including workplace training and transfer (e.g. Carter et al. 2014; Shukla et al. 2023).

**Table 1**  
Type of content to be transferred (Barnett & Ceci, 2002, p. 621).

Content dimension		Sub-Categories	
Learned Skill	Procedure	Representation	Principle or Heuristic
	Speed	Accuracy	Approach
Performance Change			
Memory Demands	Execute only	Recognise and execute	Recall, recognise, and execute

**Table 2**

Continua of transfer contexts, with examples (Barnett &amp; Ceci, 2002, p. 621).

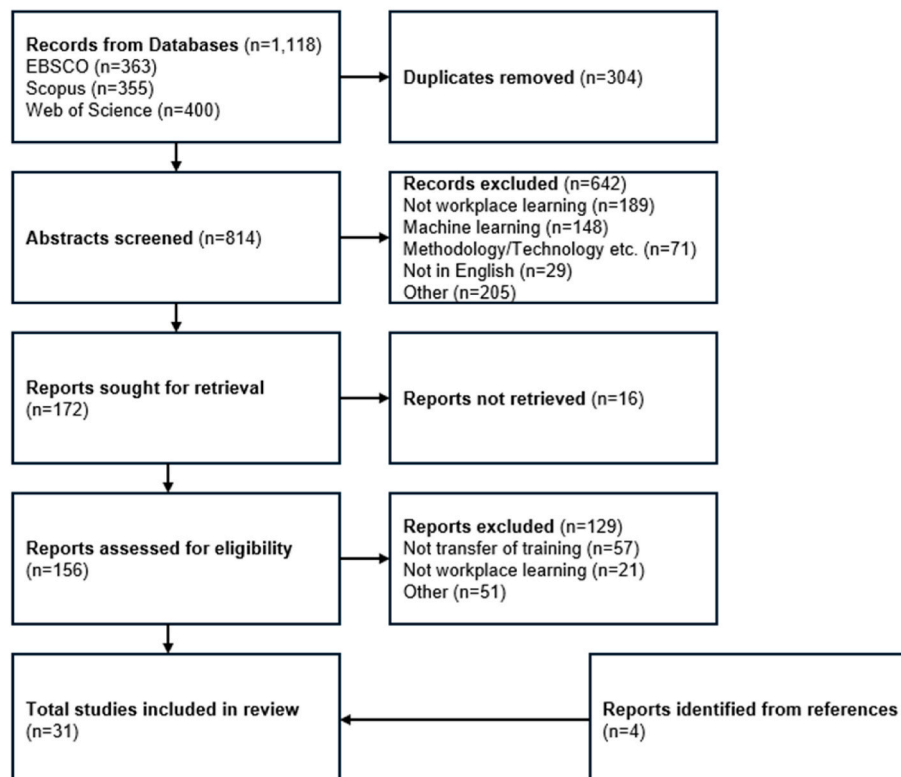
	Near Transfer	<—————	—————	—————>	Far Transfer
<b>Knowledge domain</b>	Mouse vs. rat	Biology vs. botany	Biology vs. economics	Science vs. history	Science vs. art
<b>Physical context</b>	Same room at school	Different room at school	School vs. research lab	School vs. home	School vs. the beach
<b>Temporal context</b>	Same session	Next day	Weeks later	Months later	Years later
<b>Functional context</b>	Both clearly academic	Both academic but one nonevaluative	Academic vs. filling in tax forms	Academic vs. informal questionnaire	Academic vs. at play
<b>Social context</b>	Both individual	Individual vs. pair	Individual vs. small group	Individual vs. large group	Individual vs. society
<b>Modality</b>	Both written, same format	Both written, multiple choice vs. essay	Book learning vs. oral exam	Lecture vs. wine tasting	Lecture vs. wood carving

To identify the relevant literature, a database search was undertaken in November 2024. EBSCO (all databases), Scopus, and Web of Science were selected, as these databases provide broad coverage of the subject matter. In each database, the search focused on abstracts containing the words “E-learning” or “Online learning” or “Web-based learning” or “Multimedia learning”, and “Transfer”, and “Workplace” or “Corporate” or “Company” or “Occupational”. Additional searches included the terms: “Digital education” or “Virtual learning” or “Distance education” or “Remote learning” or “Web-based training” or “Cyber learning” or “Internet-based education”. The searches covered the period from January 2000 to October 2024, and identified 1118 results, 363 from EBSCO, 355 from Scopus, and 400 from Web of Science. The abstracts for each of the results were downloaded, along with other information such as authors, year of publication, journal name, and DOI, and imported to an Excel spreadsheet which was used to summarise key information from the papers.

The inclusion criteria for the final analysis were: 1) the paper included information about transfer, 2) it focused on training for the workplace; 3) the training was delivered via e-learning; and 4) the paper

was in English. Papers that did not satisfy all four criteria were excluded. Following identification and elimination of duplicates (304 papers) the remaining 814 papers were analysed in two stages. First, the abstracts were read to identify papers that clearly did not match the inclusion criteria. Some themes were evident in the exclusions at this stage: 189 items did not deal with workplace learning (e.g. Emurian, 2006), 148 dealt with various aspects of machine learning (e.g. Lin & Chang, 2022), 71 items were proposals for or discussions of a methodology, technology, or platform (e.g. Hamburg et al. 2007), and 29 were in languages other than English (e.g. Hochholdinger & Schaper, 2008). Many of the papers could have been excluded for multiple reasons, but when at least one inclusion criterion was absent, no further investigation was conducted. In total, 642 papers were excluded at this stage. The remaining 172 papers were read to assess if all inclusion criteria were satisfied. Papers excluded at this stage included 57 papers that did not deal with transfer of training (e.g. Lemaire & Greene, 2002), 21 papers that did not deal with workplace learning (e.g. Arif & Ahmad Tarmizi, 2023), and 16 papers that were unavailable or only available for purchase (e.g. Burk et al. 2015). In total, 145 papers were excluded at this stage, leaving 27

### Process for identifying relevant papers

**Fig. 1.** Representation of filtering process.

papers for analysis. Four additional papers were added to the corpus based on citations in the papers that were reviewed (Bertram et al., 2015; Kirkman et al. 2006; Knott et al. 2024; Stein et al. 2015), leaving a total of 31 papers for review. Fig. 1 shows a graphical representation of the filtering process.

The purpose of the review was to collect data relevant to the research questions. The types of learned skill, performance change, and memory demands, described in Table 1, were recorded in the Excel spreadsheet, along with the six transfer dimensions. The type of transfer under each dimension is classified as either Near or Far. Although this is a simplification, it nevertheless leads to  $2^6 = 64$  different possibilities of detailed transfer.

Using Table 2 as a guide, near and far transfer were defined for each dimension as shown in Table 3. This pragmatic binary view enables a process of differentiation and deeper analysis of published transfer studies.

Where available, the training topic and industry information were recorded, along with training duration, and the type of transfer measurement. The number of trainees who completed the course and provided transfer information was also recorded. In addition, the theoretical framework used in each study was noted if the information was provided.

3. Findings

The number of papers published in any year ranged from zero to five, as shown in Fig. 2. Three articles were published in the period 2001 to 2006, nine in 2007–2012, eight articles in 2013–2018 and eleven in 2019–2024, demonstrating a low but reasonably consistent interest in this topic over time.

Papers that provided the time commitment reported on training ranging from a 30–50 min Naloxone distribution course (Ericson et al., 2024) to 1500 h Master's degree (Navarro Martínez et al. 2022).

The healthcare industry was the focus of 12 of the 31 papers. This may be explained by the requirement for healthcare professionals to keep their knowledge current. According to Zeiger (2005, p. 91): “Perhaps more than any other professionals, physicians are expected to keep current with the latest developments in their field”. Only two other industries, telecommunications and banking, were the focus of more than one study, with two papers for each. Highly regulated sectors (healthcare, telecoms, banking, health insurance, child welfare, policing, and pharmacy) account for 20 papers, most likely reflecting the

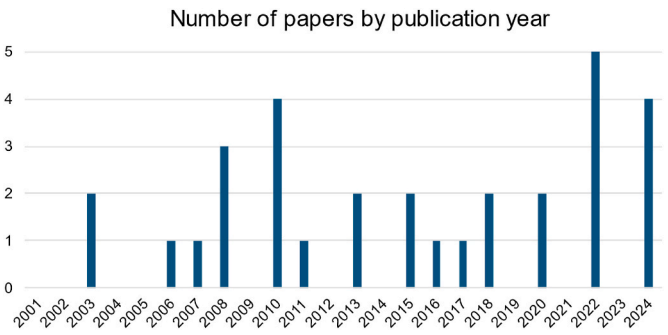


Fig. 2. Number of papers by publication year.

training required to avoid the risks of non-compliance in these sectors. The number of trainees who completed their courses and provided information in relation to transfer ranged from 6 to 3900 (median 104). Table 4 summarises key information about the training courses and theoretical frameworks applied in the studies.

3.1. Theoretical frameworks

In examining RQ1, it is clear from the papers that there is not, as yet, a widely accepted and used theoretical framework for examining the transfer of workplace e-learning. Eight papers refer to the factors that have an influence on transfer as discussed by Baldwin and Ford (1988) or Holton et al. (1996, 2000): individual differences like cognitive ability, self-efficacy, or motivation; organisational factors like peer support, supervisor support, or transfer climate; and instructional design factors like sequencing, or utility. Attack and Luke (2008) refer to a similar framework discussed by Cervero (1985) where the successful transfer is linked to educational quality, organisational climate, learners' openness to change, and perceived utility of the change. Jang (2024) refers to the Dynamic Transfer Model (Blume et al. 2019) where transfer is an iterative process, with feedback and intention to transfer affecting what transitions from one phase to the next. However, these models refer to transfer in general, and not specifically transfer of e-learning. In their study, Park and Wentling (2008) focused on e-learning, and developed a transfer framework based on the number of separate tasks, the number of times the learned competence was used, and task difficulty, while also considering computer attitudes and usability of the training material. Other theoretical frameworks adopted in the papers include a theory of supportive learning for distance education based on communication with peers and tutors (Attack, 2003), Thorndike and Woodworth's (1901) theory of common elements (Jordan, 2016), transfer as an element of a knowledge management strategy (Tessier & Dalkir, 2016), and cognitive load theory as it relates to multitasking and the effects of design, contextual factors, and trainee characteristics on transfer (Ronen, 2008).

3.2. Training content

Fig. 3 shows the analysis of training content based on the dimensions in Table 1.

First, the Learned Skill ranges from specific (a procedure to follow in all circumstances), to general (a principle or heuristic applicable in many different situations). The training involved principles or heuristics in 19 of the studies. For example, Attack (2003) discussed a course where nurses were trained to consider patients' post-discharge home situation and access to support services. In Martins et al. (2018), the training topic was Operational Efficiency, an unstructured task that involved applying general principles. Similarly, Kramer (2007) outlined IT security training where trainees had to apply general principles to identify security risks. Six papers in the review reported training in procedures. For example, Sloth et al. (2022) described training in surgical laparoscopic

Table 3  
Binary representations of the six dimensions of transfer.

	Near Transfer	Far Transfer
Knowledge domain	Within the same high level knowledge domain (cognitive, affective, psychomotor). Many overlapping factors	Different knowledge domain Few overlapping factors
Physical context	Similar physical settings Settings with similar access and control attributes (e.g. opening hours, permitted behaviours)	Dissimilar physical settings Settings with different access and control attributes
Temporal context	Up to four weeks between training and application  Similar time-sensitivity/time-pressure	More than four weeks between training and application  Different time sensitivity/time-pressure
Functional context	The application of training in a manner consistent with the original aims of the training	The application of training in a way not envisioned by the original training
Social context	Similar group size Similar level of collaboration	Different group size Different level of collaboration
Modality	Similar sensory (verbal, visual, auditory) modality Similar physical modality	Different sensory modality Different physical modality

**Table 4**

Key information about the training courses.

Paper	Industry	Training Topic	Type of e-learning	Training Duration	# of trainees	Theoretical Framework for Transfer (5)	Findings in relation to transfer
Jordan (2016)	Telecoms	Not stated	Synchronous; communication with instructors	Various (1)	118	(a), (b), (i)	No significant difference between traditional and online training.
Macdonald et al. (2008)	Healthcare	Collaboration	Asynchronous; post-course meetings with team for group assignment	Not stated	59	Not stated	82% of trainees agreed or strongly agreed that they had used the trained competence in the workplace.
Atack (2003)	Healthcare	Healthcare relationships	Asynchronous; Communication with instructors and peers	16 weeks (2)	11	Not stated	Trainees reported post-training changes in work practices.
Rankin et al. (2013)	Healthcare	Triage skills	Asynchronous; Communication with peers	6 weeks (2)	132	Not stated	Overall triage accuracy improved, but no significant difference between a control group and an intervention group who undertook additional learning tasks.
Hinz (2018)	Health Insurance	HIPAA	Asynchronous; No communication with peers or instructors	1 h	33	(b)	No significant difference between people who completed an e-learning course and took a test, and those who took the test without completing the course.
Hilbig et al. (2013)	Various	Instructional Design	Synchronous; Communication with instructors and peers	15 h (3)	11	(d)	Interviews revealed that 9 of the 11 participants had used the trained competence in the workplace.
Molina-Arrebola et al. (2020)	Healthcare	Transfusion	Unclear whether synchronous or asynchronous; Trainees had access to chatroom	35 h	556	Not stated	91.1% of trainees and 95.8% of tutors considered that trainees had applied "some" or "a lot" (two highest scores on a 4-point Likert scale) of their training in the workplace.
Saleh et al. (2022)	Humanitarian Aid	Humanitarian leadership	Combination of synchronous and asynchronous	240 h	8	(d)	Interviews with trainees and their colleagues reported improved work performance and expanded scope of work.
Park and Wentling (2008)	Heavy Machinery	Not stated	Asynchronous; No detail about communication	Not stated	47	(a), (c)	Computer attitudes (anxiety, confidence, liking, usefulness) have an indirect effect on transfer, mediated by perception of course usability.
Atack and Luke (2008)	Healthcare	Infection control	Asynchronous; No communication	Not stated	55	(e)	55 trainees completed post-completion questionnaire giving examples of changes in work practices as a result of the course
Tessier and Dalkir (2016)	Call centre	Not stated	Asynchronous; No detail about communication	Not stated	51	(f)	Group that received training via e-learning used corporate wiki more frequently than groups with webinar or email training.
Joo et al. (2011)	Not stated	Not stated	Not stated	Not stated	379	(a), (g)	Organisational support positively affected transfer, learning flow and learner satisfaction. However, the hypothesised effect of learner satisfaction on transfer was not shown.
Martins et al. (2018)	Banking	Operational efficiency	Not stated	Not stated	3900	(a), (d)	Trainee self-reports indicated a link between learning strategies (cognitive/help seeking, behavioural, self-regulatory) and transfer. Supervisor reports showed a link between cognitive/help seeking strategies and transfer.
Kramer (2007)	Telecoms	IT security	Not stated	Not stated	145	(d)	Trainees who had the opportunity to apply the learned competence reported that they did so, but not all trainees had the opportunity.
Kerfoot et al. (2010)	Healthcare	Histopathology	Asynchronous; No communication with instructors or peers	45 weeks (2)	724	Not stated	Trainees who received spaced training over 4 weeks showed stronger transfer than those who received the training in a single block.
Sloth et al. (2022)	Healthcare	Laparoscopy	Asynchronous; Also involved use of portable laparoscopy simulator. No detail about communication	5.5 h (3)	46	Not stated	No significant differences in outcomes between groups who received in-person training vs. training via e-learning.

(continued on next page)



Table 4 (continued)

Paper	Industry	Training Topic	Type of e-learning	Training Duration	# of trainees	Theoretical Framework for Transfer (5)	Findings in relation to transfer
Adánez-Martínez et al. (2022)	Healthcare	Telephone consultations	Combination of synchronous and asynchronous. Communication with instructor and peers during synchronous phase	Not stated	145	Not stated	Trainee self-reports indicated implementation of trained competence in the workplace.
Ronen (2008)	Not stated	Not stated	Not stated	Not stated	418	(h)	Transfer was positively associated with computer self-efficacy, usability of learning material, and supervisor support. User control over time and training location did not predict transfer.
Navarro Martínez et al. (2022)	Healthcare	Digital skills	Not stated	22–1500 h (4)	104	(d)	Almost 60% of respondents indicated that they had transferred learned competencies to the workplace, with a positive correlation between the length of the course and transfer.
Kobulsky et al. (2020)	Child welfare	Adoption and guardianship	Not stated for e-learning; Virtual coaching sessions were synchronous with communication with coaches	20–28 h	327	Not stated	Group that received virtual coaching in addition to e-learning showed better knowledge retention than e-learning only group, but no significant differences in transfer between the two groups.
Talanti et al. (2010)	Banking	Regulatory compliance	Asynchronous; No detail about communication	Not stated	293	(h)	Statistically significant correlations between self-reported transfer and motivation, content validity, and supervisor support.
Kirkman et al. (2006)	Travel	Teamwork	Asynchronous; No interactivity	Not stated	326	(a)	Intra-team trust, experienced leadership, and technological support led to better transfer outcomes.
Stein et al. (2015)	Healthcare	Evidence-based psychiatric treatment	Not stated if synchronous or asynchronous. Communication with peers through a “learning collaborative”.	12 h	36	Not stated	No significant difference between e-learning group and in-person workshop group.
Knott et al. (2024)	Pharmacy	Pharmacy preceptor training	Asynchronous; Communication with peers	6 h	28	(d)	Trainees and their supervisees associated the e-learning course with better work performance.
Kow et al. (2024)	Healthcare	Clinical reasoning	Asynchronous; No communication	2 h	63	Not stated	Standard e-learning group and group using virtual simulation reported post-training transfer to the workplace; simulation group reported higher transfer levels.
Dixit and Sinha (2022)	Not stated	Management skills	Synchronous; Communication with instructors and peers	Not stated	108	Not stated	Trainees and supervisors reported that virtual training aided transfer.
Thompson et al. (2003)	Various	Human resource management	Synchronous; Communication was available but unclear if with instructors, peers, or both	24 h	18	(a), (d)	Trainees and supervisors reported post-training transfer to the workplace
Dalston (2009)	Public Libraries	Dealing with difficult patrons	Asynchronous; Some participants had access to a facilitator	2 h	193	Not stated	31% of trainees reported post-training transfer. The study did not disprove the null hypotheses in relation to the effect of internal and external support on training transfer.
Ericson et al. (2024)	Healthcare	Naloxone distribution	Asynchronous; No detail about communication	30–50 min	185	Not stated	14.6% of respondents reported dispensing Naloxone in the month following training
Jang (2024)	Non-Profit	Emergency preparation	Asynchronous; No detail about communication	Not stated	28	(c)	The intervention group showed higher transfer scores, but the difference was not statistically significant.
Bertram et al. (2015)	Police	Operating with helicopter support	Synchronous Virtual Reality, with communication with team members	2 days	6	(a), (b), (d)	In-person training group scored better than e-learning (Virtual Reality) group for transfer in a basic scenario, but the e-learning group outperformed the in-person group in a complex scenario.

(1) Sample course mentioned had a duration of 24 h.

(2) Time commitment not stated.

(3) Mean or median time.

(4) Range from short courses to Master's degree.

(5) Theoretical Frameworks: (a) Baldwin and Ford (1988), (b) Holton (1996, 2000)), (c) Blume et al. (2019), (d) Kirkpatrick (1979), (e) Cervero (1985), (f) Nonaka and Takeuchi (1995), (g) Hoffman and Novak (1996), (h) Sweller (1988), (i) Thorndike and Woodworth (1901).

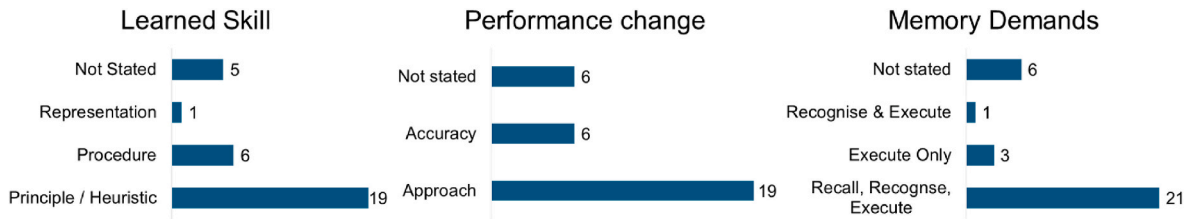


Fig. 3. Analysis of training content (# of papers).

techniques, where the expected outcome was technical proficiency.

Another procedural course involved training triage nurses in how to use the Canadian Triage and Acuity Scale (Rankin et al. 2013). One paper, Navarro Martínez et al. (2022), fell into to the category of Representation, because the training subject was “digital skills”, which are neither highly procedural nor solely principle-based. Five papers did not provide sufficient information to classify the learned skill.

Second, the expected performance change following training could relate to speed of task execution, accuracy of execution, or the selection of the most appropriate implementation approach. Nineteen papers dealt with topics where trainees would need to select a situationally appropriate implementation approach. For example, Kobulsky et al. (2020) described training for child welfare workers to improve outcomes for adoption and guardianship. Macdonald et al. (2008) described

Table 5  
Training content and type of transfer.

Paper	Learned Skill	Performance Change	Memory Demands	Knowledge Domain	Physical Context	Temporal Context	Functional Context	Social Context	Modality
Jordan (2016)	NS	NS	NS	Near	Near	Far	Near	Unclear	Far
Macdonald et al. (2008)	PH	Approach	RRE	Near	Far	Near	Near	Far	Far
Atack (2003)	PH	Approach	RRE	Near	Far	Far	Near	Near	Far
Rankin et al. (2013)	Procedure	Accuracy	RRE	Near	Unclear	Unclear	Near	Near	Near
Hinz (2018)	PH	Accuracy	RRE	Near	Unclear	Near	Near	Near	Unclear
Hilbig et al. (2013)	PH	Approach	RRE	Unclear	Unclear	Far	Near	Unclear	Unclear
Molina-Arrebola et al. (2020)	PH	Approach	RRE	Near	Unclear	Far	Near	Near	Far
Saleh et al. (2022)	PH	Approach	RRE	Near	Unclear	Far	Near	Unclear	Far
Park and Wentling (2008)	NS	NS	NS	Near	Unclear	Far	Near	Unclear	Unclear
Atack and Luke (2008)	PH	Approach	RRE	Near	Near	Near	Near	Far	Far
Tessier and Dalkir (2016)	Procedure	Accuracy	Execute only	Near	Near	Unclear	Near	Near	Near
Joo et al. (2011)	NS	NS	NS	Near	Unclear	Near	Near	Unclear	Unclear
Martins et al. (2018)	PH	Approach	RRE	Near	Unclear	Far	Near	Unclear	Unclear
Kramer (2007)	PH	Approach	RRE	Near	Unclear	Far	Near	Unclear	Near
Kerfoot et al. (2010)	PH	Accuracy	RRE	Near	Unclear	Far	Far	Unclear	Near
Sloth et al. (2022)	Procedure	Accuracy	Execute only	Near	Far	Far	Near	Far	Near
Adánez-Martínez et al. (2022)	Procedure	Approach	RRE	Near	Unclear	Far	Near	Far	Near
Ronen (2008)	NS	NS	NS	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear
Navarro Martínez et al. (2022)	Representation	Approach	RRE	Near	Far	Near and Far	Near	Unclear	Near
Kobulsky et al. (2020)	PH	Approach	RRE	Near	Unclear	Unclear	Near	Unclear	Far
Talanti et al. (2010)	NS	NS	NS	Near	Unclear	Unclear	Unclear	Unclear	Unclear
Kirkman et al. (2006)	PH	Approach	RRE	Near	Far	Far	Near	Far	Near
Stein et al. (2015)	PH	Approach	RRE	Near	Unclear	Far	Near	Far	Far
Knott et al. (2024)	PH	Approach	RRE	Near	Unclear	Far	Near	Far	Far
Kow et al. (2024)	PH	Approach	RRE	Near	Near	Near	Near	Unclear	Far
Dixit and Sinha (2022)	PH	NS	NS	Near	Unclear	Unclear	Unclear	Unclear	Unclear
Thompson et al. (2003)	PH	Approach	RRE	Near	Unclear	Unclear	Near	Unclear	Far
Dalston (2009)	PH	Approach	RRE	Near	Unclear	Far	Near	Unclear	Far
Ericson et al. (2024)	Procedure	Approach	RRE	Near	Far	Near	Far	Unclear	Far
Jang (2024)	Procedure	Accuracy	Execute only	Near	Unclear	Far	Near	Unclear	Far
Bertram et al. (2015)	PH	Approach	RRE	Near	Far	Near	Near	Near	Far
Totals	PH: n = 19 Procedure: n = 6 Representation: n = 1 NS: n = 5	Approach: n = 19 Accuracy: n = 6 NS: n = 6	RRE: n = 22 EO: n = 3 NS: n = 6	Near: n = 29 Far: n = 0 Unclear: n = 2	Near: n = 4 Far: n = 7 Unclear: n = 20	Near: n = 7 Far: n = 16 Near and far: n = 1 Unclear: n = 7	Near: n = 26 Far: n = 2 Unclear: n = 3	Near: n = 6 Far: n = 7 Unclear: n = 18	Near: n = 8 Far: n = 15 Unclear: n = 8

PH = Principle/Heuristic, NS = Not Stated, RRE = Recall, Recognise, Execute.

a course dealing with collaborative work and problem solving. Six papers described training where the desired outcome was accuracy. For example, [Hinz \(2018\)](#) examined a course about the accurate application of health insurance codes in an IT system, and [Tessier and Dalkir \(2016\)](#) reported on a course teaching call centre employees how to provide accurate information to customers. No paper dealt with training where speed was the sole objective, although speed of execution of laparoscopic techniques formed part of assessment described by [Sloth et al. \(2022\)](#). Six papers did not provide information about the expected post-training performance change.

The third dimension relates to demands on the trainee's memory when executing the learned competence. For example, on-screen input tips in a computer system would limit a trainee's memory requirements; conversely, remembering a detailed matrix of options, recognising which option is situationally appropriate without external prompts, and then executing it, involves higher memory demands. In total, 22 papers dealt with topics where trainees had to recall, recognise, and execute the appropriate skill. For example, [Kerfoot et al. \(2010\)](#) described a medical diagnosis course where trainees had to assess each case and make a decision based on its individual presentation. Similarly, [Adánéz-Martínez et al. \(2022\)](#) discussed a telephone consultation course for physicians. The physicians needed to adapt their approach to the specifics of each case using the learned procedure, rather than simply following a script. Three papers described situations where the expected training outcome was solely execution-based, and six papers did not provide sufficient information to assess the memory demands.

Most of the training discussed in the corpus involved relatively complex tasks: learned skills involving principles or heuristics, changes in approach rather than changes in speed or accuracy, and the requirement for trainees to recall, recognise, and execute based on their analysis of a situation. [Table 5](#) shows an analysis of the learning content.

### 3.3. Type of transfer

To answer RQ2, the type of transfer assessed in each study was recorded according to the binary classifications of the transfer dimensions in [Table 3](#). [Fig. 4](#) summarises the results.

In their meta-analysis of transfer research, [Blume et al. \(2010\)](#) bemoaned the lack of detail provided by researchers about their operationalisation of transfer. It seems that little has changed. Just 6 of the 31 papers provided sufficient information to assess all 6 dimensions of transfer. The physical context was unclear in 20 papers, the social context was unclear in 18 papers, the modality was unclear in 8 papers, the temporal context was unclear in 7 papers, and the functional context and knowledge domain transfer were unclear in 3 and 2 papers respectively.

The frequency of near transfer was highest for the knowledge domain and the functional context, with 29 and 26 studies respectively assessing near transfer on these dimensions. This is to be expected for two reasons.

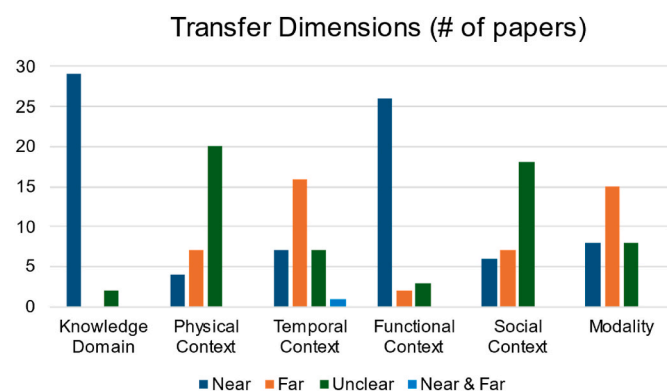


Fig. 4. Transfer dimensions (# of papers).

First, the topics of workplace training are generally chosen because they are relevant to the trainees' roles, with an expectation that the trained competencies will be used in the workplace. Second, when assessing training effectiveness, the measurement will focus on the use of the training in the expected context.

The dimension with the highest frequency of far transfer assessment was the temporal context, with 17 studies assessing use of the trained competencies more than 4 weeks after training. The modality, social context, and physical context formed part of the far transfer mix in 15, 7, and 7 studies respectively. These dimensions may be different in e-learning than in face-to-face training. While e-learning involves interaction with an electronic device, implementation of trained competencies could be quite different: for example, a child welfare meeting ([Kobulsky et al. 2020](#)), or interacting with patients and conducting blood transfusions ([Molina-Arrebola et al. 2020](#)). The social context can also be different, as many e-learning courses involve individual learning, but applying the trained competencies is often in a group situation (e.g. [Atack & Luke, 2008](#); [Kirkman et al. 2006](#)). Likewise, the physical context can be different, for example if e-learning is done at home but implementation is in a hospital (e.g. [Atack, 2003](#); [Macdonald et al. 2008](#)).

### 3.4. Transfer measurement

To answer RQ3, the type of transfer measurement described in each paper was recorded ([Table 6](#)) across three categories. First, self-reports where the trainee reported if they had transferred the trained competence to the workplace. Second, third-party reports where another person, usually a supervisor, reported if trainees were using the trained competencies. The third category is an objective measurement of transfer.

People tend to rate themselves differently than others rate them ([Harris & Schaubroeck, 1988](#)), suggesting that self-reports are an imperfect transfer measurement, particularly where using the trained competence is a socially desirable behaviour ([Podsakoff et al. 2003](#)). Third-party reports may provide more objectivity, but without a defined scale there is a risk of inconsistency. An empirical objective measure provides the best assessment of transfer effectiveness.

Twenty-three of the 31 papers used self-reports for transfer measurement. Of these, 17 collected information using surveys, and 5 used interviews. One study used both surveys and interviews.

Of the 17 studies using self-reports, 9 also had third-party reports (6 surveys and 3 interviews). The triangulation afforded by combining self-reports with third-party reports enhances the reliability of results ([Creswell & Creswell, 2018](#)).

Just seven studies used objective measures of transfer. Each measurement methodology was unique, ranging from an independent audit of post-training work product ([Rankin et al. 2013](#)) to an automated page count of wiki use ([Tessier & Dalkir, 2016](#)).

In evaluating the training results, eight of the studies referred to the 4-level model of training outcomes ([Kirkpatrick, 1979](#)). Level 1 refers to trainees' reactions to the training, Level 2 refers to the amount learned, Level 3 refers to behaviour changes, and Level 4 refers to tangible results. Level 3 on this framework represents training transfer, which is the measured outcome in 7 of the 8 papers using this framework. However, [Kirkman et al. \(2006\)](#) went further and measured a Level 4 outcome, improvement in customer satisfaction.

### 3.5. Summary

This review indicates that there is not yet a common theoretical framework for the study of workplace e-learning, although the models developed by [Baldwin and Ford \(1988\)](#) and [Holton et al. \(1996, 2000\)](#) appear more often than other approaches. The learning material addressed in the studies tended towards the more complex end of the scale in terms of learned skills, performance change, and memory demands, indicating a willingness to use e-learning for complex topics. The



**Table 6**

Type of transfer measurement.

Paper	Self Report	Type	Form	3rd-Party Report	Type	Form	Objective Measurement	Type
Jordan (2016)	Yes	Survey	4 Likert scale questions	Yes	Survey	3 Likert scale questions	No	N/A
Macdonald et al. (2008)	Yes	Survey & Interview	3 Likert scale questions. Semi-structured focus group interviews	Yes	Interview	Semi-structured interviews	No	N/A
Atack (2003)	Yes	Interview	Focus group interview	No	N/A	N/A	No	N/A
Rankin et al. (2013)	No	N/A	N/A	No	N/A	N/A	Yes	Independent audit of triage charts
Hinz (2018)	No	N/A	N/A	No	N/A	N/A	Yes	10-question multiple choice test
Hilbig et al. (2013)	Yes	Interview	10–20 min interviews	No	N/A	N/A	No	N/A
Molina-Arrebola et al. (2020)	Yes	Survey	6 Likert scale questions	Yes	Survey	6 Likert scale questions	No	N/A
Saleh et al. (2022)	Yes	Interview	Semi-structured interview	Yes	Survey	5 Likert scale questions, 3 open questions	No	N/A
Park and Wentling (2008)	Yes	Survey	13 questions	Yes	Survey	13 questions	No	N/A
Atack and Luke (2008)	Yes	Survey	3 open questions	No	N/A	N/A	No	N/A
Tessier and Dalkir (2016)	No	N/A	N/A	No	N/A	N/A	Yes	Automatic page count of wiki use
Joo et al. (2011)	Yes	Survey	4 Likert scale questions	No	N/A	N/A	No	N/A
Martins et al. (2018)	Yes	Survey	7 Likert scale questions	Yes	Survey	7 Likert scale questions	No	N/A
Kramer (2007)	Yes	Survey	18 Likert scale questions, 1 Yes/No question	No	N/A	N/A	No	N/A
Kerfoot et al. (2010)	No	N/A	N/A	No	N/A	N/A	Yes	20 question test
Sloth et al. (2022)	No	N/A	N/A	No	N/A	N/A	Yes	Test with scores based on time and/or accuracy
Adánez-Martínez et al. (2022)	Yes	Survey	8 Likert scale questions	No	N/A	N/A	No	N/A
Ronen (2008)	Yes	Survey	5 Likert scale questions	No	N/A	N/A	No	N/A
Navarro Martínez et al. (2022)	Yes	Survey	5 Likert scale questions	No	N/A	N/A	No	N/A
Kobulsky et al. (2020)	Yes	Survey	4 Likert scale questions; 2 Yes/No questions	No	N/A	N/A	No	N/A
Talanti et al. (2010)	Yes	Survey	Not stated	No	N/A	N/A	No	N/A
Kirkman et al. (2006)	No	N/A	N/A	No	N/A	N/A	Yes	Customer satisfaction survey
Stein et al. (2015)	No	N/A	N/A	No	N/A	N/A	Yes	Survey of patients re frequency of use of trained competences
Knott et al. (2024)	Yes	Interview	15–20 min semi-structured interviews	Yes	Survey	Survey of trainees about preceptors' use of trained competences	No	N/A
Kow et al. (2024)	Yes	Survey	14 Likert scale questions	No	N/A	N/A	No	N/A
Dixit and Sinha (2022)	Yes	Survey	Likert scale questions. Number not stated	Yes	Interview	Semi-structured interviews	No	N/A
Thompson et al. (2003)	Yes	Interview	Structured interview with open-ended questions	Yes	Interview	Structured interviews	No	N/A
Dalston (2009)	Yes	Survey	1 Likert scale question, 1 open question	No	N/A	N/A	No	N/A
Ericson et al. (2024)	Yes	Survey	Not stated	No	N/A	N/A	No	N/A
Jang (2024)	Yes	Survey	11 Likert scale questions	No	N/A	N/A	Yes	Videos demonstrating task completion
Bertram et al. (2015)	No	N/A	N/A	Yes	Survey & interview	6 Likert scale questions, Interviews	No	N/A

review also indicates that the type of transfer being measured is frequently unclear in published studies. Finally, most studies used self-reported transfer rather than an objective measurement.

#### 4. Discussion

The variety of research frameworks adopted within the papers indicates that the field of study has yet to reach maturity. However, e-learning is still a comparatively young field of research, and its widespread adoption in workplaces is quite recent. It seems likely, therefore,

that this topic will receive increased scholarly interest over time.

The description of transfer was quite limited in most of the corpus, with just 5 of the 31 papers providing enough information to fully classify the transfer using the framework in Table 3. To some extent this is understandable: the authors were focused on describing their training programs, and their level of success or otherwise in delivering their training objectives. While transfer to the workplace was an objective, transfer was mainly regarded as a single outcome, with nuance and sub-classification not necessary for the objectives of their studies.

While it was not possible to classify the type of training content in

terms of learned skill, performance change, and memory demands for 5 the studies, it was clear for the remaining papers that the training was mainly at the more complex end of the scale for all three factors, indicating an acceptance of e-learning as a training tool that can be used for complex topics in addition to procedural training.

While the majority of the studies relied on self-reports to assess whether transfer had occurred, leading to a risk of measurement bias, not all researchers regard this as a negative. According to Talanti et al. (2010, p. 217): "Although there are many researchers who are against the use of learners' self-reports to measure the degree of transfer of training, learners are the most important and valid source as their perceptions will affect their motivation and performance". Nevertheless, using a replicable empirical measurement for transfer will always provide a more solid foundation for conclusions, and for scholarly analysis, than basing those conclusions on subjective self-reports.

## 5. Limitations and recommendations for future research

In common with most systematic reviews, this paper has some limitations that must be mentioned. First, the database search was limited to publications in English. It is possible that relevant publications in other languages were overlooked. Second, the searches were limited to the abstracts of articles and, although the search terms were carefully selected, it is possible that relevant articles did not include these terms in their abstracts resulting in their omission from the results. It is also possible that alternative search terms might have returned different results. Third, while this review analysed near and far transfer, it is possible that using a different aspect, like lateral and vertical transfer or literal and figural transfer, could have provided additional insights.

Compiling this literature review raised some questions that could be addressed in future studies. First, although the papers discussed the transfer of workplace e-learning, there is little discussion of the factors that promote the transfer of workplace e-learning, and how they might differ from the factors that promote the transfer of traditional learning. More research on this topic might lead to improvements in the design and delivery of workplace e-learning. Second, as the review revealed that a majority of the studies were conducted in highly regulated industries, future researchers might examine which industries are most likely to use e-learning, and for what specific purposes. Third, future researchers might consider including detail about the training content and the transfer context in their published results to allow for detailed cross-study analysis. Finally, the papers indicated that there is not yet a widely used theoretical framework for the topic. There has been some progress in this respect. For example, Park and Wentling (2008) and Shukla et al. (2023) have proposed theoretical frameworks including factors specific to e-learning including computer attitudes, learning design, and usability of the training material. Future research should aim to further develop this framework and develop a model for transfer of e-learning that can be empirically tested.

## 6. Conclusion

The reporting of studies relating to the transfer of workplace e-learning has not yet reached the level of maturity where researchers have a common understanding of what information should be included in papers to facilitate systematic reviews and meta-analyses. Furthermore, it seems that common research frameworks deal with transfer in a general sense, and do not focus on the specifics of e-learning. Gegenfurtner et al. (2014, p. 1110) noted that: "This gap of theory frameworks is unfortunate because it deemphasizes the momentum of computer-supported training in organizations and companies worldwide". As the use of workplace e-learning continues to grow, we need to develop a strong theoretical framework for the transfer of workplace e-learning that will, in turn, lead to practical improvements in the development and implementation of future training.

## Funding

Publication costs supported by Irish Research eLibrary

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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