

Learning Environments for Virtual Team Success:
An Analysis of Published Literature

Barbara Lauridsen, MBA
Adjunct Faculty, National University
Barbara.lauridsen@natuniv.edu

Abstract

In recent years, universities have been mobilizing to deliver instruction to students who no longer go on campus. On a flexible schedule adult learners connect to attend a virtual classroom. Three elements distinguish virtual learning: technology, course content and supporting network. The themes in the literature are: technology which enables a learning management systems environment; delivery of content, and pedagogy for cognitive learning methods. The research question addressed is “In what ways can an online learning environment support learning skills for effective virtual work teams in the industry?” This literature review summarizes and analyzes published research focusing on application of best practices for delivering online courseware for *synchronous* or *asynchronous* learning networks.

Key Words & Acronyms: Asynchronous Learning Network (ALN), Content Deliver Network, Computer Based Training (CBT), e-Learning Alignment Guide (eLAG), Face-to-Face (F2F), Learning Management System (LMS), National Repository of Online Courses (NROC), National University (NU), Virtual Learning Environment (VLE), Virtual Learning Community (VLC), Voice of Internet Protocol (VoIP), Western Cooperative for Educational Telecommunications (WCET)

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Working Thesis Statement. The working thesis answers the question is “In what ways can an online learning environment support learning skills for effective virtual work teams in the industry?” This paper focuses on application of best practices for adult education delivered by technologies that are web enabled online learning managements systems, either *synchronous*, *asynchronous* or hybrid learning networks. The working assumption is that access to relevant and realistic education in skills for virtual learning teams is instrumental for the workforce future of teams that operate in different geographical locations. The approach for composing this paper was to evaluate case studies as evidence that learning team skills contribute to effective working teams together with the enabling technology, methods and pedagogy.

E-learning Components. Three elements distinguish virtual learning: instructional methods, instructional media and media elements. A prepared and motivated learning facilitator can be effective in encouraging behaviors and demonstrate skills for online learners to become effective in communication skills necessary for success in the industry. As depicted in Figure 1, e-learning components are the technology and tools, the course contents and the services (which includes electronic libraries of articles and resources) to deliver the learning which includes pedagogy and instructor’s knowledge of the subject. The intersections between domains of this Venn diagram will be discussed later in the analysis.

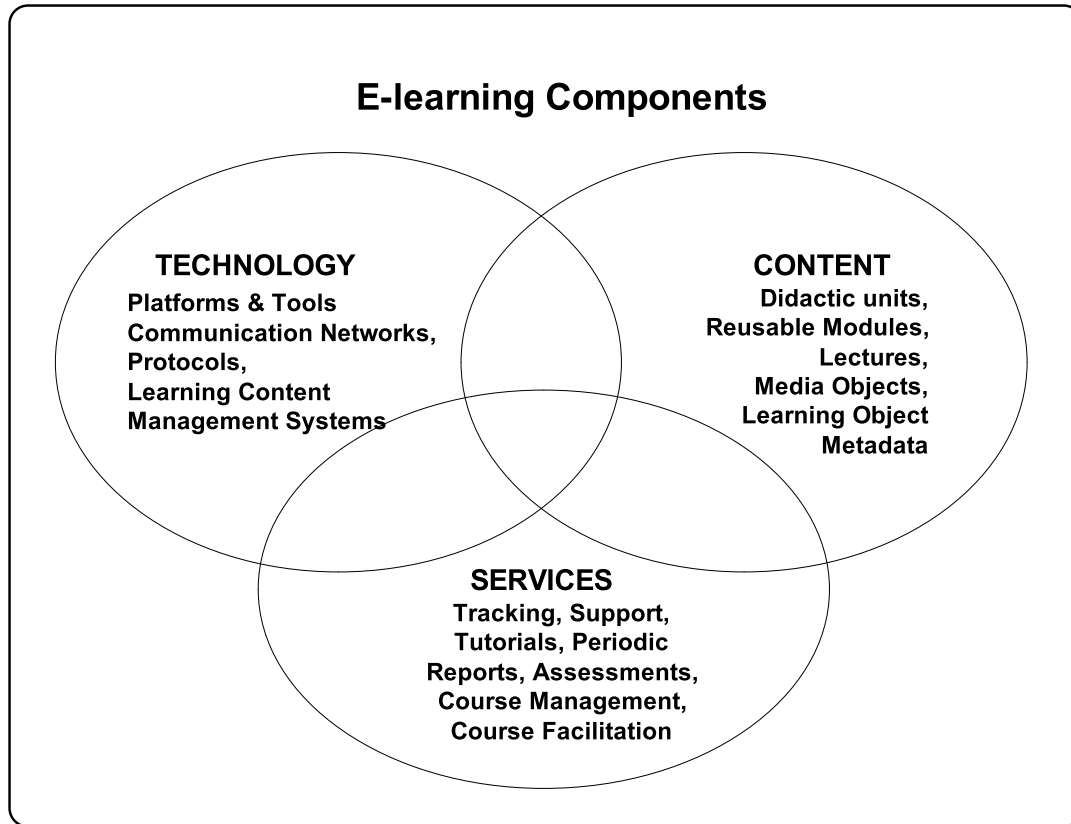


Figure 1. E-Learning Components

Background and context. The motivation in this review and analysis is to examine effectiveness in conveying lessons on critical thinking within web-based online learning in which learners are disbursed across locations and time zones. The topic of computer-assisted instruction is still relevant in today's learning environment. The premise published in 1986, O'Neil's (2008) work is about "form follows function" (p. 251) when instructional materials, the process of creating meaningful lessons during a "tool-building era" (p. 266).

The term *synchronous* describes a modality during which the course instructor is connected on a scheduled time when the students are also present to listen and watch real-time lectures in a learning management system (LMS) that includes audio conversation and text chat that is retained in an archive when the session is complete. The term *asynchronous* describes an environment when discussion threads capture postings from both teacher and learners whenever they log in but which have a time lag in the conversation. The analysis of the literature addresses distinctions in media that delivers online instruction for Voice over Internet Protocol (VoIP) mediated environments for forming collaborative teams and the pedagogy that influences course content for specific assignments involving learning teams. Hybrid courses use the best of the options and tools to build a learning environment that has multiple dimensions.

Distance Learning Growth. The demographics of online learners are often studied by researchers. Building skills for effective virtual teams is enhanced when the teaching tools resemble web-enabled collaborative tools used in the high tech industry. Internet usages is increasing for both business and learning as evidenced by the penetration of connecting to the web by all segments of the population. In March this year the website Internet World Stats reported that North America has 251,290,489 internet users with a 74.4% penetration rate and a 132.5% growth between years 2000 to 2008 (Miniwatts Marketing Group, 2009, p. 3). The statistics in Table 1 indicate that the problem of connectivity will continue to escalate as use of video objects and social networking applications soak up the available broadband. Learning objects have taken on the attributes of social and eCommerce objects for purposes of distribution by way of VoIP. The global statistics also show an escalation of user growth and penetration.

Table 1. Internet Users & Population Statistics

INTERNET USERS AND POPULATION STATS FOR THE AMERICAS						
REGION	Population (2008 Est.)	% Pop. America	Internet Users, Latest Data	% Population (Penetration)	User Growth (2000-2008)	% Users America
North America	337,572,949	36.7 %	251,290,489	74.4 %	132.5 %	59.1 %
South America	389,621,930	42.4 %	132,385,340	34.0 %	826.3 %	31.2 %
Central America	151,256,045	16.5 %	32,339,500	21.4 %	905.1 %	7.6 %
The Caribbean	40,371,917	4.4 %	8,894,300	22.0 %	1,489.9 %	2.1 %
TOTAL AMERICAS	918,822,841	100.0 %	424,909,629	46.2 %	236.8 %	100.0 %

NOTES: (1) Internet Usage and Population Statistics for the Americas were updated for March 31, 2009. (2) CLICK on each region or country to see detailed data for individual regions. (3) Population numbers are based on data contained in the [US Census Bureau](#). (4) Internet usage stats comes mainly from data published by [Nielsen Online](#) , [ITU](#) , and other trustworthy sources. (5) Data on this site may be cited, giving due credit and establishing a link back to [Internet World Stats](#) . (6) For definitions and help, see the [site surfing guide](#) . © Copyright 2009, Miniwatts Marketing Group. All rights reserved.

Anticipated growth in online modality can be associated with that for distance learning programs. Statistics published by the U.S. Department of Education reveal considerable growth in this domain. For data gathered during 2006 to 2007, approximately 11,200 college-level programs were associated with distance education; 66% as degree programs and the remaining 34% certificate programs (IES, n.d.). Of these, the most widely used technology for Internet-based course delivery is *asynchronous* (Prasad & Lewis, 2009, p. 3) rather than real-time *synchronous* modality and involves a total of 12,153,000 enrollments with 77% online enrollments (p. 9). The statistics cited in Table 2 are by institution type. According the U.S. Department of Education (2009), two thirds of Title IV degree granting postsecondary institutions offer online, hybrid or blended online or other distance courses. This reflects the profile of people who return to school while still working.

Table 2. Institutions offering distance education courses

Table 1. Total number of 2-year and 4-year Title IV degree-granting postsecondary institutions, and percent that offered distance education courses, by course type, institutional type, and institution size: 2006–07

Institutional type and size	Total number of institutions	Percent offered any online, hybrid/blended online, or other distance education courses ¹	Percent offered college-level credit-granting online, hybrid/blended online, or other distance education courses			Percent offered noncredit distance education courses ¹
			Courses at either level ¹	Undergraduate courses ²	Graduate/first-professional courses ³	
All institutions	4,200	66	65	66	60	23
Institutional type						
Public 2-year	1,000	97	97	97	†	50
Private for-profit 2-year	500	18	16	16	†	‡
Public 4-year	600	89	88	87	82	42
Private not-for-profit 4-year	1,500	53	53	51	46	10
Private for-profit 4-year	300	70	70	70	‡	2
Size of institution						
Less than 3,000	2,700	51	51	51	44	11
3,000 to 9,999	900	91	91	88	77	42
10,000 or more	500	97	96	93	90	53

† Not applicable. Two-year institutions do not offer graduate degrees, although they sometimes offer individual graduate courses.

‡ Reporting standards not met.

¹Based on the estimated 4,160 2-year and 4-year Title IV degree-granting postsecondary institutions in the nation.

²Based on the estimated 3,890 institutions that had undergraduate programs in 2006–07.

³Based on the estimated 1,810 institutions that had graduate or first-professional programs in 2006–07.

Profile of a learner/worker. Caudill (2007) indicates that the fastest growing category for online courses is career and technical education with demographics being age 23 for on-campus and age 37 for on-line (p. 188-189). Learners in on-line courses are often full time workers with an ambition to gain technical skills perceived to increase success in the industry. In the search for technical talent, project teams are moving toward decentralized structures. Outsourcing contractors offer services to build software products using a global labor pool at discount rates.

Virtual project teams are assembled to accomplish work carefully defined for rapid delivery and are then disengaged so that the available talent can be reassigned. People without required specific skills are released. Those with the most relevant skills are moved to a next project and learn on the job to produce results for which a client is willing to pay a fixed price for a deliverable rather than the effort to build it. Project success is evaluated by overall results in terms of business bottom line. The influence of the industry is impacting the expected learning outcomes for online courseware. Learners must gain the skill of understanding the essence of critical thinking and a become quick-study of details and in gaining technical know-how.

Serif et al. (2009) illustrate a use case diagram for common classroom compared for home based learning. Reading the diagrams in Figure 2 (Serif et al., 2009, p. 234), one can infer the distinction of on-the-job training in a shared video conference room with groups of participants in which simultaneously scheduled events occur compared to individual learners linked in from separate computers into a virtual class room. The challenge is to leverage LMS environments to enhance skills in critical thinking and collaborative communications.

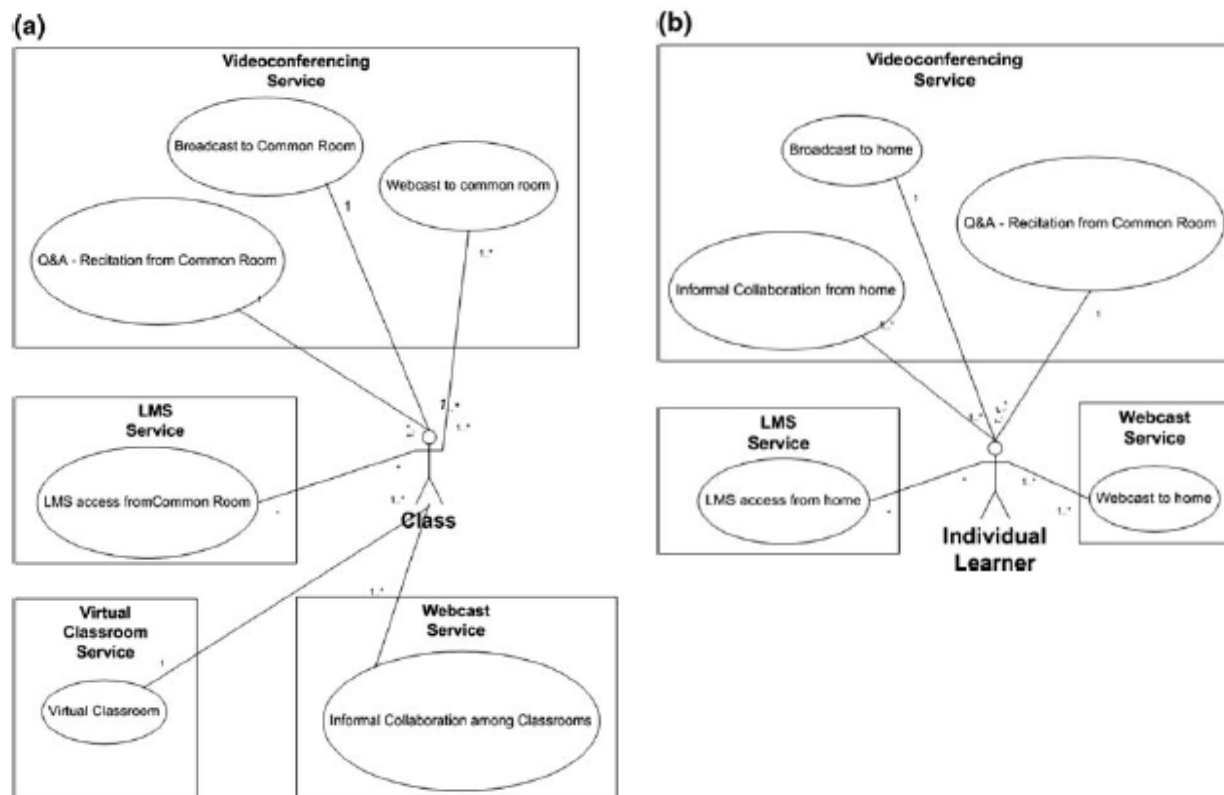


Figure 2. Common Room vs. Home Based Learning

The Delphi Report published a consensus statement which defines critical thinking as “purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference”... and includes ...“evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based” (Facione, 2009, p. 22).

Articulating the voice of an entire committee, Facione sets a context for understanding and appraising research about explaining “exactly how a particular conclusion was reached, or why certain criteria apply” (2009, p. 3). In the world of research in education technologies, the academic discipline sets an intention that meaningful interpretation of research findings follow from the evidence gathered. In the following pages, published research papers are examined with respect to the strengths and weaknesses of argument, matching the evidence presented to the conclusions and recommendations and credibility of the findings to inspire new research.

The following review of literature is organized by three themes

1. Technology which enables learning management systems environments.
2. Delivery of educational content using learning networks.
3. Pedagogy for cognitive learning methods.

Literature Review

Transitioning from face-to-face (F2F) teaching to online delivery of adult education has been examined as a research topic for over ten years. This literature review examines specific research papers that reported case studies in which adults are enrolled for online learning. Implementations for practical application in the field of distance learning are suggested. Two of the studies evaluate and measure effectiveness of teaching critical thinking skills in the curriculum and offer graphical summaries as an effective framework to illustrate statistical findings; both use in-depth examination of case studies to develop the concepts and discuss the findings (Mentis, 2008; Heckman & Annabi, 2006). The other scholars explored the motivations and learning style of adults in online courses and methodologies for measuring performance of virtual teams (Scott, 2008; Robinson & Hullinger, 2008; Daniel, Schwier & Ross, 2007). The anticipated growth in online course delivery is assumed to be an ideal environment for increasing higher order levels of mental capacity, synthesis, critical thinking and making judgments using interactive learning environments enabled by trained facilitators and well designed courseware (Kuskis, 2006; Heckman & Annabi, 2006; Wan, Fang & Neufeld, 2007; Mentis, 2008; O’Neil, 2008; Daniel et al., 2008; Wu, Biebre & Niltz, 2008).

Theme 1 – LMS Environments and Tools

Heckman & Annabi (2006) examine implications for the role of the teacher for conveying critical thinking skills in the F2F vs. Asynchronous Learning Networks (ALN) environments. The case study documents the teach-learner relationship that exhibits a “radical change of perspective” from concentration on what is known to “focus on what is not known yet” with collaboration being the key to asking insightful questions instead of using past knowledge as a reference point (p. 147). Within this context, students gain practice in assessing the relevancy of information. The authors conclude that *asynchronous* discussions generate “a higher level of cognitive analysis” than F2F discussions (p. 148). Their research instruments have value as an initial framework for future studies.

Scott's 2008 doctoral study addresses motivation for adult learners from diverse backgrounds and their perceptions of VoIP mediated environments. Scott took a mixed method approach with three collection phases using online questionnaires, surveys and testimonies in written journals. The population of 84 adult learners provided 73 responses (90%), with demographics that were itemized (2008, p. 66) but may not compare to that of a general population. Twenty-six references were summarized in a literature review that appraised good teaching in universities, intelligence theory and learning style, adult learners and technology. The coursework appraised was reliant on teamwork, communication, and critical thinking skills that included both problem solving and decision making. Scott's initial findings suggested that little relationship, "no statistical correlation" (2008, p. 72) between students' intelligences and learning styles and their perception of the VoIP learning environments tending to use *synchronous* chat in preference to audio communication using microphone.

Robinson and Hullinger's 2008 study explores benchmarks for web-based learning and the correlation of data about engagement by cohorts of students who have adopted Internet-related technologies. The study's findings support strategic planning by online education providers to expand accreditation self-study programs and to measure gains in learning outcomes. Whereas online delivery of learning has a different pattern for student/faculty interaction, the nature and frequency of contact, the mode and timing of feedback, the level of academic challenge all deserve careful evaluation and accountability by higher education program designers.

Theme 2 - Learning Networks

Heckman and Annabi (2006) used a case study method in order to be "experimental, active, and collaborative" (p. 142) in an experience where an instructor has a high degree of involvement in the learning process. Heckman and Annabi measured effectiveness of learning environments to sharpen analytical and critical thinking skills in an ALN and share findings from "an empirical comparison of FTF and ALN case studies with three objectives, to be descriptive, methodological, and pedagogical. However, Heckman and Annabi do confess to having limitations inherent in the study design and that achieving their recommendations requires "attention to the attitudinal and motivational predispositions students bring to the educational setting" (2006, p. 149). Whereas their paper proposes further research, and thus is inconclusive, they describe the case study method fully illustrated with tables of data. Graphical summary displays offer a clear roadmap for conducting new research. Likewise, Mentis (2008) cites literature published since 2005 to indicate key findings about alignment between the forces of context, pedagogy and technology tensions arise that are at odds with current institutional context. His work offers a framework in four themes, tools/media, teacher/learner, content assessment, and e-learning. The strength of the Mentis (2008) study is the four frameworks which illustrate progress from the paradigm of one-way communications with a passive student to one in which learners are self directed; his explanatory discussions are inherently credible for guiding program designers of curriculum (pp. 1-14).

For socially *asynchronous* communication environments, the working assumptions for successful teams are improved communications, brainstorming, assigning responsibilities, analyzing a problem, sharing documents while drafting, revision and editing content, and resolving any conflicts such as power grabbing or broken promises. In online courses, the learned skill of collaborative teams requires explicit support by the course facilitator who begins with effective team building. After groups have become teams, Stagers et al. (2008) conclude that it is time “to back away from our initial teacher-center stance, necessary for building completely *asynchronous* virtual teams, and move toward a more student-center approach” (p. 485).

Theme 3 - Pedagogy, Cognitive Learning

According to Mentis (2008) there are three zones for e-learning environment: technology, pedagogy and context. His research was captured in a framework call the e-Learning Alignment Guide (eLAG) which illustrates the topic of maximizing virtual team communications. The paper’s outcome is evidence of solid critical thinking on the part of the researcher in setting a framework for “signposts, landmarks, and indicators” and to offer a perspective on navigating the e-learning topography (p. 218). An e-learning alignment guide outlines the three zones of technology, pedagogy and context. According to Robinson and Hullinger (2008), the ideal online students are active learners who proactively orchestrate their own agenda for learning. The authors document the impact of research into higher education pedagogy that enables innovation for teaching-learning and include ideas about effective use of emerging technologies to support processes which actively engage online students.

Mentis (2008) uses three case studies to gather evidence for his argument. He highlights the design of sophisticated online courseware that moves away from the paradigm of one way communications toward interactive dialogical teaching and learning. The old paradigm is monolog style lectures with student listening and taking notes. The new paradigm is interactive and conversational (p. 219). He proceeds to highlight the pedagogy for teacher & learner in which the student is no longer passively engaged in downloading information but is becoming self-directed and comfortable with all the media, technologies of the digital age, and who is an active and collaborative member of a community of learners. The Mentis (2008) work has implications for program design that is relevant and current for today’s online learners.

Earlier, Heckman and Annabi (2006) discuss the traditional course in which the teacher represents having the expert knowledge, and make suggestions to “explore the rich, but relatively untapped, potential of a narrative-based pedagogy in *asynchronous* learning networks” (p. 149). Heckman & Annabi highlight the opportunity to experience team dynamics as a community of learners that include active participation by the teacher. Integrating his insights using the frameworks, Mentis lays out a context zone for the e-Learning as a movement away from formal structured literacy toward informal, innovative and media-rich educational experiences (2008, p. 223) and “foregrounding the implications of these shifts for pedagogy within different

contexts” (p. 218). This e-learning guide is an ideal outcome for quality online learning experience for collaborative team and is distinctive strength of his paper.

Analysis of findings for the three themes

According to Mentis (2008) there are three zones for e-learning environment: technology, pedagogy and context. His research is composed in three framework eLAG diagrams adapted during the following analysis to discuss maximizing virtual team communications (p. 219-223). The Mentis frameworks serve as an anchor for this paper’s analysis of concepts identified as key words and correlating frameworks by the other researchers.

Theme 1 - LMS environments, technology-mediated learning

Adopting the best practices performance metrics, assessments and facilitator involvement is a dynamic context that is responding to a paradigm shift. Figure 3 (adapted from Mentis, 2008, p. 219) overlays the original framework with key phrases to highlight the opportunity for sophisticated courseware to shift away from one-way communications toward interactive dialogical teaching and learning. The monolog style lectures with student listening and taking notes shifts toward a new paradigm that is interactive and conversational (Mentis, 2008, pp. 218-219). Technology tools in an integrated LMS enable this paradigm shift.

Technology Zone (Design)



Figure 3. The technology zone of the eLAG

Wan, Fang & Neufeld (2007) discuss a theoretical framework for technology-mediated learning, which correlates to ideas about LMS environments, finding that the research demonstrates a weakness, an “[i]nconsistent measurement of learning outcomes” by learning effectiveness or learners’ perceptions (p. 184), leading to a difficulty triangulating the results for cognitive learning. They propose a framework of four dimensions which corresponds well to the Mentis framework of four themes as shown in Table 3. Further, Capella University offers learning exclusively through online delivery using four strategies which delineate a framework shown in the right hand column in Table 3. “With these four foundational cornerstones in place, additional faculty support can be provided to help implement the best practices through specific techniques and approaches that are compatible with the present technology, whatever it may be” (Irlbeck, 2008, p. 28). In the discussion of best practices, the Capella key strategies are plotted with other frameworks in Figure 9.

Table 3. Correspondence of three frameworks

	Wan, Fang & Neufeld (2007) Four Dimensions	Mentis (2008) Four Themes	Irlbeck (2008) Four Strategies
1	primary participant	teacher/learner	faculty-learner relationships
2	instructional design	content assessment	professional expertise
3	technology	tools/media	learning process

4	learning processes and outcomes	e-learning	assessing learning and teaching
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Whereas Scott (2008) concluded that preferences for VoIP were significantly influenced by the skill of the instructor in using the online learning environment in an educationally sound manner, the qualitative data showed that when VoIP was used purely as a lecture delivery environment it limits the students' experience for collaboration. Nevertheless, despite the shortcomings, Scott's doctoral research makes some meaningful recommendations to instructors who are considering using VoIP-mediated learning environments. The recommendations serve to frame a follow-up qualitative study that gathers relevant data to include *synchronous* LMS environments.

An interesting research problem is to examine the "formation of collaborative teams for specified assignments in online programs impacts the effectiveness of graduating student in their profession lives" (Lauridsen, 2009, p. 5). The literature provides evidence that the current emphasis on group assignments is being extensively studied, but there seems to be a void in the follow-up surveys to determine and measure long term value in the lives of the participants when they perform work on teams in the industry. This problem needs to be further studied within programs that are using *synchronous* LMS environments rather than merely *asynchronous* learning environments because of the potential to engage the facilitators in gathering direct observations and establish long term teacher-student relationships in order to follow-up with learners after graduation.

Theme 2 - Learning Networks

There are contrasting stories about advantages of *synchronous* vs. *asynchronous* technologies, tools and methodologies. Assessing the key findings can be assessed using five clusters:

1. Integrating program goals for sustainable learning communities contrasting F2F to online learning networks.
2. Interactions by teams beyond the classroom and required content using *asynchronous* discussion threads.
3. Integrating the role of learning facilitators.
4. Team formation for collaborative projects performed by online learners.
5. Role of program administrator to formalize goals for effective team outcomes.

Active engagement outside of scheduled class supports learners in making connections which enables a sense of community. Virtual Learning Communities (VLC) are bounded by time and the formal boundaries of the course, however, individuals can build a level of social networking that extends beyond the schedule assignments.

Face-to-face vs. learning networks. The strengths and shortcomings of traditional F2F learning environments can be understood as if in a continuum in the direction of learning networks using web-enabled tools and instructional methodologies. For high tech online courses,

the demographics of the learners are distinct from traditional academic degree programs. The course content is not dependent on traditional F2F skills associated with classrooms in which small groups can pull chairs together to brainstorm problem solving during a scheduled event. An important team skill is to assign roles and then execute the task to gather relevant information, interpret the assignment then divide up the workload. Virtual teams brainstorm without being in a shared conference room with a whiteboard to draw the focus. Even when co-located, industry work teams brainstorm using instant messenger, emails, phone calls or web-based conference tools. Figure 4 (adapted from Mentis, 2008, p. 223) overlays the eLAG framework with keyword phrases indicating a movement away from formal structured literacy toward informal, innovative and media-rich educational experiences. The tradition context is for reputable academic institutions to be formal, age-specific, authoritative, scholarly and structured. The new learning networks are diverse, immediate, informal, innovative and media rich (Mentis, 2008, p. 219-223)

Context Zone (e-Learning)



Figure 4. The context zone of the eLAG

Synchronous audio discussion enhances chat during scheduled live learning sessions. This builds immediacy for teams to function effectively. Daniel, Schwier and Ross argue that incidental discourse, outside of required content, plays a significant role in “building a sustainable learning community, whereby individuals extend interactions beyond classroom/required content” (2007, p. 471). Figure 5 (adapted from Daniels et al., 2007, p. 471) highlights with dashed right facing arrows five of the original ten categories for intentional experiences for

achieving group assignments in a traditional classroom. Regular curriculum has responsibility for handling experiences for direct inquiry, delivery of explicit information, evaluation of case studies, elaboration beyond the basis to critical thinking, and summation of the content. Traditional courses often omit experiences that are incidental but have high value to the learner.

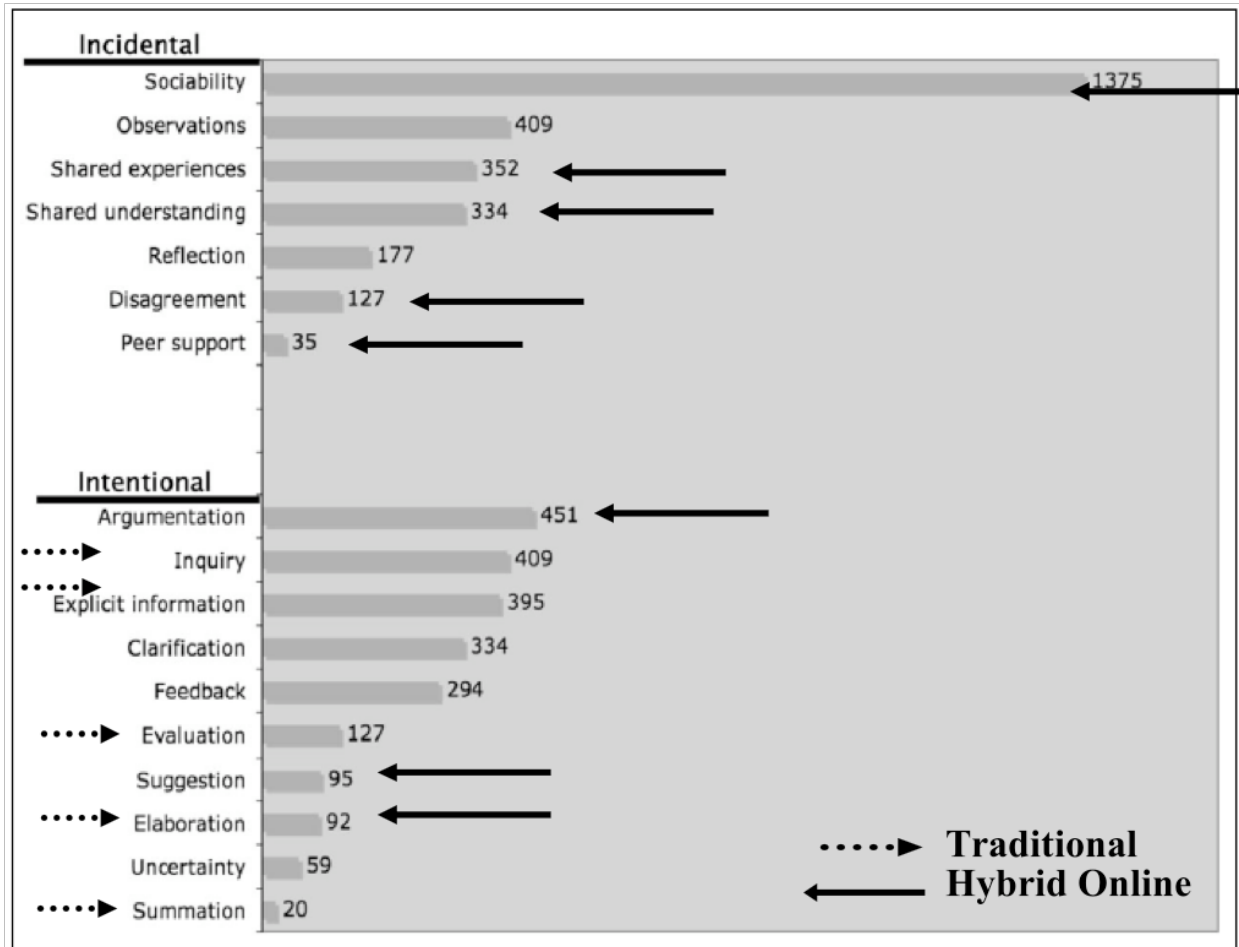


Figure 5. Frequency of Observations of Discourse Variables in a VLC

When resources are pooled for a blended learning experience in which self-directed learners participate in proactive dialog, a rich and deep education can be achieved. Figure 5 also highlights with solid left arrows eight of the categories for both intentional and incidental instruction for hybrid online *synchronous* courseware in which the facilitator participates with frequent dialog with participants using technology and media objects that support interactive learning (Daniel et al., 2008, pp. 469-471). The chart in Figure 5 compares the significant areas of interest for facilitating and strengthening the communication processes for virtual teams which strengthens work team skills. This concept is further discussed below in Figure 9 Best Practices.

O'Neil (2008) reprises an earlier published discussion about the "level of discourse" and the deficiency of authoring languages compared to increasing sophisticated authoring systems (p. 252). O'Neil suggests a strong influence for tomorrow's systems to separate content and strategy

an offers his perspective about existing capabilities of instructional systems development (ISD) for a systematic approach for "task analysis, behavioural objectives, criterion reference testing, individualised instruction" (2008, p. 254). These ideas assert that sociability, shared experiences and understanding, disagreements and peer support, argumentation are available when learning is *synchronous*.

Theme 3 - Pedagogy, Cognitive Learning Methods

The key aspects for success for instructional success is the strength of the pedagogical influence in which the teacher is in a role of mentor in the learner relationship and demonstrates mental capacity, synthesis, critical thinking. For online programs to succeed there must be planned ways to measured learner performance, objective ways to design or select publisher’s course content using a standard quality appraisal criteria and to integrate content delivery networks that reinforce the values of self-directed learning and inquiry based learning.

Inquiry Based Learning. Whereas this review sustained a focus on literature which used case study methods, to compose the analysis it was beneficial to be guided by Evan’s discussion of collaborative work, active, exploratory, inquiry-based learning, and critical thinking and informed decision making (Evans, 2007, p. 128). Evans acknowledges the distinction of media objects in the new learning environments. Like Mentis (2008), Evans (2007) sees that the old paradigm promoted isolated work in which content was factual and somewhat linear and teacher-centric and that the new learning environment was student-centric, promotes multi-path progression for information exchange and is authentic in the real world content that it reflects. Table 4 (Adapted from Evans, 2007, p. 128) highlights an authentic read-world context for collaborative work teams, inquiry-based learning, critical thinking for informed decision making and mind-sharing. The five arrows highlight the five specific areas of interest for building virtual team skills for the new learning environments.

Table 4. Traditional and New Learning Environments

Traditional Learning Environments	New Learning Environments
Teacher-centered instruction	Student-centered learning
Single-sense stimulation	Multi-sensory stimulation
Single-path progression	Multi-path progression
Single media	Multimedia
Isolated work	Collaborative work ←
Information delivery	Information exchange
Passive learning	Active/exploratory/inquiry-based learning ←
Factual, knowledge-based learning	Critical thinking and informed decision-making ←
Reactive response	Proactive/planned action ←
Isolated, artificial context	Authentic, real-world context ←

Self-Directed Learning. Figure 6 “The pedagogy zone of the eLAG” (adapted from Mentis, 2008, p. 221) highlights key phrases for the pedagogy for teacher & learner in which the learner is no longer passively engaged in downloading information but is becoming self-directed and comfortable with all the media, technologies of the digital age, and who is an active and collaborative member of a community of learners. This is an ideal outcome for quality online learning experience for self-directed learners who are comfortable with the digital age, media objects and being a collaborative member of a community of learners.

Pedagogy Zone (Teacher & Learner)



Figure 6. The pedagogy zone of the eLAG

An *asynchronous* medium is perceived to add in some complexities for assignments involving team collaboration. After initial recursive exercises which meld individuals into a cohesive group, the groups become fully engaged during the subsequent teamwork stage. According to Staggers et al. (2008), a teacher-centric approach has evolved to become an effective student-centered stance which can achieve high productivity for a virtual team. As new forms of teaching tools emerge, instructional design needs to take advantage of the trend toward learner independence from the attending traditional classroom. O'Neil (2008) has a long track record publishing ideas about CBT authoring systems which are essentially irrelevant to the metaphors of instructional technology and *pedagogy* (p. 266).

The National Repository of Online Courses (NROC) is an active library of online course content for students and faculty in higher education, high school and advanced placement (NROC, 2005). The NROC guidelines provided is categorized in ten domains shown as a legend in figures 7 and 8 below. The ten domain identifiers have been plotted into the Venn framework

which shows three ellipses which hold the key words for synthesizing diverse findings. This framework contrasts to virtual teams in the industry in subtle but meaningful ways.

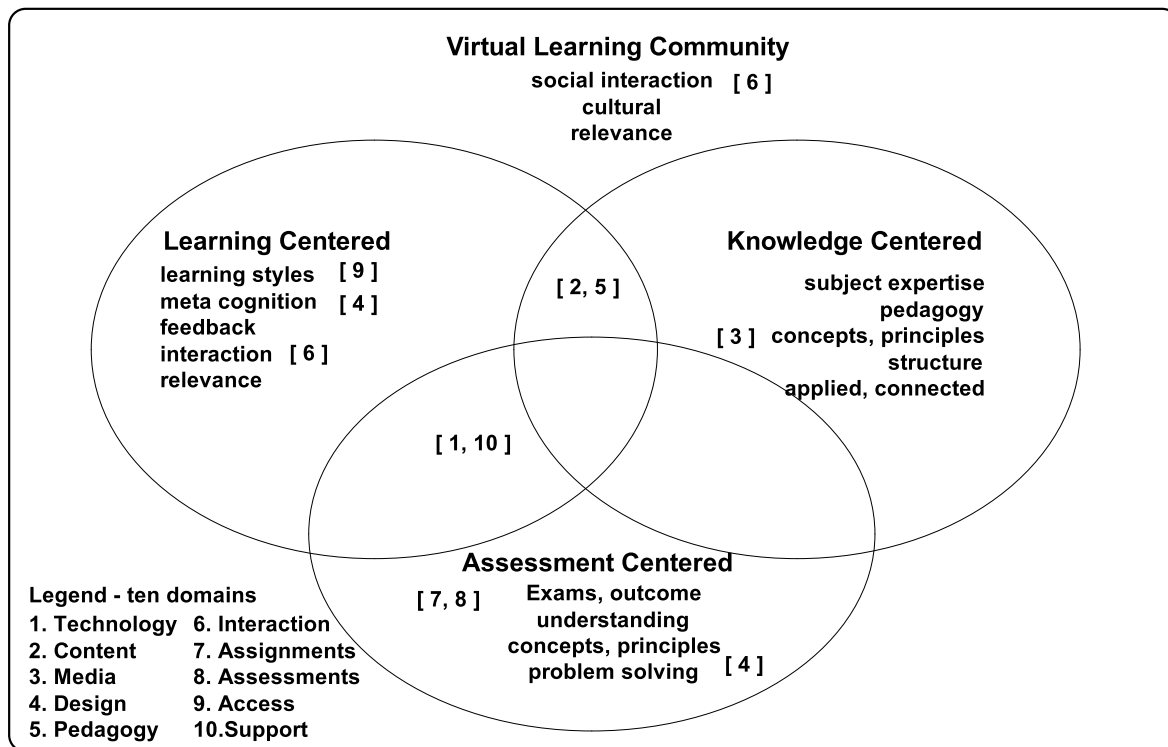


Figure 7. Framework for Virtual Learning Community

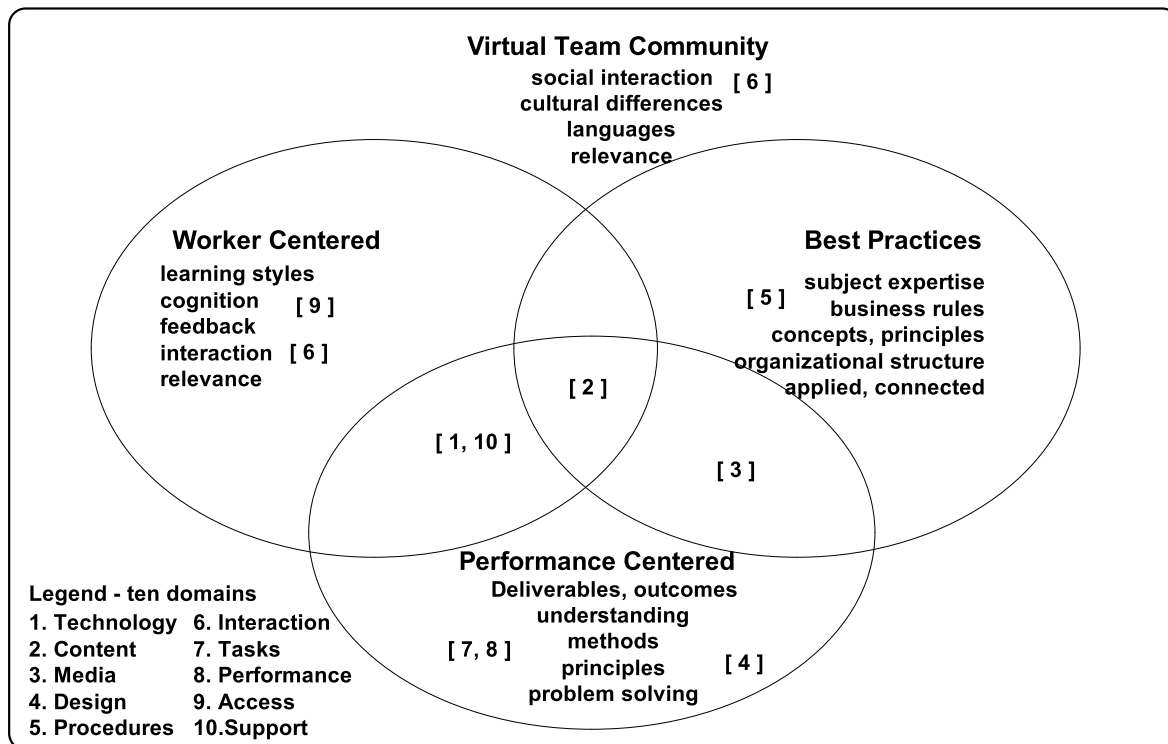


Figure 8. Framework for Industry Virtual Teams

Industry Best Practices

The ten domains used in the virtual learning team framework shown in Figure 7 above have been modified to label a virtual team community framework illustrated in Figure 8. When viewed together, one can see a correspondence of the attributes of learning teams with work teams. The mapping of the original 10 domain names from NROC (2005) into the modified framework changes the vocabulary for three of the domains. The adaptation refers to procedures instead of pedagogy, tasks instead of assignments, and performance instead of assessments. The placement of the keywords suggests that a virtual learning community has a strong influence on all three dimensions for Worker Center, Best Practices and Performance Centered.

Whereas the acknowledged skill acquisition that facilitates understanding of real-world and job-related problems has been measured by only a few published academic reports, researchers often recommend conducting relevant and new research to confirm a trend toward collaborative learning teams. Authors who document simple research findings from a student population taking online courses within a specific institution often recommend further research in order to gain further insights from a larger population sample. Collaborative practice in virtual team skills can be enhanced when the teaching tools closely resemble web enabled collaborative tools used in the industry. Whereas four elements distinguish online learning (instructional methods, instructional media and media elements) as well as the talent and motivation of a facilitator, these factors are measurement variables in proposed research projects that should distinguish *synchronous* from *asynchronous* delivery of prepared course content. Thus the elements that distinguish a virtual team in the industry are methodology, communication media objects as well as talent and effectiveness of a project manager in orchestrating synchronous meetings and asynchronous delivery of in-progress and completed work units.

Best Practices Instructional Theory

Constructionist learning theory

Wu, Bieber & Hiltz (2008) discuss a constructionist participatory pedagogy theory in a context of “authentic assessment and peer evaluation” (p. 323). For data collected in the years 1999 to 2002 for a case study, Wu, Bieber & Hiltz (2008) were convinced that a participatory exam process framework has merit which was demonstrated by objective scores on exams for graduate level Information Systems online classes. Several researchers have concluded that the effectiveness of technology-mediated learning, or a learning management system, or a computer-mediated communication or an *asynchronous* learning network, all dependent on course design instructional strategy and the technologies used (Heckman & Annabi, 2006; Wan, Fang & Neufeld, 2007; Mentis, 2008; Wu, Bieber & Hiltz, 2008; Robinson & Hullinger, 2008).

When forming a learning community, Kuskis (2006) examined how that goal was achieved by an instructor in the context of collaboration by members of a virtual learning team, composing the term “equivalency theorem” (2006, p. 186) to describe the type of interactions in distance learning that are meaningful to advance learning and collaborative skills. According to Caudill (2007), learners reflect the culture that “demands different pedagogies ... most apparent in *asynchronous* online environments, situations where students post to a common area to exchange information” (p. 187). This phenomenon as evidenced by partnerships of corporate entities and higher education and recognizing “increasing demands that students exit a degree program with technical skills” (p. 191). Technology is not an end in itself; it exists to facilitate the learning experience. Acquiring pure technical skills is not sufficient for survival in the dynamic virtual teams of today. People skills serve to integrate performance for achieving complex deliverables which are often very costly when there is a failure late in the life cycle. An essential element is team communication. The ambition to gain technical skills is perceived by students to increase success in technology to the degree that the learning opportunities are offered by online curriculum.

Quality Online Learning Experience

Three elements distinguish effective learning: methods, media and media elements. E-Learning tool designers use media elements in a visual learning environment (VLE). Icons, special effects, control features, and frames that enclose a whiteboard, text chat that resembles instant messaging are media elements that mimic F2F environment and experiences of a traditional classroom. Tool vendors include media objects as a way of achieving immediacy between the teacher and learners. In addition, the Western Cooperative for Educational Telecommunications (WCET) published best practices as a corroboration of ideas which explained details found in the actual implementations with-in learning environments. For regional accrediting associations these best practices “constitute a common understanding of those elements that reflect quality distance education programming (WCET, 2001).

WCET (2001) distinguishes five best practices relevant to distance education: 1. Institutional Context and Commitment, 2. Curriculum and Instruction, 3. Faculty Support, 4. Student Support, and 5. Evaluation and Assessment. The publication is a guideline for specific matters and protocols “designed to assist in determining the existence of those elements when reviewing internally or externally education activities” for electronically offered degree and certificate programs (p. 1). These are plotted in Figure 9 using numbers. Capella University’s four strategies (also mentioned in Table 3 above) delineate a framework including: a. Faculty-Learner Relationships at the center, b. Learning Process, c. Professional Expertise, and d. Assessing Learning and Teaching (Irlbeck, 2008, p. 28). The overlay of the WCET five best practices (using numbers) with Capella’s strategy (shown in Figure 9 using italics with lowercase letters) indicates a complimentary set of key concepts within framework for the three domains: technology, context and support.

Content Delivery Networks (CDN). Practitioners with subject matter expertise who are contracted to facilitate online courses like to be confident in advance that course content is relevant and can be demonstrated by the stories they tell about their real-world experiences. Prepared courseware may reflect a grounded approach to the systematic use and interaction between pedagogical models, strategies, learning and instructional theories. Academic program directors like reassurance that the academic theories are meaningful when transferred into the real world. CDN plots into the technology domain in Figure 9.

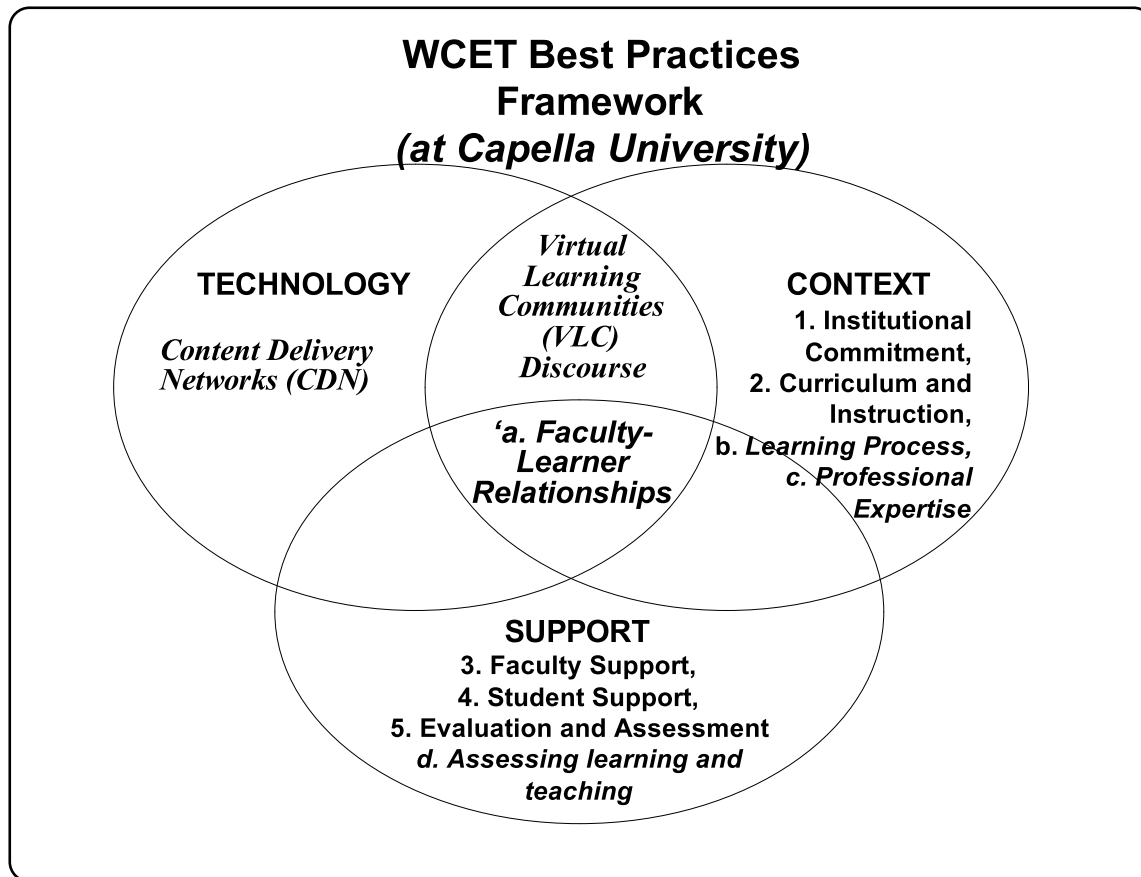


Figure 9. Best Practices Framework Overview

Incidental and Intentional Learning (Discourse). Daniel, Schwier and Ross (2008) correctly distinguish incidental from intentional objectives. It is a smart idea to allow incidental discourse a measure of time during online sessions to share experiences that lead to a practical understanding, reflection and peer support for joint assignments. This strengthens communication skills. Threaded discussions promote intentional learning based on content of the course, the readings and the individual assignments. The variables are explicit information upon which daily postings elaborate and augment, clarify and summarize the content. Incidental learning is voluntarily generated to share experiences, observations, reflections, peer support and negotiating disagreements. A good facilitator will encourage and actively participate in this

activity. Discourse aligns into the intersection between the technology and context domains in Figure 9.

Virtual Learning Communities (VLC). By following best practices to achieve planned performance results, published guidelines, the designers of e-Learning courseware can deliver tools that contribute to the overall experience. Course writers facilitate building certain skills that can be relevant to career progress, for solo learners to adopt and prove using ordinary academic assignments or exams and for virtual teams that perform a joint assignment, not just to produce a deliverable but to practice the process of dialog, to clarify the roles, balance the work load and celebrate success. VLC originates in the context domain but is manifested also in the technology domain of the WCET framework in Figure 9.

Virtual Teams (VT). Learning and working in virtual teams increases the value of lessons and results created. While progressing on surveying the literature about learning tools, teams and instructional pedagogy, this paper focused on online learners who gained virtual team skills for course assignments.

Conclusion

This paper has gathered and reported findings from a dozen published research articles on the topic of online delivery of e-learning. It has compared and contrasted opinions from the authors, shown statistical data to justify attention on the topic of effective learning management systems and the context for delivering learning content. Several theories and conceptual frameworks were analyzed and illustrated in Venn diagrams. Analysis of the findings has explored ideas about how universities can prepare learners for industry expectations through existing programs by designing assignments for virtual learning teams to reflect real world best practices. This paper endorses program design for learning teams to be assessed by increased proficiency communication in skills while working collaboratively. Performing activities to produce a deliverable is not just about responding to the instructor's instructions and submitting a jointly written paper or an exam. The lesson to be applied is to consciously influence methods of collaboration that enhances business outcomes. Working in virtual teams increases the value of the lesson in communication beyond the result created for a course assessment.

Learners come from a diverse background and eagerness to take on new skills. Education Institutions are offering increasing variety of online courseware instead of traditional face-to-face classroom style. Solving the problem of delivering the best possible online education requires coordination between all interested parties. Beyond program design, course design and preparation, online delivery of interactive *synchronous* lectures ensures relevance to the ambitions of the learners gain useful knowledge and communication skills. These ambitions need first to be expressed by the learners, and then understood by the course facilitator.

With LMS and VLE tools, one-way monological teaching is becoming superceded by interactive dialogical learning with intention to value and measure incidental discourse. The

opportunity for delivering online courses is to go beyond traditional practices of teacher-oriented delivery has been acknowledged. The paradigm shift is toward the teacher-as-a-mediator of community of learners. A virtual learning community culture is ideal for assignments which value the process of team formation as well as creating a high quality deliverable that is a result of inspiration and collaboration.

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