



## Strengthening Deeper Learning through Virtual Teams in e-Learning: A Synthesis of Determinants and Best Practices

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**Abstract:** Globally, e-learning is gaining popularity as its potential contributions to economic and social development are recognised. However, its full potential has not been realised, as most e-learning practices merely replicate traditional existing teaching methods and have not fully exploited the interactive and social components of peer learning. Recently, there has been an increased focus on deeper learning in higher educational settings, in particular, a focus on the skills and knowledge that reinforce each other and together promote deeper learning (Chow, 2010). In other words research shows that to be successful all students must have access to educational opportunities that foster deeper learning. Virtual teams (VT) are said to foster "deeper" learning, but have not been empirically studied in the academic sphere, and little is known about their effectiveness as a learning mechanism in e-learning. In this paper the findings of a systemic review and interpretive synthesis of the body of literature on e-learning and VT are presented. The objective of the study was to identify the core skills and knowledge from research that reinforce each other and together promote deeper learning. The results from this study will strengthen e-learning program planning and delivery within higher education centres that are already engaged in e-learning, as well as convey important best practices for learning centres at the beginning stages of e-learning development. Presented is an e-learning framework, which may serve as the foundation of future empirical studies in e-learning.

**Keywords:** e-learning; online education; distance education, virtual teams; deeper learning; instructional design

**Résumé :** À l'échelle mondiale, l'apprentissage en ligne gagne en popularité puisque ses contributions éventuelles au développement économique et social sont reconnues. Cependant, son plein potentiel n'a pas été réalisé, car la plupart des pratiques d'apprentissage en ligne ne font que simplement reproduire les méthodes d'enseignement traditionnelles existantes et n'ont pas pleinement exploité les composantes interactives et sociales de l'apprentissage par les pairs. Récemment, il y a eu une focalisation accrue sur l'apprentissage plus approfondi dans des milieux d'enseignement supérieur, en particulier, l'accent sur les compétences et les connaissances qui se renforcent mutuellement et, ensemble, favorisent un apprentissage plus approfondi (Chow, 2010). Autrement dit, la recherche montre que pour réussir, tous les étudiants doivent avoir accès à des possibilités éducatives qui favorisent un apprentissage plus approfondi. Les équipes virtuelles (EV) sont dites de favoriser l'apprentissage « plus approfondi », mais elles n'ont pas été empiriquement étudiées dans la sphère académique, et on en sait peu sur leur efficacité en tant que mécanisme d'apprentissage en apprentissage en ligne. Dans cet article, les résultats d'une revue systématique et d'une synthèse interprétative de la littérature sur l'apprentissage en ligne et les équipes virtuelles sont présentés. L'objectif de l'étude était d'identifier les compétences de base et les connaissances issues de la recherche qui se renforcent mutuellement et, ensemble, favorisent un apprentissage plus approfondi. Les résultats de cette étude permettront de renforcer la planification de programme et la livraison d'apprentissage en ligne dans les centres d'enseignement supérieur qui sont déjà impliqués dans l'apprentissage en ligne, ainsi que de transmettre d'importantes meilleures pratiques pour les centres d'apprentissage qui en sont aux premiers stades du développement de l'apprentissage en ligne. On présente un cadre de référence d'apprentissage en ligne, qui peut servir de base à de futures études empiriques en apprentissage en ligne.

**Mots clés :** apprentissage en ligne, enseignement supérieur



## Introduction

E-learning has transformed traditional ways of learning in higher education. It is defined as:

An approach to teaching and learning, representing all or part of the educational model applied, that is based on the use of electronic media and devices as tools for improving access to training, communication and interaction and facilitates the adoption of new ways of understanding and developing learning. (Sangrà, Vlachopoulos, & Cabrera, 2012, p. 152)

Notably, e-learning encompasses some key characteristics of both distance learning and online learning and underscores the integration of “pedagogy, instructional technology and the Internet in teaching and learning environments” (Carter & Salyers, 2015). Globally, e-learning is gaining popularity as its potential contributions to economic and social development are recognised. In Canada, e-learning’s provision of the needed flexibility (i.e., any time, any place) is recognized as a fundamental vehicle for fostering a lifelong learning society (Canadian Council on Learning, 2009). According to the Contact North 2012 report, it is estimated that between 875,000 and 950,000 registered online students at colleges and universities in Canada take a purely online course at any one time. In the US, in 2012, over 6.7 million students were taking at least one online course, an increase of 570,000 students over the number reported in the previous year (Allen & Seaman, 2013).

However recent reports have revealed some countries are not performing to expectations in their e-learning endeavours. For example Canada is reported as trailing behind the efforts of other countries in e-learning, with Canadian post-secondary institutions lagging behind those in many other countries in incorporating online components into their programs, and e-learning in workplace training is not yet a standard feature (Canadian Council on Learning, 2009). The same report, however, highlighted the importance of e-learning to Canadian social and economic development and called for a coherent framework to shape e-learning’s development in Canada, noting, among other things, the need for concerted efforts to fill gaps in research and harness the potential of technology to meet the needs of learners (*ibid.*). This is aptly stated, as there appears to be a scarcity of research on e-learning in Canada (Salyers, Carter, Carter, Myers, & Barrett, 2014; Kaznowska, Rogers, & Usher, 2011). A stronger understanding of online learning is therefore essential for the future success of education and training.

From the outset, e-learning has been hailed as offering the “potential to enable student centred learning through the realisation of constructivist teaching principles” (Edwards & Bone, 2012, p. 2). However, this potential has not been realized since most studies describe current activities in e-learning as mostly replicating or transferring traditional existing teaching and learning approaches into e-learning environments (Salmon, 2005). In Canada one of the major barriers to the development of e-learning is noted as “the poor design and quality of some early stage online courses and the low level of student engagement these engendered” (Contact North, 2012, p. 17). In other words, educators are striving to conceptualize how teaching and learning can be enacted in e-learning settings whereby data, information, knowledge, and the capacity to socially shape such data, information and knowledge tends to define the learning experiences of many students (Edwards & Bone, 2012). Moreover, there has been an increased focus on deeper learning in higher educational settings, in particular, a focus on the skills and knowledge that reinforce each other and together promote deeper learning (Chow, 2010). Deeper learning, as presented by the Hewlett Foundation, prepares students to master core academic content, think critically and solve complex problems, work collaboratively, communicate effectively, have an academic mindset, and learn through self-direction. Nevertheless, to be successful all students must have access to educational opportunities that foster deeper learning. As a result there is a growing need for a stronger understanding of e-learning that encompasses the examination of ways in which e-learning promotes deeper learning.

In addition, there is growing practical evidence that one of the key factors for e-learning success is an understanding of the social component of learning, i.e., the importance of person-to-person, and group/team, interactions within the e-learning framework. Social aspects of peer learning are considered to build student motivation, enhance social connections and increase student access to feedback about their learning (Morrison, 2006). Not surprisingly, therefore, most workplace training and graduate teaching in e-learning environments utilize group work. Group or team work, according to precepts of adult education, fosters deeper learning, in a co-production of knowledge model, and also provides skills that professional programme students require in the workplace, where teams are the norm today and team work a required skill set.

Virtual teams are one such example of a form of a workplace team with potential implications for e-learning. Virtual teams are groups of people committed to a common purpose or goal that are separated geographically, that use a variety of communication technologies that allow them to transcend the limits of time and distance, in order to work together (Ale, Ahmed, & Taha, 2009; Green & Roberts, 2010; Martins, Gilson, & Maynard, 2004). Aside from their ability to allow highly skilled but geographically dispersed individuals to work together, past reviews have highlighted studies that claimed other benefits of virtual teams. For example, these benefits may include: increased team cohesion and a greater sense of responsibility among team members (Ale et al., 2009); increased participation among members and reduction in the effects of status inequalities (Martins et al., 2004) and greater opportunity for students to acquire an international perspective through their learning (Green & Roberts, 2010).

There is a growing body of knowledge on how to develop effective virtual teams in the professional context (Faizuniah & Chan, 2014; Parke & Campbell, 2014; Berry, 2011). As well, there is some discussion in academic circles of possible relationships between e-learning and virtual teams (Erez et al., 2013; Shea, Sherer, Quilling, & Blewett 2011). As Hunt, Smith, & Chen, (2010) observed, academicians need to challenge students to engage, and one way to accomplish this is by using active collaborative teaching scenarios. However, virtual teams have not been extensively empirically studied in the academic sphere, and little is known about their effectiveness as a learning mechanism in e-learning. The key question is whether virtual teams used in the e-learning space are effective in producing better student learning outcomes? It is useful therefore to consider what lessons can be learned from the literature on virtual teams which can be applied and used within e-learning environments to promote deeper learning. In order to draw these conclusions, there is a need for an in-depth meta-review of findings in the literature on virtual teams concerning the impact/results from virtual teamwork, which can be useful or transferred to general e-learning. This study therefore reviewed and synthesised the findings in the literature on virtual teams and e-learning published within the past decade. The objective was to identify core skills and knowledge from the virtual team and e-learning research that reinforce each other and together promote deeper learning; also proposed is an e-learning framework, which may serve as the foundation of future empirical studies in e-learning, and may contribute to enhanced pedagogical design. The results from this study will strengthen e-learning program planning and delivery within higher education centres that are already engaged in e-learning, as well as convey important best practices for learning centres at the beginning stages of e-learning development.

This paper is organized as follows. First, we present an overview of our knowledge synthesis methods, which includes a systematic search of the literature and an interpretive synthesis of existing research. We then present an analysis and discussion of our findings and our proposed e-learning framework. The final section indicates the limitations of our research and provides recommendations.

1. What instructional activities were facilitated in the lab sessions?
2. Were the instructional activities helpful for students to achieve the course competencies?

## Methods

Our review was underscored by rigor and transparency (Mays, Pope, & Popay, 2005) to enable the study to be replicated by others. We conducted a systematic search and review of the literature to identify the key determinants of effective learning in an e-learning educational delivery model, effective virtual teams, and the additional impact of an e-learning framework that incorporates a virtual teamwork component within the program model. One of the key advantages of a systematic over a narrative literature review is that it allows for the synthesis of the research in a systematic, transparent, and reproducible manner. In other words, adopting a systematic review methodology helped in counteracting bias by making explicit the values and assumptions underpinning our review process. In addition, comparative and thematic synthesis methods, rather than quantitative analysis, were selected to uncover contextual issues identified in the studies and provide educators and policy-makers with a reliable basis to formulate program model frameworks and take evidence-informed action. We adapted an interpretive review method, an approach that provides a useful structure within which to conduct a synthesis of the literature. Notably, the goal of the synthesis was not to produce an aggregation of data, but theory grounded in the studies included in the review (Dixon-Woods, et al., 2006).

### Study Questions

It was not possible nor desirable for us to specify in advance the precise review question, *a priori* definitions, or categories under which the data will be summarised. The precise formulation of review questions in advance of the synthesis, as Dixon-Woods et al, (2006) noted, is successful in instances “where the phenomenon of interest, the populations, interventions, and outcomes are all well specified – i.e. if the aim of the review is aggregative”. For our study the aim was to allow the definition of the phenomenon of virtual teams and e-learning to emerge from our analysis of the literature (Jensen & Allen, 1996). However, it should be noted that, although at the outset we did not have a specific hypothesis that we were going to explore, three general questions were used to frame our project. These project review questions, which could best be described as “tentative, fuzzy and contested” (Greenhalgh et al., 2005), were: What drives effective e-learning? What makes virtual teams effective? What lessons can be learned from the literature on virtual teams which can be applied and used within e-learning environments? We then employed a highly iterative approach to specify our review questions, i.e., we modified the questions in response to search results and findings from retrieved items. The multidisciplinary nature of our research team was of great benefit to this process of refining the questions, as it allowed a range of perspectives to be incorporated into the process.

### Study Eligibility

Our focus was to include many different forms of evidence with the aim of generating a comprehensive framework, thus we conducted an interpretive synthesis (Sandelowski et al., 1997) of all types of evidence relevant to our understanding of the mechanisms that underlie effective e-learning and virtual team environments, and for whom virtual teams work and in what circumstances. However, we limited the date range to the past 10 years in adherence to the grant funding call to focus on the state of research knowledge emerging over the past decade. Because we sought to include only the most recent decade of published evidence in our report, we therefore excluded studies published prior to 2005. Non-English language materials were also excluded because of the cost and time involved in material translation. Thus, potential relevant studies might have been missed due to our exclusion criteria.

### Study Identification

As stated above, our research focus was to be as comprehensive as possible in identifying studies relevant to our understanding of the criteria that underlie effective e-learning and

virtual team environments, and for whom virtual teams work and in what circumstances. We therefore used purposive sampling initially to include only those studies published within the past ten years that investigate (e-learning OR virtual teams) AND (success\* OR effective\* OR best practice\*) in multidisciplinary environments. To achieve this we adopted a number of strategies, including searching for relevant evidence in electronic databases; reference chaining; searching grey literature websites; and contacts with experts. During the month of May 2015 two librarians (the co-investigator and the research assistant) developed and ran combinations of search strategies in electronic databases: ERIC, ABI/Inform, Business Source Complete, Web of Science, Academic Search Premier, Science Direct, and Research Library. Appendix A presents the combinations of search terms used in the study. We also checked the reference list of studies retrieved from databases to ensure that we had included all the relevant studies fitting our search criteria. In addition, since there are numerous official reports, studies, theses, dissertations and working papers on these topics we included relevant materials retrieved through searching gray literature sources, including the Canadian Research Index, ProQuest Dissertation & Theses, and Google Scholar. Further, in May 2015 we created a research project website. We utilized expertise within the team of policy makers and educators participating on our website to identify relevant literature. Our website received 435 unique visitors (740 page views) during the months of July and August 2015. Pingbacks and referrals came from other blogs, and social media sites, including Twitter, Facebook, Reddit, Scoop.It, LinkedIn, and Google. Social media and website participants suggested articles that could be included in our literature sample. We organized the articles in RefWorks.

### **Study Selection**

Our research team drafted a mechanism to help us eliminate studies that were not relevant to our research. We tested the draft relevancy criteria on a subset of fifty abstracts and discussed the differences in interpretation among the researchers. A high level of agreement was reached by the team of researchers ( $\kappa = 0.80$ ). The researchers discussed the discrepancies and settled on final inclusion/exclusion criteria. More importantly, the final inclusion/exclusion criteria that we applied to all citations to determine their relevance was developed post hoc (Arksey & O'Malley, 2005) as researchers became more familiar with the literature. The exclusion criteria included: not condition of interest (E-Learning and Virtual Teams); not outcomes of interest (best practices, success factors, effectiveness); published prior to 2005; and not written in English.

All titles and abstracts of potential articles were screened by the researchers independently and in duplicate for inclusion. The researchers applied the inclusion and exclusion criteria to all the retrieved citations by reading the abstracts. At this stage, the full-text of the article was retrieved and read only in situations where the relevance of a study was unclear from the abstract. We resolved any conflicts by consensus. Our aim was to prioritise papers that appeared to be relevant, rather than particular study types or research that met specific methodological standards.

### **Data Extraction**

We conducted a bibliometric analysis to describe the structure and dynamics of the research literature. We developed a data classification form to assist in systematically identifying characteristics of each article. We classified articles based on the following classification scheme:

- Web of Science subject area (based on journal content specific fields of study, e.g., Business, Education, Health)
- Number of times cited
- Year of publication
- Journal and journal impact factor

- Geographic focus (i.e., did the paper have a Canadian, North American, or global/general focus?)
- Article Focus (i.e., was ELearning and VT a major focus of the paper?)
- Article type (Empirical or non-empirical)
- Study method (e.g., quantitative, qualitative, literature review, policy/management development)
- Sector (e.g., higher education, business/professional training).

A fundamental issue in reviewing qualitative and quantitative research is the appraisal of study quality (Mays et al., 2005). Our research team gave the articles a quality rating using two quality rating matrices, one for empirical and one for non-empirical articles, developed by the researchers. We used a 15-point scale for empirical articles that included assessment of the quality of the literature review, research questions and design, population and sampling, data collection and capture, and analysis and results reporting (see Appendix B). We also used a 15-point scale for non-empirical articles (see Appendix C). Two members of the research team first rated a subset of the articles (n = 20). A high level of agreement was reached (kappa = 0.82). The two members discussed the discrepancies and a consensus was reached in all the cases. One member of the research team then rated the remainder of the articles. In an effort to limit the pool of articles to those deemed of higher quality, the research team agreed from the outset to include only those articles that had an overall score higher than 10/15. We thus, focussed our initial study synthesis on 110 highly rated studies. As shown in Figure 1 most of the studies relevant to our study were published in highly cited journals as indicated by impact factor. For our study journal impact refers to impact factor as calculated and published in the *Thomson Reuters Journal Citation Reports* and relevance was calculated by measuring the number of times that journal populated in our literature sample.

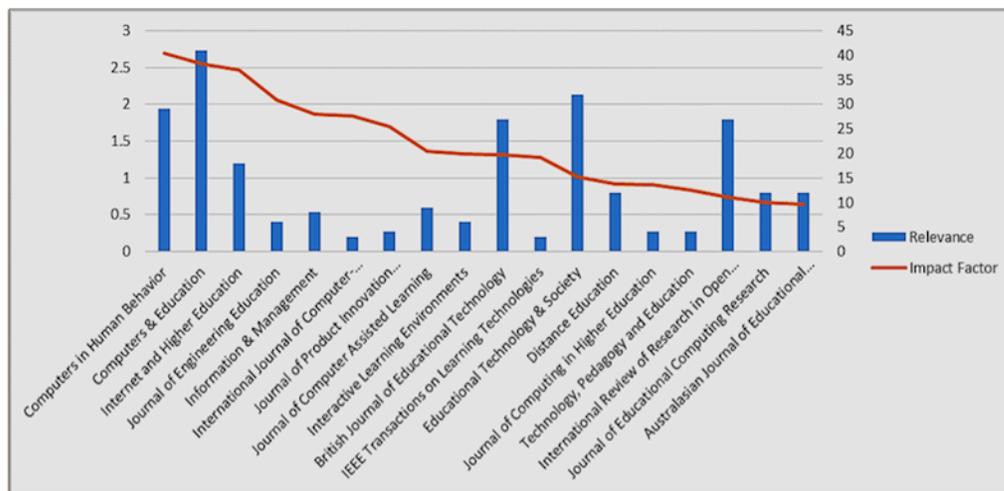


Figure 1: Study most relevant and impactful journals.

Further we identified and reviewed a number of relevant reports and dissertations from the grey literature. It should be noted that we did not formally rate the grey literature reports. Nevertheless, we reviewed the reports for information that we perceived was a novel addition to the knowledge presented in the peer-reviewed literature and would greatly contribute to our e-learning framework as a whole.

### Analysis and Synthesis

Data handling and analysis was facilitated through the use of Dedoose, an online qualitative analysis software that facilitates coding, sorting, and displaying data. The complete texts of all

included studies were loaded into Dedoose and analysed following the basic premises of Glaser and Strauss (1967)'s grounded theory and Miles and Huberman (1994)'s data reduction methods, methods we deem well suited to our focussing, reinterpretation and analysis of the evidence, primarily text-based forms of evidence (Pope et al., 2007). The data synthesis was conducted in several overlapping stages. In the first stage the research assistant and the first author read the selected studies and noted key ideas following the marginal coding process according to Miles and Huberman (1994). In the second stage, the researchers employed a constant comparison method to group and organize the marginal codes conceptually, resulting in a hierarchical organized codebook of codes and sub-codes that emerged from the data itself. The study texts were line-by-line coded, a process that enabled the researchers to undertake the translation of concepts from one study to another. The use of Dedoose added to the transparency of our data analysis. We used Dedoose to assess inter-coder reliability. A random selection of a third of the lines coded was assessed and a few discrepancies were noted, mostly the discrepancies involved omissions. All discrepancies were discussed by the researchers and a consensus approach was used to assign the final codes. Importantly, we constantly compared the theoretical structures we were developing against the data in the papers. Although onerous, line-by-line coding provided key advantages to our research, i.e., it revealed gaps and puzzles, identified core themes, illuminated theoretical components and uncovered potential sources of bias (Miles & Huberman, 1994). Line-by-line coding of the texts resulted in 601 excerpts abstracted into 133 preliminary codes and subcodes. As relationships became apparent, preliminary codes were refined and integrated into groups representing emerging thematic areas of effective e-learning and virtual teams. As patterns of relationships emerged the groups of thematic areas were refined and synthesized into domains of deeper learning in e-learning. Data saturation was reached when domain codes were densely distributed across the literature.

## **Results**

### **Overall Structure**

Our systematic search of nine key databases yielded 12,802 studies in English. Of these, 11,225 were removed on the basis of our exclusion criteria (2,383 were duplicates, 1,051 were published before 2005, and 7,791 were deemed irrelevant by consensus) (see Figure 2). In other words, of the 12,802 studies originally identified, 1,577 were selected as potential relevant studies. On the basis of examining the abstracts and full text of all these 1,577 articles during the classification process we further eliminated 720 articles. Our final sample included 857 studies. Of the 857 studies selected for inclusion in the synthesis, 500 were classified as empirical studies, 275 as non-empirical (e.g., editorials) and 22 as dissertations. Study characteristics including first author, year, focus and subject area are detailed in Table 1 in Appendix D, which includes a bibliography of the highly rated studies included in our initial study synthesis.

The process of interpreting evidence in this synthesis revealed three thematic domains of deeper learning in e-learning: contextual, behavioral, and resource. In addition, two learning theories were identified as underscoring the domains deeper learning: social constructivism theory (Vygotsky, 1978) and connectivism theory (Siemens, 2005). Further, a core process inherent in deeper learning promotion emerged: conversation. Conversation emerged as the primary social process through which the processes of deeper learning and effective e-learning was made possible (see Figure 3). The following is a detailed description of the learning theories and process revealed in this interpretive-synthesis and the underlying themes.

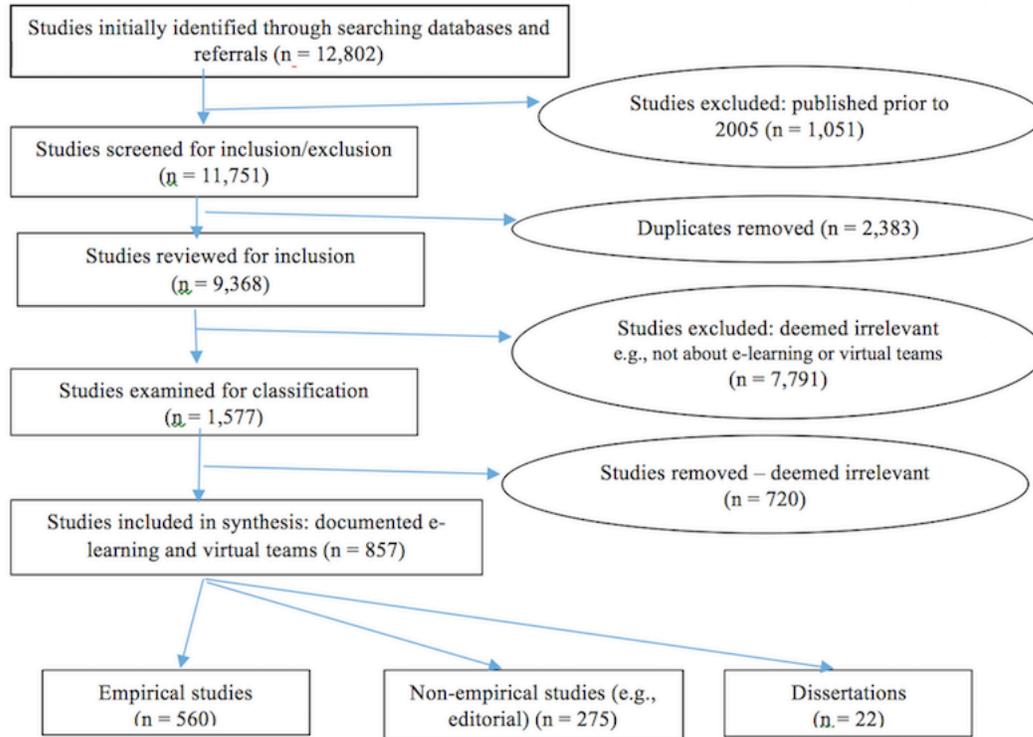


Figure. 2: Literature Search Workflow.

### Learning Theories

The synthesis revealed two learning theories that underscore the domains of the core phenomenon of deeper learning in virtual teams and e-learning. Table 2 presents a summary of the two learning theories; the social constructivism theory (Vygotsky, 1978) and connectivism theory (Siemens, 2005).

**Table 2. Learning Theories Underpinning Deeper Learning in e-Learning**

Authors	Learning Theory	Main Components/Issues Raised
Vygotsky, 1978	Social constructivism	<ul style="list-style-type: none"> <li>Individuals construct knowledge based on their experiences.</li> <li>This theory emphasizes the collaborative nature of learning.</li> <li>Knowledge is constructed within a social context.</li> </ul>
Siemens, 2005	Connectivism	<ul style="list-style-type: none"> <li>This theory is a product of the digital age.</li> <li>Learning can be achieved through networks, decision-making, collaboration, and diversity.</li> <li>Emphasizes the ability to connect ideas, and to find and apply knowledge when it is needed.</li> </ul>

These two theories help explain why learners and teachers can achieve a deeper understanding of concepts through higher levels of communication processes. For instance,

individual participants bring their life experiences to an educational setting and those experiences help shape how students and teachers process and interpret knowledge. From a social constructivism perspective “learners construct knowledge through discourse with other members of the community . . . . Learning is produced by the team” (Savin-Baden & Major, 2004, p. 71). When there is a collaborative environment for learning, more experiences are shared and knowledge can be processed from different perspectives; concepts learned by examining it from a number of different perspectives can enhance learning. From a connectivism theoretical basis, social interaction within groups helps build networks, aids in decision-making, and increases collaboration between groups that enhances the ability of students to view concepts from diverse points of view, thereby increasing an individual’s ability to understand and process information. In addition, bringing different perspectives to a learning environment can also help in applying knowledge to a variety of settings, and therefore can broaden that application of knowledge to various fields.

### **Conversation Process**

The synthesis revealed that underpinning deeper learning in virtual teams and e-learning environments is the core phenomenon of conversation. Conversation is the all-embracing term that describes socialization as well as communication processes within the learning environment. Conversation is identified as allowing learners to experience social presence and develop a feeling of belonging and psychological closeness, which is crucial to the development of deeper learning. For instance, within the e-learning literature concepts such as collaboration, community and connectedness dominated the results pointing to student satisfaction and success (Bolliger, Supanakorn, & Boggs, 2010). Among the studies included in this synthesis, several authors cited conversation processes to describe vehicles for effective virtual teams and e-learning. In their study, Tseng and Yeh (2013) identified conversation process factors such as relationship conflict and lack of communication as the most serious problems for virtual teams’ effectiveness in collaborative learning environments. Lin, Standing, and Liu (2008), in their triangulated study (meta-analysis, field experiment and survey), revealed social dimensional factors, such as developing successful social relationships, as pre-requisite to effective task coordination in virtual teams resulting in effective task accomplishment. Brown, and Voltz (2005) identified a participatory design and implementation approach as the key to effective e-learning design, “where the e-learning system is a two-way street, allowing early and ongoing communications between designer and users, rather than a conduit directed at the learner or educator” (p. 8).

Notably, the synthesis revealed a change in how, through conversation processes, “knowledge” transfer is viewed in learning environments. In other words focus is moved from individual to social/shared learning; from a passive to an active process; and from top-down to learner-centered. More importantly, knowledge transfer, acquisition or creation is not achieved by the transmission or formalization of tacit knowledge but “through its coordination aimed at pursuing a common objective” (Ditillo, 2004). It is not considered as a simple transfer of a fixed entity but as involving learners and instructors actively inferring and constructing meaning from a process of interaction (Hislop, 2010). In other words, learning is maximized in-context and through interaction with others (Greenhow, Robelia & Hughes, 2009). Social learning strengthens the development of tacit knowledge (Tee & Karney, 2010). Not surprising, a number of authors considered social presence an important factor in student satisfaction and success (Bolliger, Supanakorn, & Boggs, 2010; Swan & Shih, 2005). Shen, Cho, Tsai, and Marra, (2013) observed students’ self-efficacy as related to social interactions among students and between students and instructors. According to Shen et al.:

The nature of online learning requires students to interact actively with both instructors and classmates. Especially those students with less experience may experience anxiety about interacting with others and may feel social isolation if they perceive lack of support from others. (p. 16)

Instructors are thus encouraged to create social presence and teaching presence to foster a sense of a learning community. This may be accomplished through: participating in discussion boards; providing guidelines for social interaction; recognizing students' contribution to online learning community; and, monitoring students' social interaction processes (Shen et al., 2013). Also through engaging in conversation students and teachers share and discuss ideas, a process that promotes critical thinking and reflection. In addition collaborative problem-solving promotes the externalization and internalization of information (e.g., teaching others, or having ideas vetted and analyzed in-context). Thus, the socialization process of learning, which can be aptly summed up as conversation, allows for deeper learning of subject material in online environments. Additionally, it allows for contributions in learning that are in a way "hidden" from that found in direct face-to-face interaction. In short, the community may contribute in a manner that is more authentic or free from bias.

The following sections contain an overview of the three thematic domains underlying conversation processes supporting deeper learning in e-learning revealed in this synthesis, along with a framework that details the three domains within an e-learning educational delivery model.

### **Domains of the Core Phenomenon of Deeper Learning in e-Learning: Conversation**

The synthesis identified the core phenomenon of conversation as described within three fundamental domains: contextual dimensions; behavioral dimensions; and resource dimensions (see Table 3 for details).

**Table 3. Domains of the Core Phenomenon of Deeper Learning in e-Learning: Conversation**

THEMATIC DOMAIN	WHAT IT ENTAILS	CHARACTERISTICS
<b>Contextual Dimensions</b>	Establishing or developing a shared context, an environment where learners and instructors effectively engage in conversations. Social environments are integral to effective conversation.	<ul style="list-style-type: none"> <li>• Individual (Self-efficacy, Motivation, Interest, Task focus / goal commitment, Tech familiarity, Learning preferences)</li> <li>• Group dynamics (Structure / size, Task distribution, Group awareness, Trust, Leadership, Conflict, Interdependence)</li> <li>• Course design (Pedagogy, Incentives, Expectations, Delivery method)</li> </ul>
<b>Behavioral Dimensions</b>	Enabling or facilitating dynamic practices that create empowered continuous conversations. Strengthening networks of interpersonal relationships	<ul style="list-style-type: none"> <li>• Individual Learner (Planning, Participation, Reflection, Persistence, Communication, Task completion)</li> <li>• Group (Social interaction, Collaboration, Discussion and feedback, Problem solving, Decision making, Task coordination)</li> <li>• Instructor (Communication, Intervention, Information management, Setting expectations, Completing and implementing training)</li> </ul>
<b>Resource Dimensions</b>	Deploying or encouraging use of multiple tools/ vehicles/ supports for effective and timely conversations	<ul style="list-style-type: none"> <li>• Technology (Tools, Media), Time, Course content / materials, Training</li> </ul>

These domains were distilled and organized through a deductive process from the 133 codes identified on the basis of the highest frequency of appearance in the literature as well as, in the researchers' views, the fundamental drivers for effective e-learning and virtual teams. While

these three domains are certainly interrelated and have some overlap, the following sections highlight and describe the domains in greater depth.

### **Thematic Domain 1: Contextual Dimensions**

Contextual dimensions are described as elements enabling the creation of learning environments with a shared context, an environment where learners and instructors effectively engage in conversation. This entails the development of a learning environment that has, as observed by Wickersham and McGee (2008), “a learner-centric design as opposed to content-centric, in which the learner proceeds in a lock-step fashion through content with little or no adaptation or deviation from a content-driven script” (p. 74). Purposefully developing a shared context is considered a “useful approach to facilitating online learning, creating a strong potential to support learning processes necessary for students to cultivate tacit knowledge” (Tee & Karney, 2010, p. 1). Notably, the learning design considers the social context, i.e., the learner’s context of practice, ways of learning, and experience in the world. Social environments are integral to effective conversation and deeper learning. Importantly, to be social, learning requires feedback and interaction between learners and instructor. Contextual dimensions thus include the consideration of individual, group and course design intrinsic factors, such as learning preferences, technological familiarity and experience; task design; task complexity; goal clarity; and delivery methods. For instance the literature brought to light that task design is important, as is clarity of mandate. Early and focused goal setting and preparation are important, as are team agreements and team regulation policies. Consistently illuminated across the findings of the study are the notions that clear team norms, timeliness of response, and instructor attitude support team effectiveness and a learner-centered environment leads to greater participation, teamwork, respect, and commitment. Courses that are designed to foster peer-interaction, encourage collaborative and socially-negotiated learning contribute to active learning and critical reflection that is key to deeper learning. All in all, as Johnson, Hornik, and Salas (2008) concluded:

Creating and maintaining a shared learning space within an e-learning environment is important for enhancing learning, value, and satisfaction for participants. In addition, simply exchanging information may not create the shared social context necessary; instead the evidence suggests that social presence is also important. (p. 364)

### **Thematic Domain 2: Behavioral Dimensions**

Behavioral dimensions are described as factors that enable or facilitate dynamic practices that create empowered continuous conversation. The focus is on strengthening networks of interpersonal relationships. Behavioral characteristics were identified at individual learner, group and instructor levels. These include behavioral elements such as self-reflection, individual accountability, commitment to task, motivation, and sense of community, which are considered key to establishing trust in virtual teams for example. In a virtual context, trust is critical to the functioning of a team (Kim, Lee, & Kang, 2012). For instance, the synthesis revealed that the early collaborative phase is the most important in virtual teams for establishing the trusting relationship among its members. As Haines (2014) suggested:

Like face-to-face teams, virtual teams evolve over time. A sense of belonging is important early in the formation of a virtual team, which in turn builds commitment to the team’s goals. This in turn is linked with trust in peers, which in turn is linked with performance, and finally overall satisfaction with the team. (p. 217)

Trust is also identified as a mediating role in team performance in e-learning. Self-regulation, team regulation, and the establishment of team norms are also identified as key behavioral factors that drive effective virtual teams and e-learning. As Kwon, Hong, and Laffey, (2013) suggested “visualization of group activities relative to a group norm enhances coordination of

collaborative behavior” (p. 1273). In addition, instructor roles that produce positive outcomes include: fostering relationships and collaboration; fostering a collaborative learning environment; and, promoting peer interaction, active learning and critical reflection. As such, behaviours which contribute to establishing collaborative patterns, through channels of communication, sharing and exchanging information, and building knowledge together, are essential. Establishing a strong sense of community, high team cohesion, has been shown to result in higher levels of motivation, satisfaction among team members, in persistence, engagement and higher order thinking.

**Thematic Domain 3: Resource Dimensions**

Resource dimensions are described as encompassing the deployment or use of multiple tools/ vehicles/ supports enabling effective and timely conversation. Resource elements include deployment and use of technology as well as institutional and instructor supports such as training, time, and content design. Learners and instructors need supporting and effective communication technology to allow them to communicate seamlessly. For instance research reveals that integrating social media in learning management systems provides another way of communication that allows users to easily share information. Social presence and pedagogy grounded in the practices of interactivity and engagement leads to student satisfaction and learning success (Carter & Salyer, 2015). In addition, training support is fundamental to success in e-learning. Training in how to use the technology and new media vehicles allows for more effective and more rapid conversation. Moreover, consideration should be given to the preparation and training involved in establishing cooperative patterns and behaviours. The role of the instructor is therefore paramount with regard to content design. As Toven-Lindsey, Rhoads, and Lozano (2015) observed “intentional course design that facilitates structured peer interaction, including discussion boards, wikis, and video conferencing, contributes to active learning and critical reflection” (p. 3). The use of social technologies and the designing of course materials and content that create relationships and enable constructivist/ connectivist learning are mentioned by researchers as important aspects of e-learning success.

**The Framework**

Based on the synthesis of the knowledge in our sample of studies, we developed a framework that details the three fundamental domains within an e-learning educational delivery model (see Figure 3).

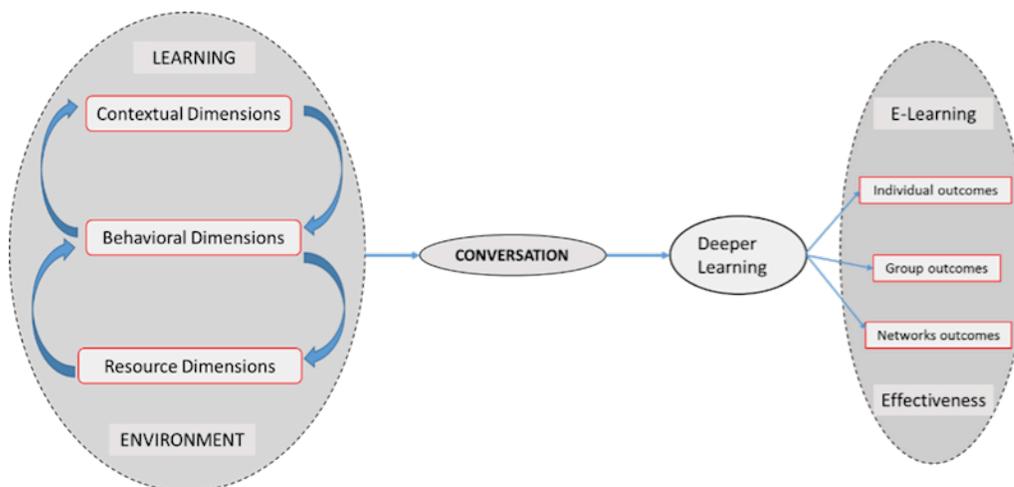


Figure 3: E-Learning Framework.

Underpinning the framework are the Social Constructivism and Connectivism theories of learning. As presented in Figure 3 above, a learning environment in which conversation drives the contextual, behavioral and resources dimensions describing the knowledge and skills that promote deeper learning, results in e-learning effectiveness at individual, group and networking levels. For example, it is evident from the synthesis that conversation leads to effective problem-solving competencies among students in e-learning environments and contributes to increased positive self-evaluation on individual capabilities. In other words students, through peer feedback and interaction between learners and instructor, develop enhanced individual feelings of competence. As Krause, Stark, & Mandl, (2009) confirmed, externalization makes students become aware of their own knowledge, which in turn leads to greater feelings of competence. It is therefore particularly important that, to achieve e-learning effectiveness, e-learning instructors' focus be expanded from enhancing individual cognition to encouraging conversation, i.e., develop and build the contexts, behaviors and resources that encourage conversation, knowledge sharing and building through social interactions among students (Kwon et al., 2013). This will result in positive outcomes for students to successfully function in society at individual, group or network levels. Social aspects of peer learning can contribute to student motivation, build effective collaborative skills, enhance social connections, and lead to increased engagement required in the workplace and lifelong learning society.

## **Discussion and Conclusion**

This study advances understanding of e-learning by synthesizing the literature on effective virtual teams and e-learning practices and proposing a framework by which a conversation driven e-learning environment can promote deeper learning and positively influence the learning environment and outcomes. The proposed e-learning framework describes what is needed in developing an e-learning environment that facilitates conversation (communication, collaboration, teamwork, and student engagement), and promotes deeper learning, all of which ultimately enhances the effectiveness of the learning environment and improves individual, group and network outcomes. From this synthesis exercise the following conclusions can therefore be drawn. The core phenomenon that promotes deeper learning in e-learning is conversation. In other words conversation drives the skills and knowledge that reinforce each other and together promote deeper learning. Such knowledge and skills are best described within the contextual, behavioural, and resource dimensions of the e-learning environment. In short, conversation allows learners to experience social presence and develop a feeling of trust, belonging and psychological closeness, which is crucial to the promotion of deeper learning. In line with social presence, the learner-centred approach to education is identified as the essence of ensuring students' participation and promoting a sense of community.

The study findings will strengthen e-learning program planning and delivery within educational centres that are already engaged in e-learning, as well as convey important best practices for learning centres at the beginning stages of e-learning development. As stated above a stronger understanding of the determinants of effective e-learning is therefore essential for the future success of education and training in countries like Canada where research on e-learning is reported as lacking and is not yet a standard feature of workplace training. The study also has broad societal implications. It has the potential to fuel social and economic development and innovation, and to foster lifelong learning in our society.

## **Limitations and Recommendations**

From this interpretive-synthesis a number of important practice implications and areas in need of further research can be derived. Perhaps the most significant is related to the finding that conversation is the basic process that promotes deeper learning in e-learning. To support deeper learning, learning centre administrators and instructors need to encourage maximal

conversation with and among students. Nevertheless, some study limitations need to be pointed out. It is recognized that synthesis is an interpretive endeavour and therefore other interpretations of the data are possible. Further, our synthesis did not include unpublished case studies or conference presentations which could have enriched the data. Thus, despite the study rigour and diligent attempts that have been made to gain insight and knowledge about the fundamental knowledge and skills drawn from the virtual team and e-learning research that reinforce each other and together promote deeper learning, important information is still lacking. More empirical research may be needed to substantiate the findings of this study. For instance, empirical research is needed to support the e-learning framework proposed in this study to evaluate its practicality and efficacy. One study could explore, for example, individual learner characteristics or teaching styles so as to find out if there are specific types that are better suited to drive conversation in e-learning environments and promote deeper learning.

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