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A Systematic Meta-Analytic Review of Thinking beyond the Comparison of Online Versus Traditional Learning

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Abstract

This study analyzes empirical evidence that compared face-to-face and online education. A meta-analysis points to various gaps in research, including how policy and curriculum development should be guided in this fast-moving education medium. Significant gaps remain, especially in the area of adaptability of both faculty and students to various forms of online education. Conversely, as students are increasingly diverse, bringing a range of backgrounds, expectations, and culturally specific interactions to the table, how is online learning shaping the new classroom? Using a systematic review of the literature, we attempt to answer this question. Our findings showed no significant difference between onsite and online courses. The study also affirmed that the most important aspects when considering online education are the course design and delivery – specifically, through greater alignment between technology and pedagogy.

Key words*: Online Education; Meta-Analysis; Systematic review.*

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Introduction

The Internet has been in existence in many forms since the 1960s, however, the world of 'interconnectivity' took a more recognizable shape in the 1990s when Tim Berners-Lee developed the World Wide Web. Since then, the world has been presented with irresistible change in the way business, work, research, and more importantly education is conducted. The US Department of Education estimated that compared to 35% in 1994, by the year 2000, 98% of United States had internet access (USDE, 2001b). Furthermore, globalization and its consequent interdependency ignited the need to understand how systems operate in diverse environments to create harmony and ensure effectiveness. It has become increasingly clear that the world opened by the Internet is now a permanent and integral part of higher education and Human Resource Development. Today there are no boundaries to what we could learn from each other across the world, and knowledge that was once confined to local environments has now become accessible from anywhere, anytime, and to anyone who has access to the Internet.

The intensity of these occurrences compelled countries such as China to speed up their transformative economic reforms and open up to the world. Organizations increased their drive to become learning organizations, and individuals moved away from mastering a single skill to mastering a skill set. All these changes require some form of education, which has become expensive and time consuming. Gaining these new skills may require sending a group of employees to attend educational sessions in far-away destinations, paying for facilitators to conduct lengthy onsite educational sessions for employees, or quitting a job to go to school in order to acquire the skill-set needed to make individuals relevant in their work role. To moderate the financial impact of moving from one place to another to learn about the different systems and cultural aspects that drive interconnectivity, nations, organizations, and individuals alike have resorted to participating in various forms of online education.

The Babson Survey Research Group, the Online Learning Consortium (OLC), Pearson, WCET, StudyPortals, and Tyton Partners collaborated to conduct a survey of Online Learning and the findings were reported in a 2016 publication by the OLC. According to the report, more than one in four students (approximately 28 percent) now take at least one distance education course online, with approximately 50 percent of them taking full time online classes. Despite the increase in online education, some doubts about its legitimacy have been raised. For instance, the OLC reported the findings of a survey of chief academic officers (CAOs), which indicates that only about 29.1 percent of officers accept the legitimacy of online programs. Interestingly, about 60.1 percent of CAOs whose institutions have 10,000 or more online enrollments reported faculty acceptance, while only 11.6 percent of those with no distance programs responded their faculty acceptance of the value and legitimacy of online education.

A report presented to the Innovation and Online Committee of the Florida Board of Governors showed that 42 percent of incremental cost across the Florida State University System is incurred on online course delivery. On the other hand, it was argued that online course enrolment for the 2014-15 academic year could help the state to save an estimated $184.3 million from building infrastructure for postsecondary education. A study to compare the learning performance of students who participated in onsite and online classes in China showed contradictory results. A two-independent sample t-test results showed no significant difference between average test scores of students who took onsite and online classes, however, there was a significant difference between their average final paper scores with students in the onsite category performing better than online. These and other arguments inspired us to conduct this comparative analysis.

Over the last few years the ever-shifting landscape of online education has been challenging the status quo in higher education, pushing the comfort zone of many and taking them to places they may not be fully prepared to engage in. It has become increasingly clear, however, that the Web is now a permanent and integral part of higher education, training and development. Today, there are no boundaries to what we can learn from each other across the world, and knowledge that was confined to local environments has now became accessible anywhere, anytime, and to anyone who has access to a mobile device and the Internet.

Indeed, the Internet has made geographical and time differences irrelevant, in effect taking the distance out of 'distance education'. And "as the greater interactivity and global connectivity that future technology will afford, the gap between the online experience and the in-person experience will continue to close" (Harden, 2013, p. 56). Moreover, student learning styles have shifted. Traditional learning methods such as attending lectures, reading textbooks, and participating in teacher-dominated discussions no longer fully meet students' needs (Harden, 2013). New technologies allow students to engage in academic interactions beyond the walls of the classroom, and to collaborate in less restrictive ways – learning methods that better fit the increasingly global 21st century student body.

Along with a growing demand in higher education participation "institutional leaders are increasingly seeing their students as creators rather than consumers, which clearly indicates that the paradigm that has worked for over a century is gradually becoming obsolete" (Johnson, Becker, Estrada & Freeman, 2014. p. 6). This trend, along with the growing proportion of academic leaders who report that online learning is critical to their institution's long-term strategy (Allen, & Seaman, 2015), point to the fact that the global nature of higher education and Human Resource Development (HRD) in general will only grow. In short, the Internet – and online education – is here to stay, and colleges who in the past have resisted online education will almost certainly be forced to take drastic measures to expand their online programs quickly (Van Der Werf & Sabatier, 2009). HRD and higher education institutions need to engage in this conversation, especially given dwindling state funding for higher education (Myring, Bott & Edward, 2013), and the fact that demand for higher education growing at unprecedented rates is forcing institutions to accommodate large student numbers with limited physical space (Rickard, 2010).

Justification for Study

Clearly, this is a dynamic field, however, the relevant research is limited: Current research being done in this field has dealt mostly with justifying that online learning outcomes are as good as those from traditional classrooms. Indeed, numerous empirical research papers compare the quality of online and face-to-face offerings, and most of these studies conclude that online education is as good as traditional approaches – and in some instances even better. Very few systematic reviews and meta-analyses exist on this body of research. This study is an attempt to fill this gap. The systematic review as an intervention and the meta-analysis will be used to assess empirical evidence that compared face-to-face and online education and focus on institutions that offer both types of education. In addition, the systematic review will point to various gaps in research, including how policy and curriculum development should be guided in this fast-moving medium of education. Significant gaps are also identified in the area of adaptability for both faculty and students to various forms of online education. And conversely, as students are increasingly diverse, bringing a range of backgrounds, expectations, and culturally specific interactions to the table, research is needed on how online learning is shaping the new classroom. Are faculty adequately prepared to engage in this quickly evolving environment? Do we have the right framework to equip faculty with the necessary tools? This study will point to some of these aspects in order

to contribute to our understanding of the future of online education, and to inform policy.

Research Purpose

There are two major implications for Human Resource Development (HRD) and higher education that drove this research. First, online education is growing rapidly but is not yet fully embraced by all higher education institutions and human resource development departments in organizations. Second, the body of literature around those who question both the legitimacy and quality of online offerings as measured by test scores and other performance indicators of learning outcomes, as well as those who claim that this is indeed part of the future of higher education is also growing substantially. However, limited meta-analyses exist on this body of research. Therefore, a systematic review and a meta-analysis seem necessary in order to critically appraise and formally synthesize the existing evidence on online teaching and learning outcomes, and to inform relevant decision-making. This study analyzes empirical evidence that compared face-to-face and online education in institutions that offer both types of education. The study will attempt to answer the following research questions:

1. Are there differences in quality between online and traditional education courses offered by conventional higher education institutions?
2. Is there a relationship between the quality and acceptance of online education by conventional higher education institutions?
3. Identify policies and programmatic intervention points that may serve as leverage areas for improving online education.

Literature Review

As a prelude to the systematic review and meta-analysis, we have briefly reviewed the literature on online education from a historical perspective and online education in its current incarnation.

Historical Perspective of Online Education

Online education is grounded in distance education, and even today the terms are used interchangeably. Means, Toyama, Murphy, Bakia, and Jones (2009) note that "online learning overlaps with the broader category of distance learning, which encompasses earlier technologies such as correspondence courses, educational television and videoconferencing" (p. 11). The history of distance education in fact goes as far back as 1728, with the first distance course established in Boston using lessons sent by mail. By 1840, shorthand was taught by correspondence in Great Britain and at Penn State, the latter being also today's leading online education institution. Penn State in fact began offering courses through radio in 1922, but it was not until the 1950s that college credit courses were offered using broadcast television. Western Reserve University and New York University were both pioneers in the area of televised distance learning. In fact, NYU produced the well-known program Sunrise Semester, which aired on CBS from 1957 until 1982.

In Great Britain, in the early 1960s, members of the government and the BBC began floating around a new idea: both groups were interested in developing a "University of the Air", and by 1969 that vision had been realized. Re-titled the Open University, it was the first successful distance learning institution, with hundreds of thousands of students earning undergraduate, postgraduate and certificate degrees that are recognized throughout most of Europe.

In terms of the technological aspects, while the history of distance education is long, the role of computers in education started a short time ago but has grown rapidly. It was only in the 1950s that educational institutions started using computers for

accounting and some undergraduate records. In the 1970s educational institutions made computers available to students through the use of dumb terminals. By the 1990s educational institutions were using computer for scheduling, and the use of personal computers by students and faculty emerged. Finally, by the early 2000s we saw textbooks transitioning to electronic versions, and a decade later online class delivery systems have become commonplace, even in primarily face-to-face teaching and learning environments.

In terms of the student body, distance education students early on were largely located in rural or remote areas, without geographical access to higher education institutions. In the United States another major section of distance learners was made up of members of the military. In fact, the number of correspondence courses increased significantly after World War II, when many veterans hurried to complete the education they had missed while in service (Sherron & Boettcher, 1997). Today, however, online education is much more than an alternative for working adults with little access to conventional classrooms. It has become a desirable option used by people of all ages and backgrounds to either fully provide, or at the very least supplement, a variety of higher education needs.

The Current State of Online Education

Online offerings appear poised to become an educational norm in the years ahead: A 2011 inquiry by Ambient Insight Research showed that roughly a million and a quarter higher education students took one hundred percent of their courses online, and over 10.5 million students took some of their classes online. One important consideration for this growth is cost: With ever rising tuition costs and growing numbers of people needing to work full-time in order to afford college, it seems inevitable that we will continue to look for lower-cost and flexible educational opportunities. Desai, Hart, and Richards (2009) contend that the tremendous growth of online education "can be attributed, in part, to shrinking budgets and lower local student enrollments at universities" (2009, 328). When utilized effectively, online options have provided higher education institutions with relatively inexpensive and flexible opportunities to growing their offerings far beyond their immediate proximity (Casey, 2008). Harden (2013) also argues that given advancements in information technology, the continued tuition increases that outpace inflation, and the student loan debt crisis, the college classroom will in part become virtual.

In fact, Allen and Seaman (2015) of the Babson Survey Research Group state that during the recent economic downturn in the US, online enrollment grew by double digits, while enrollment in the traditional classroom dropped; their study also showed that in 2014 three-quarters of the US higher education enrollment increases came from online offerings. Part of this increase is also due to the growing participation of traditional institutions, as they gain ground in the arena of for-profit competitive online education. In 2013, MIT became the first elite university to offer, for a small fee, a marketable credential for students who complete its free, open-source online courses. Indeed, if this is where the future of our higher education is headed, and "as the greater interactivity and global connectivity that future technology will afford, the gap between the online experience and the in-person experience will continue to close" (Harden, 2013, 56).

This may mean that "prestigious institutions, especially those few extremely well-endowed ones with money to buffer and finance change, will be in a position to dominate this virtual, global educational marketplace" (Harden, 2013, 56). And at the very least, higher education institutions such as MIT and Harvard would benefit by attracting the best and the brightest students (or creators), and at the same time broaden their reach globally, which would help them to maintain elite status. In fact, the accreditation and status of an institution has a lot to do with the perceived quality of

their online education program: Faculty who are often skeptical of major disturbances in higher education are more receptive to online courses offered by accredited institutions, especially those that have both online and on-campus programs (Lederman & Jaschik, 2013).

The learning styles of students have shifted. The virtual environment is now capable of providing students with the skills necessary to effectively communicate and work with others – to achieve both individual as well as common goals. The virtual space has also created an encouraging environment for knowledge to flourish, at increasing rates, and for a wide variety of learners. One of the main arguments against online education has been that it is so difficult to accommodate the needs of diverse learners. However, this is not unique to online education. We could just as well ask how well we accommodate students in a 300-person lecture hall! One strength of online courses is actually that students can have a mix of synchronous and asynchronous experiences, that missed lectures will be available for review on students' own time, and that the conversation can continue even when faculty members are not available.

To sum up, the World Bank estimated in 2014 that the next 12 years will see a 25 percent increase in global higher education participation (Johnson, et al., 2014). And today the proportion of academic leaders who report that online learning is critical to their institution's long term strategy has grown from 48.8 to 70.8 percent; moreover, the percent of academic leaders who rated the learning outcomes of their online education as same or superior to those in face-to-face instruction grew from 57.2 percent in 2003 to 77 percent in 2012 (Allen, & Seaman, 2015).

Methodology

Systematic Meta-Analytic Review

There are several different approaches to literature review and research synthesis. Research synthesis is a collective term for the assemblage of approaches for summarizing, integrating and, in some cases, cumulating the findings of different studies on a particular topic or a specific research question (Davies, 2000; Yawson, 2013). "This broad range includes narrative reviews, integrative reviews, realist synthesis, vote-counting reviews, meta-analyses, best evidence synthesis, meta-ethnography and systematic evidence review" (Yawson, 2013, p.59). The simplest form of research synthesis is the traditional qualitative literature review, often referred to as the narrative review (Davies, 2003).

Systematic reviews or systematic evidence reviews (SERs) are different from narrative reviews in that they attempt to deal with all of the limitations of narrative reviews (Cook et al., 1997; Thomas & Harden, 2003). SERs have developed in response to an increasing need for policymakers, researchers, and education practitioners to have access to the latest research evidence when making decisions (Harden & Thomas, 2005). SERs are a rigorous and transparent form of literature review (ODI, 2012) and they incorporate the strengths of integrative reviews, vote-counting reviews, meta-analyses, best evidence synthesis, and meta-ethnography. It has been described as "the most reliable and comprehensive statement about what works if it is done well and with full integrity" (van der Knaap, Leeuw, Bogaerts, & Nijssen, 2008, p. 49). SERs include identifying, gathering, synthesizing, and assessing all available evidence, quantitative, and/or qualitative, in order to generate a robust, empirically derived answer to a specific research question (ODI, 2012).

Meta-analysis is a technique that allows the averaging of results from a considerable number of independent studies that look into the same phenomenon. This is done by putting diverse studies on a single quantitative evaluation scale, in order to

gain a composite estimate of the size of the effect. The approach "provides a method of quantitatively summarizing and comparing empirical literature to reduce Type I and Type II error" (Allen, Bourhis, Burrell & Mabry, p. 83, 2002).

When the alpha levels are set to (.05 or .01), it helps prevent or guard against Type I errors, meaning it protects us from determining that there is an effect of one variable on another, when in reality there is no effect. However, working to minimize Type I errors increases the likelihood of committing Type II errors, meaning the possibility of concluding that there exists no effect when in actuality there is one. Therefore, meta-analysis deals with the Type-II error by analyzing the size of the effects in various studies and weighing the effect sizes for qualitative factors, for example the number of participants and the inclusion of controls (Glass, McGraw, & Smith, 1988).

Meta-analysis procedures follow two vital points of focus: qualitatively reviewing and assessing the viability and soundness of the empirical studies under consideration, and quantitatively examining the findings of each study. McIsaac (1990), one of the first scholars to deploy meta-analysis to the distance education literature, noted that: "Meta-analysis offers a way to begin to synthesize research studies in this growing area. It is important to consider other ways of encouraging not only original research reports of studies so that the results which are generalizable can be made available around the world." (p. 15). Using the features of meta-analysis in concert with systematic review is what is referred to as Systematic Meta-Analytic Review (SMAR).

Systematic Review

This systematic evidence review seeks to understand the quality and acceptance of online education by higher education institutions. Among others Ng and Peh (2010) asserted that "in the hierarchy of scientific evidence, systematic reviews (along with meta-analyses) occupy the highest levels in terms of the quality of evidence" (p. 362). A systematic review is a rigorous way of summarizing the available scientific evidence. Also "a systematic review limits bias while improving the reliability and accuracy of recommendation because it combines information from individual studies and has an overall sample size that is greater than that of any one study" (Ng & Peh, 362). As, Harris, Quatman, Manring, Siston, & Flanigan (2014) described, "systematic reviews or meta-analyses critically appraise and formally synthesize the best existing evidence to provide a statement of conclusion that answers specific...questions" (2761).

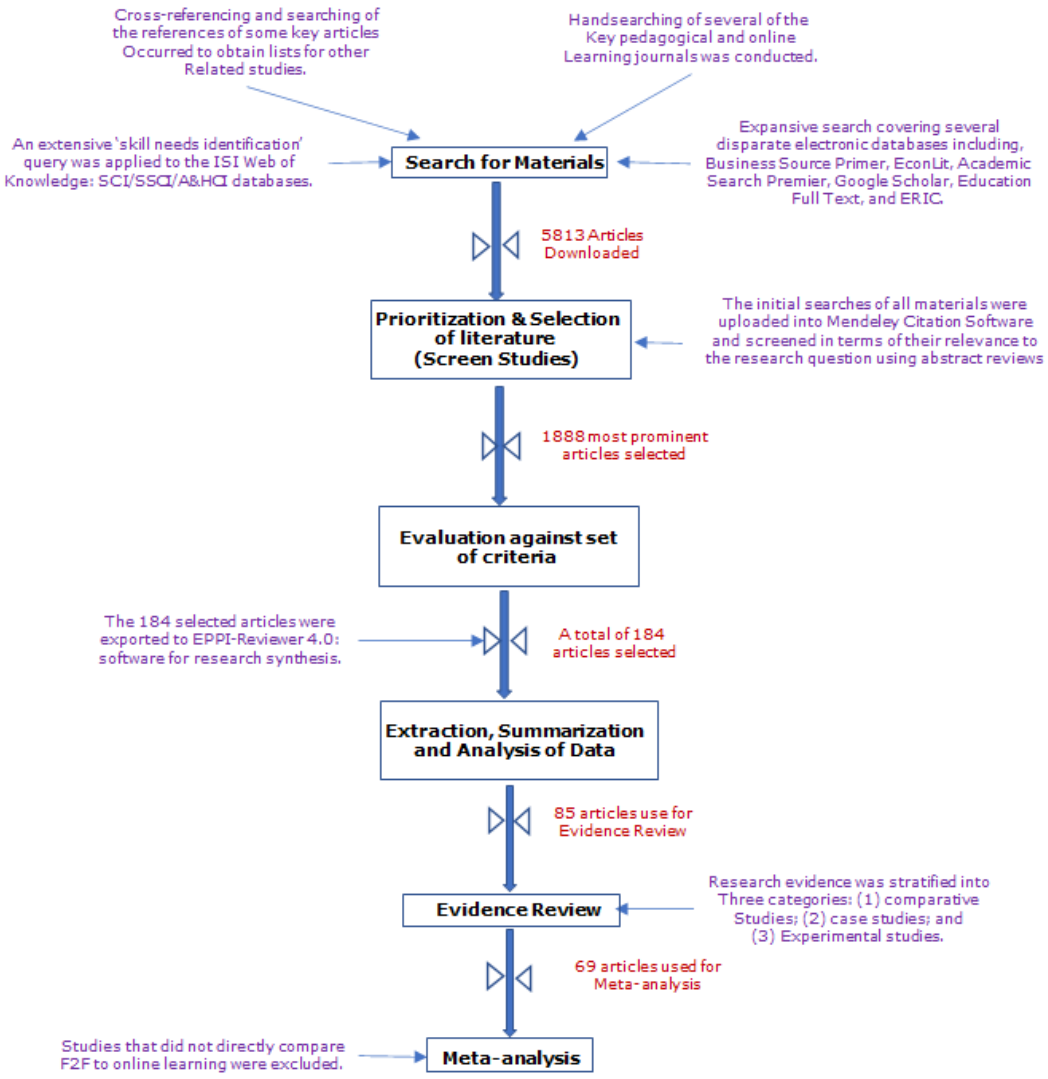
Therefore, through a systematic review, this study aims to critically and objectively assess existing literature in answering the research questions above. Indeed, Ng and Peh (2010) stressed that that systematic review "is currently considered the best, least biased and most rational way to organize, gather, evaluate and integrate scientific evidence" (p. 362). In addition, Hemingway and Brereton (2009) extoll those pursuing a high quality systematic review to make sure they are working with all the relevant published and unpublished material, identify what studies are included or excluded from the review, asses the quality of included studies, synthesize findings in non-biased ways, identify any flaws in the included studies and in their analysis, and provide balanced summaries of the findings to their audience. This study followed the suggested approaches put forward by (Hemingway & Brereton, 2009; Harris, et al, 2013; Ng & Peh, 2010) when conducting the review.

Search for Literature

The goal of a systematic review is to identify as much relevant literature as possible, which meets the research questions. Therefore, we conducted our initial search for literature using text mining. This process, also known as "knowledge discovery from textual databases, refers to the process of extracting interesting and

non-trivial patterns or knowledge from text documents" (Tan, 1999, p.1). Indeed, this approach "has been used to enhance the production of systematic reviews" (Ananiadou, Rea, Okazaki, Procter, & Thomas, 2009, p.2). In this study, an extensive query was applied to the ISI Web of Knowledge/Science Citation Index/Social Science Citation Index/Arts & Humanities Citation Index (ISI-SCI/SSCI/A&HCI) databases using the following keywords and phrases: education, quality, learning, e-learning, distance learning, virtual, courses, degree, and program. Each of the keywords and phrases was explored in conjunction with the term "online". In addition to the query described above, a vast search was conducted to identify relevant studies in other electronic databases such as Academic Search Premier, Business source Premier, Google Scholar, JSTOR, and Libraries Catalog, among others. This search resulted in 5813 articles. These were then uploaded to Mendeley, which is an online reference and portable document format (PDF) organizer application. Figure 1 is a flow diagram summarizing the entire systematic review.

Figure 1:
Flow diagram of the systematic review



Screening, Data Extraction, and Analyses

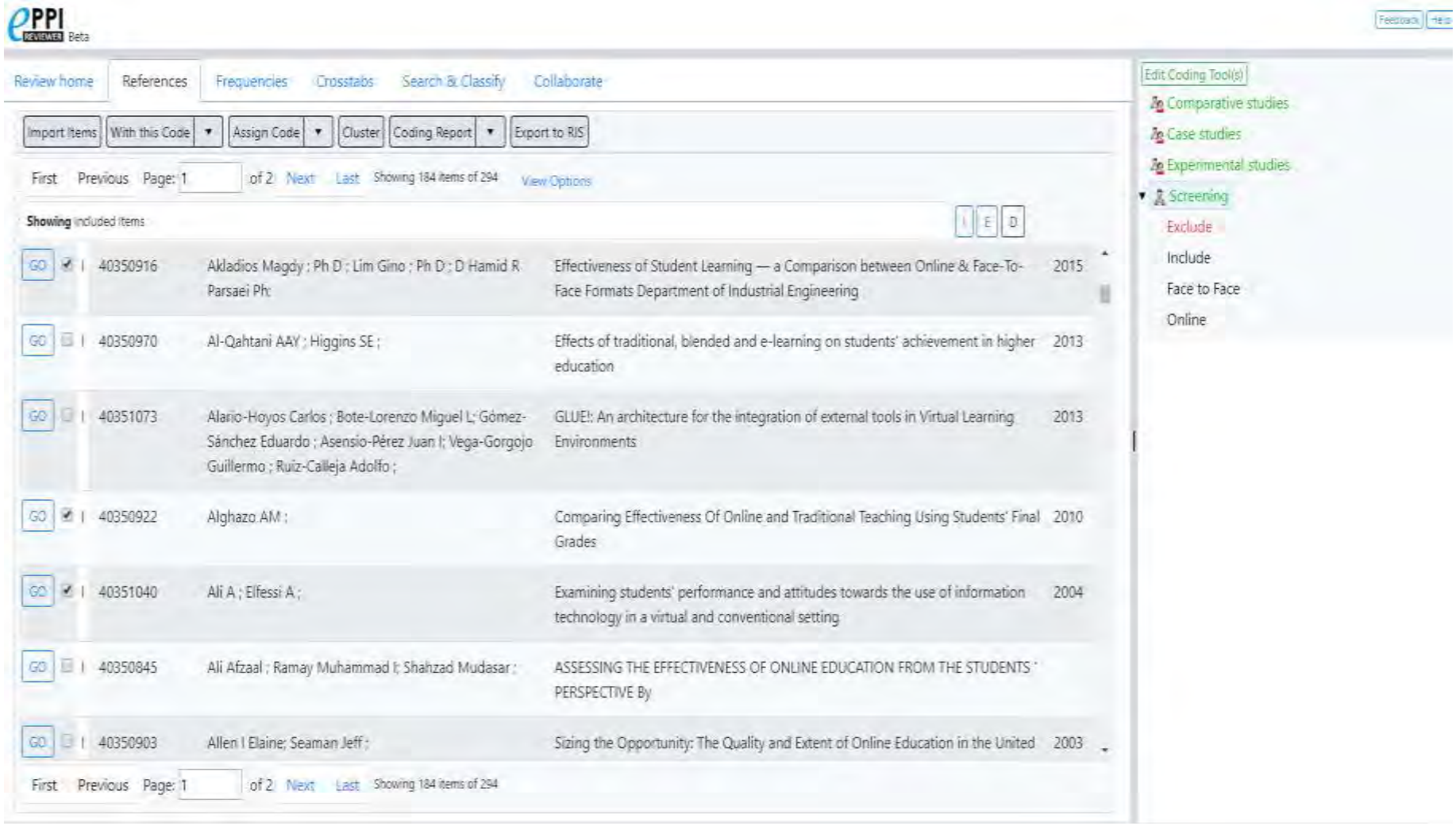
There were 5813 literature pieces downloaded / uploaded into the Mendeley Citation Software, and screened using abstract reviews to identify those relevant to our

research questions. This resulted in 1888 articles. To simplify the evidence collection process, we evaluated each identified source using explicit criteria, to include and exclude studies. We adapted the criteria from Yawson & Kuzma, (2010), Pope et al., (2007) and CRD's guidance for undertaking reviews, and included:

- the quality of the source – peer-review journal publication, edited conference proceedings, a report from recognized research centers and universities;
- the approach to the primary research and the methodology used; study specificity of how the study is comparing online, on-ground (Face to Face - F2F);
- the level to which the source discussed the broader research question on 'Are there differences in quality between online and traditional education courses offered by conventional higher education institutions?';
- Conceptual and review articles were excluded.

This resulted in a total of 184 articles. These 184 were organized and coded; this process is also known as document clustering or materials evaluation. We did this by exporting the 184 articles from Mendeley to a robust software (i.e., EPPI-Reviewer Beta) for de-duplication, relevance assessment and coding. Ananiadou et al. (2009) stated that many social science studies are using powerful technologies for text mining. Further, "the emergence of research, learning, and teaching repositories in recent years containing textual data sources and materials offers the opportunity to analyze across multiple data collections in different locations" (Ananiadou, 2009, 1). The EPPI-Reviewer allows for easy access and manipulation. EPPI-Reviewer Beta has the functionality to help manage the systematic review through all stages of the process from bibliographic management, screening, coding and right through to synthesis. It also accounts for the intercoder agreement and reliability. Based on our clustering analysis 85 articles were selected for the evidence review. We stratified the research evidence into three broad categories: (1) comparative studies, (2) case studies, and (3) experimental studies. Please see Appendix 1 for the stratification of the 85 articles. A comparative study as used in this paper is defined as a study in which online and face to face (F2F) courses or curricula were investigated and a comparison of various student-learning outcomes was examined using statistical tests. Experimental studies involved the random assignment of participants into different groups – online, F2F or blended courses. A case study is a research method that focuses on understanding the dynamics of single settings and, in this study, the online curriculum. If a study was both experimental and comparative, then it was coded as comparative. Likewise, if a study was both a case study and comparative, then it was coded as comparative.

Figure 2:
Screen Shot of EPPI-Reviewer Beta Relevance Assessment and Coding



Data Analysis

Key Findings from the Systematic Review (Systematic Evidence Review)

The most important aspects when considering online education is the course design and delivery – specifically, through greater alignment between technology and pedagogy. Palloff and Pratt (2007) noted that it is not sufficient for faculty to merely plug their face-to-face lectures into an online platform. What they in fact describe are three key elements that must be present in order for an online education to succeed: people, purpose and process. The responsibility for incorporating these elements falls on the students as well as the instructor; Desai et al., (2009) argued that for online education to succeed, "… high levels of interaction typically need to be present for learners to have a positive attitude and greater satisfaction" (2009, 328).

Instructor Role

When compared to traditional classroom courses, the roles of students and instructors in an online environment must change. In fact, with online teaching the role of the instructor shifts more toward a facilitator role, and this shift is also a critical part of the design. Students will benefit in many ways from online courses, such as finding a more level playing field whether they are introverts or extroverts; however, the student must also take a sometimes more active role in their learning. The Illinois Online Network (2006) stresses that the instructor also needs to take an active role in the learning process (as cited in Palloff & Pratt, 2007). In the best type of interaction, a feeling of community is created and the instructor acts as the hub in a hub-and-spokes model – jumping in and out of conversations, asking questions, and challenging learners to think critically and creatively. Boston and Ice (2011) describe this network of interactions between participants as a "web of learning" (p. 5). Indeed, the metaphor of a web is a powerful and relevant one to describe the active, not passive, transmission and acquisition of knowledge that occurs in well-designed online environments.

Instructor Training and Skill Needs

While numerous early studies have advised that teaching online requires a unique approach and skill-set distinct from those required in the physical classroom (Fetherston, 2001; Hardy & Bower, 2004; Oliver, 2002), in the rush to enter the virtual world many online courses were closely copied from those originally developed for the physical classroom. Further, most of these courses are taught "by faculty with no formal training teaching online of any kind, not to mention training in [instructional design] or any of the related e-learning fields" (Möller, Foshay, & Huett, 2008, p. 67). This is where Palloff and Pratt's second element – purpose – comes in, since in many instances such courses left behind disappointed students and faculty that may never consider teaching online courses again. Since faculty are expected to be experts in specific content and not in various technologies, the purpose and goal of the online presence should be so clear and strong as to drive the networks and mechanisms needed to train, support, and encourage faculty.

Online Course Development

Developing and teaching online courses requires adaptations in teaching practices (Desai et al., 2009; Koehler & Mishra, 2009). Online teaching and learning requires more than just providing access to information: Palloff and Pratt (2007) assert, " a good online course doesn't "teach," but instead makes resources and activities available that allow students to explore content together in an effective manner" (p.138). The best way to design learning environments is to give learners the ability to

provide feedback and advice, and even help construct learning experiences that meet their needs. As Gibson (1998) writes, "if you want to use the web to change how you teach, and how students learn, make your course site integral to your curriculum. Populate it with materials students normally cannot access – don't offer what they already have or have too much of (like reading), offer something new that will help them learn" (1998, 48).

Student Assessment

Online courses must also consider assessment as part of the complete design. Appropriate assessment methods ensure that transfer of learning has occurred, but it rests on close collaboration between faculty who are teaching the online course and instructional designers. A blend of assessment types is usually considered beneficial for deeper learning. Traditional methods such as quizzes and tests can ensure that key concepts are being memorized; but more importantly, using critical thinking questions to assess real-world case studies would provide more meaningful evidence of learning. These types of assessments are more realistic, require judgment and innovation, and ask students to "do" rather than to just convey surface-level memorization of definitions or concepts.

Student Engagement

The major critique proffered against online learning emanates from the concerns that there is an inferior interaction between students and faculty as compared to the traditional classroom setting, making student engagement difficult. However, from our systematic review we found that online learners in fact require more interaction with the instructor. This is a surprise finding, but there is enough evidence to support it. F2F learners implicitly designate one or two of their members to be "participators." These students ask most of the questions and give the instructor feedback while the others learn more quietly. Because online students can't always watch the interaction of others, they tend to interact with the instructor through questions.

It was also found that online learners will quit more quickly. In a classroom, most learners are comfortable enough to wait things out if the first week or two of instruction is unclear. But there is no such social pressure to stay online if the course is not meeting their expectations, so online learners will walk away. They will assume that online learning is a bad form of education or that they do not have the requisite skills or personal style to handle it.

Is there a difference?

Finally, the findings are that there are no clear differences between F2F and online leaning outcomes. Just as there are differences in the learning outcomes of various pedagogical approaches with F2F, the same applies to online learning. However, overall if you compare F2F to online learning there are no major differences in the learning outcomes.

Meta-Analysis

In conducting this meta-analysis, the comparative studies that were obtained from the systematic review were used. However, 16 of the articles used for the systematic evidence review were excluded, as they did not directly compare F2F to online learning or did not provide clear sampling of study participants. This resulted in 69 studies that we used for the meta-analysis.

Table 1:
Descriptives for the Meta-Analysis

Category	Sample Total	Number of Articles Reviewed	SD	Mean	Median
Online Better	3,175	12	382	265	1,401
Same	7,628	46	201	170	3,915
On ground Better	1,863	11	179	169	1,021
Cumulative Sample Total	12,666	69	238	186	1,401

Table 1 shows the results of our meta-analysis. Of the 69 articles, 12 concluded that online learning is better than F2F learning, 11 studies concluded otherwise, and the remaining 46 studies did not find any significant statistical differences between online and on-the-ground learning. The 69 articles we analyzed had a cumulative total of 12,666 participants. More than half of this sample believed that there is no significant difference between the online and on-the-ground learning.

A one-way ANOVA was conducted to compare the effect of the instructional methods of teaching on student learning outcomes. Because the data used for this analysis were existing data from previous empirical studies, we compared the mean scores of participants' responses on three main criteria: online, onsite, and same as reported in each of the articles used in the analysis. The results showed there was no significant difference between delivery methods and student learning: F2F (M =169, SD =179); Online (M = 265, SD = 382); Same (M = 170, SD = 201) at $p < 0.05$ for the three response types [$F(57,11) = 1.254$, $p = .358$]. Our results support the popular view of previous studies that there is no significant effect between the various instructional methods on student learning outcomes.

Table 2:
ANOVA - Methods of Instructional Delivery

	Sum of Squares	df	Mean Square	F	Sig
Between Group	35.746	57	.627	1.254	.358
Within Group	5.50	11	.50		
Total	41.246	68			

Conclusion

It may be time that educators and policy makers think beyond the comparison of online and F2F teaching and learning and rather focus more attention to learning improvements in general. As our systematic meta-analytic review (SMAR) has shown, several studies have concluded that both online learning and F2F have their merits and demerits, but on the whole they both achieve the same objectives. There is, however, an exponential growth in online education, making it critically important that more research and policy attention be paid to improving student experiences in that arena.

Policies and Programmatic Intervention Points

Universities and institutions of higher learning need to bring the administration of online education into the mainstream. In most institutions, there are separate governance of online programs from the traditional brick and mortar programs. For example, most universities have 'University of XYZ Online®.' This comes in various

governance structures disparate from the main University Administration. It is our contention that that time has come to move away from this type of governance structure, as it is the legacy of the age of comparing online to F2F. While these governance structures have had great success up to now, it is also a model that is quickly losing its usefulness.

It may also be time to stop attempting to make the online experience as similar to the F2F as possible. The most common mistake that new online instructors make is to assume that what works in the F2F classroom will work online. The two different environments each have their own advantages and problems. Understanding these can lead to success. Despite all of the differences between online and F2F learning, one's experience as a classroom instructor can still be a good baseline by which to measure your new online methods and vice versa. However, one should not try to simply imitate the F2F learning in the online environment.

Student Engagement

Engaging students to enhance learning has been a subject of discussion for scholars of teaching and learning for decades. And, while still an intricate area of research, it has assumed broader significance and importance as a result of the increasing level of online instruction. Whereas there is a vast array of literature and empirical research on how to engage students in the traditional classroom, there is limited guidance for online (hybrid or fully asynchronous) teaching and learning. It becomes even more of a research gap if one considers the fully asynchronous online classroom. Issues of this nature should be the focus of research in this domain as we move beyond the comparison of online versus traditional learning.

Creating a successful online course entails much more than just placing a course designed for a physical environment on the Internet. Subtle interactive and creative assessment tools need to be included, in order to create a true community of learning. This can best be done by those knowledgeable with online teaching and learning, and if we expect faculty to become these experts overnight and on their own, we are setting them up to fail.

Recent advancements in technology have not only changed our lives for the better, they have also challenged the status quo and pushed the comfort zone of many individuals and organizations. Today, many faculty are still skeptical toward online instruction, even when traditional universities are growing their online presence (Wright, 2014). It is interesting to note broad differences in how online education is valued by different groups. For instance, Allen and Seaman (2015) revealed that on the whole, faculty surveyed believed that online learning outcomes are inferior or somewhat inferior to the outcomes of courses taught on face-to-face; the same study however, when parsing by experience, found that more than half of those who had taught online felt that online learning outcomes were the same as those taught in face-to-face environments. Likewise, Windes and Lesht (2014) showed that, at both public and private institutions, faculty with online teaching experience have a favorable impression of online teaching. This is line with the results of our meta-analysis and systematic review.

Implications for Practice

Research seems to indicate that there is a difference between faculty and administrators, the latter of whom often see online learning in a much more positive light (Tanner, Noser, & Totaro, 2009). Several studies by Allen and Seaman saw this distinction between chief academic officers who consider online instruction appropriate, and a general view across faculty that online instruction is not an appropriate method of knowledge delivery (2010, 2011, & 2013). In terms of faculty and students, a study by

Zhao, et al., (2009) showed considerable increase in satisfaction by both faculty and students with their online instruction; however, faculty satisfaction seems to lag significantly behind that of the students. In part, faculty seem to believe that most of the soft skills their courses impart require interpersonal interactions, and that the online environment is less effective in instilling these skills (Lederman & Jaschik, 2013). Harden (2013) gives voice to this conventional wisdom that the virtual environment can only allow information to flourish, and not knowledge:

> "*There is nothing like the personal touch of being in a classroom with an actual professor, says the conventional wisdom, and that is true to some extent. Clearly, online education cannot be superior in all respects to the in-person experience. Nor is there any point pretending that information is the same as knowledge, and that access to information is the same as the teaching function instrumental to turning the former into the latter. But researchers at Carnegie Mellon's Open Learning Initiative, who've been experimenting with computer-based learning for years, have found that when machine-guided learning is combined with traditional classroom instruction, students can learn material in half the time. Researchers at Ithaka S+R studied two groups of students—one group that received all instruction in person, and another group that received a mixture of traditional and computer-based instruction. The two groups did equally well on tests, but those who received the computer instruction were able to learn the same amount of material in 25 percent less time.* " (Harden, 2013, 57).

Aside from these more philosophical issues that faculty take with online education, there are also more practical concerns that are well founded. For instance, managing the workload of online courses can be challenging for faculty, especially if there is no responsive support system available to them. In addition, faculty have competing priorities and teaching objectives, and redesigning learning activities, courses, and curricula is labor intensive. Although perhaps counterintuitive, online courses require more preparation effort from faculty who have previously been used to lecturing in a physical classroom. Online teaching requires suitable technologies, which are also continuously evolving. If faculty do not feel comfortable with the technologies, or do not have a strong support system, they would naturally be hesitant to teach online courses, or would at least need more time to become comfortable using these tools.

Therefore, in order to help everyone sustain an environment of great learning, it is vital that we support and encourage our faculty to integrate technology in their teaching and learning processes, as effectively as possible. Instructional designers need to work closely with faculty both in the design/development of their online courses and in the ongoing support and faculty enrichment that takes place as faculty are teaching and assessing online courses. Although this is true for both the face-to-face and virtual engagements, faculty enrichment opportunities should be an integral part of any online initiative. In some instances, students are more tech savvy than their teachers, which is another reason to incorporate strong continuous enrichment opportunities for faculty. Numerous studies show that educators in the online medium "are faced with new pedagogical issues surrounding student interactions, course content design and delivery, multiple levels of communication, defining new types of assignments and performance expectations, and different assessment and evaluation techniques (to name a few)" (Möller et al., 2008, p. 67). Part of this support is also active engagement in communities of practice. We believe this continuous exchange of knowledge and experience will lead not only to increased satisfaction for students and faculty, but also – in time – to the sustained environment of quality education.

Of course, it is not the number of technologies faculty incorporate into the overall design of their online course that will win the day – it is the pedagogy. Expert

instructional designers know this. Currently, most online courses seem to try to fit technology into whatever pedagogy is being used but with the emphasis on technology, instead of the content. This usually leads to disappointing outcomes and backlash from teachers, administrators, and stakeholders as to why technology is being used for its own sake. The unfortunate result is that many of those involved resist any push for technology use despite the fact that some tools might actually enhance desired learning experiences.

Depending on the type and number of technologies that are incorporated in online course designs, it takes concerted institutional effort and upfront investment, both in the design and support phases. In fact, studies consistently show that most online courses fail mainly because they did not fully consider or plan for the costs associated with online delivery, lacking administrative support structures, and lacking incentives for developing and teaching online courses. Neely and Tucker (2010) conclude that "significant per course costs that are often unaccounted for in university budgets ... include leadership and support ... in coordinating the design, development, and implementation of new courses" (2010, 28). What is important to keep in mind however, is that once such a program is up and running, given that initial support, it is to a large degree self-sustaining. In fact, Caswell et al. (2008) found that while there is initial cost associated with developing a course, technology keeps reproduction costs minimal.

To conclude, while it might be helpful for faculty who teach online courses to be familiar with various technologies, it is not necessary for them to be effective teachers. What they need are: well-designed courses, planning ahead, faculty enrichment opportunities, a strong institutional support system, and of course the willingness to learn new approaches and tools. Incorporating technology into teaching and learning can be most meaningfully achieved when those who teach are provided multiple opportunities to articulate, interrogate, and communicate their assumptions and expectations. In this context then, enrichment opportunities should be tailored to faculty and instructors to help them in those areas where they personally identify challenges or gaps. Our expectations are that this type of personalized training will lead to increased, and also more effective, use of educational technologies in teaching and learning in general, and in online education in particular.

Limitations

The findings of this study should be considered within the context of its limitations. There is a limitation with the use of meta-analytic review as samples are collected from independent studies. Vote counting takes no account of the differential weights given to each study. The systematic review was exclusive to English language journals that are found in the main databases. Articles that do not cite the search terms in English, and journals that are not included in the main databases, were not captured or were excluded from the analysis. Also, the search in the main databases was not all-encompassing, since it omitted books that are not online and unpublished conference proceedings, except those published in special editions of journals.

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Appendix 1:
Stratification of the 85 articles for the Systematic Review

#	Authors	Study/Title	Classification
1	Akladios, M., Lim, G, & Parsaei, H.	Effectiveness of Student Learning—a Comparative between Online & Face-To-Face Formats	Comparative
2*	Alghazo, A. M.	Comparing Effectiveness Of Online and Traditional Teaching Using Students' Final Grades.	Comparative
3	Ali, A., & Elfessi, A.	Examining students' performance and attitudes towards the use of information technology in a virtual and conventional setting	Experimental
4	Alsaaty, F. M., Carter, E., Abrahams, D., & Alshameri, F.	Traditional Versus Online Learning in Institutions of Higher Education: Minority Business Students' Perceptions	Descriptive
5	Aragon, S. R., Johnson, S. D., & Shaik, N.	The influence of learning style preferences on student success in online versus face-to-face environments	Comparative
6	Arbaugh, J. B.	Virtual classroom versus physical classroom: An exploratory study of class discussion patterns and student learning in an asynchronous Internet-based MBA course	Comparative
7	Ary, E. J., & Brune, C. W.	A comparative of student learning outcomes in traditional and online personal finance courses	Comparative
8*	Ashkeboussi, R.	A comparative analysis of learning experience in a traditional vs. virtual classroom setting	comparative
9	Atchley, T. W., Wingenbach, G., & Akers, C.	Comparison of course completion and student performance through online and traditional courses	Comparative
10	Block, A., Udermann, B., Felix, M., Reineke, D., & Murray, S. R.	Achievement and satisfaction in an online versus a traditional health and wellness course	Comparative
11	Bosshardt, W. & Chiang, P.	Lecture capture learning: Do students perform better compared to face-To-face classes?	Comparative
12	Botsch, R. E., & Botsch, C. S.	Audiences and outcomes in online and traditional American government classes revisited	Experimental
13	Bourelle, A., Bourelle, T., Knutson, A. V., & Spong, S.	Sites of multimodal literacy: Comparing student learning in online and face-to-face environments	Case Study
14	Bristow, D., Shepherd, C. D., Humphreys, M., & Ziebell, M.	o Be Or Not To Be: That Isn't the Question! An Empiric al Look at Online Versus Traditional Brick-and-Mortar Courses at the University Level.	Comparative
15	Brown, J. C., & Park, H. S.	Longitudinal student research competency: Comparing online and traditional face-to-face learning platforms	Experimental
16	Buerck, J. P., Malmstrom, T., & Peppers, E.	Learning environments and learning styles: Non-traditional student enrollment and success in an Internet-based versus a lecture-based computer science course	Comparative
17	Callister, R. R., & Love, M. S.	A Comparative of Learning Outcomes in Skills-Based Courses: Online Versus Face-To-Face Formats	Comparative
18	Chen, C. C., Jones, K. T., & Moreland, K.	Distance Education in a Cost Accounting Course: Instruction, Interaction, and Multiple Measures of Learning Outcomes	Comparative
19	Chenoweth, N. A., & Murday, K.	Measuring student learning in an online French course	Comparative
20	Coates, D., Humphreys, B. R., Kane, J., & Vachris, M. A.	No significant distance" between face-to-face and online instruction: Evidence from principles of economics	Comparative
21	Cooper, L. W.	A comparison of online and traditional computer applications classes	Comparative

#	Authors	Study/Title	Classification
22	Daymont, T., & Blau, G.	Student performance in online and traditional sections of an undergraduate management course	Comparative
23	Dennis, J. K.	Problem-based learning in online vs. face-to-face environments.	Comparative
24	Diaz, D. P.	Comparison of student characteristics, and evaluation of student success, in an online health education course	Doctoral dissertation
25	Driscoll, A., Jicha, K., Hunt, A. N., Tichavsky, L., & Thompson, G.	Can online courses deliver in-class results? A comparison of student performance and satisfaction in an online versus a face-to-face introductory sociology course	Experimental
26*	Duffy, T., Gilbert, I., Kennedy, D., & Kwong, P.	Comparing distance education and conventional education: Observations from a comparative study of post-registration nurses.	Comparative
27	Dutton, J., Dutton, M., & Perry, J.	How do online students differ from lecture students	Comparative
28	Dutton, J., Dutton, M., & Perry, J.	Do online students perform as well as lecture students?	Comparative
29*	Farinella, J.	Professor and student performance in online versus traditional introductory finance courses	Comparative
30*	Figlio, D., Rush, M., & Yin, L.	Is it live or is it internet? Experimental estimates of the effects of online instruction on student learning	Experimental
31	Fordis, M., King, J. E., Ballantyne, C. M., Jones, P. H., Schneider, K. H., Spann, S. J., ... & Greisinger, A. J.	Comparative of the instructional efficacy of Internet-based CME with live interactive CME workshops: a randomized controlled trial.	Experimental
32	Fortune, M. F., Shifflett, B., & Sibley, R. E.	A comparison of online (high tech) and traditional (high touch) learning in business communication courses in Silicon Valley	Comparative
33	Frederickson, N., Reed, P., & Clifford, V.	Evaluating Web-supported learning versus lecture-based teaching: Quantitative and qualitative perspectives.	Comparative
34	Friday, E., Friday-Stroud, S. S., Green, A. L., & Hill, A. Y.	A multi-semester comparison of student performance between multiple traditional and online sections of two management courses	Comparative
35	Gallagher, J. E., Dobrosielski-Vergona, K. A., Wingard, R. G., & Williams, T. M.	Web-based vs. traditional classroom instruction in gerontology: a pilot study	Comparative
36	Gibson, J. W.	A comparative of student outcomes and student satisfaction in three MBA human resource management classes based on traditional vs. online learning.	Comparative
37*	Hannay, M., & Newvine, T.	Perceptions of distance learning: A comparison of online and traditional learning	Comparative
38	Hansen, D. E	Cohesion in online student teams versus traditional teams	Comparative
39	Harris, R. A., & Nikitenko, G. O.	Comparing online with brick and mortar course learning outcomes: An analysis of quantitative methods curriculum in public administration	Comparative
40	Hauck, W. E.	Online versus traditional face-to-face learning in a large introductory course	Comparative
41	Hay, A., Peltier, J. W., & Drago, W. A.	Reflective learning and on-line management education: A comparative of traditional and on-line MBA students.	Case Study
42*	Horton, D., Campbell, J., & Craig, M.	Online CS1: Who Enrols, Why, and How Do They Do?	Comparative
43	Jeannette, K. J., & Meyer, M. H.	Online learning equals traditional classroom training for master gardeners.	Comparative

#	Authors	Study/Title	Classification
44	Jeffries, P. R., Woolf, S., & Linde, B.	Technology-based vs. traditional instruction: A comparative of two methods for teaching the skill of performing a 12-lead ECG	Comparative
45	Jenkins, S., Goel, R., & Morrell, D. S.	Computer-assisted instruction versus traditional lecture for medical student teaching of dermatology morphology: a randomized control trial.	Comparative
46	Johnson, D., Burnett, M., & Rolling, P	Comparative of internet and traditional classroom instruction in a consumer economics course	Comparative
47	Johnson, S. D., Aragon, S. R., Shaik, N., & Palma-Rivas, N	Comparative analysis of learner satisfaction and learning outcomes in online and face-to-face learning environments	Comparative
48	Kearns, L. E., Shoaf, J. R., & Summey, M. B.	Performance and satisfaction of second-degree BSN students in Web-based and traditional course delivery environments	Comparative
49	Ladyshewsky, R. K.	E-learning compared with face to face: differences in the academic achievement of postgraduate business students.	Comparative
50	Mahoney, J.	Do you feel like you belong? An on-line versus face-to-face pilot study.	Comparative
51	Mathiowetz, V., Yu, C. H., & Quake-Rapp, C.	Comparative of a gross anatomy laboratory to online anatomy software for teaching anatomy	Comparative
52	McLaren, C. H.	A comparison of student persistence and performance in online and classroom business statistics experiences	Comparative
53	Mehlenbacher, B., Miller, C. R., Covington, D., & Larsen, J. S.	Active and interactive learning online: A comparative of Web-based and conventional writing classes	Comparative
54	Mentzer, G. A., Cryan, J., & Teclehaimanot, B.	Two peas in a pod? A comparison of face-to-face and web-based classrooms	Comparative
55	Neuhauser, C.	Learning style and effectiveness of online and face-to-face instruction	Comparative
56	Nguyen, J., & Paschal, C. B	Development of online ultrasound instructional module and comparative to traditional teaching methods.	Comparative
57*	Odhiambo, S. O.	The impact of E-Learning on academic performance: a case study of Group Learning Sets	Case Study
58	O'Neal, K., Jones, W. P., Miller, S. P., Campbell, P., & Pierce, T.	Comparing web-based to traditional instruction for teaching special education content	Comparative
59	Parsons-Pollard, N., Lacks, R. D., & Grant, P. H.	A comparative assessment of student learning outcomes in large online and traditional campus- based introduction to criminal justice courses	Comparative
60	Phadtare, A., Bahmani, A., Shah, A., & Pietrobon, R.	Scientific writing: a randomized controlled trial comparing standard and on-line instruction	Experimental
61	Poirier, C. R., & Feldman, R. S	Teaching in cyberspace: Online versus traditional instruction using a waiting-list experimental design	Comparative
62	Priluck, R.	Web-assisted courses for business education: An examination of two sections of principles of marketing	Comparative
63	Pucel, D. J., & Stertz, T. F.	Effectiveness of and student satisfaction with web-based compared to traditional in service teacher education courses.	Comparative
64	Raghavan, V., Braun, F., & Goh, S.	An Assessment of Student Learning Perceptions in Concurrent Online and Face-to-Face Education Delivery Environments	Comparative
65	Rich, A. J., & Dereshiwsky, M. I.	Assessing the comparative effectiveness of teaching undergraduate intermediate accounting in the online classroom format	Comparative
66	Rovai, A. P., Ponton, M. K., Derrick, M. G., & Davis, J. M.	Student evaluation of teaching in the virtual and traditional classrooms: A comparative analysis	Case study

#	Authors	Study/Title	Classification
67*	Ryan, R. C.	Student assessment comparative of lecture and online construction equipment and methods classes	Case study
68	Salyers, V. L.	Web-enhanced and face-to-face classroom instructional methods: Effects on course outcomes and student satisfaction	Comparative
69*	Sankaran, S. R., Sankaran, D., & Bui, T. X.	Effect of student attitude to course format on learning performance: An empirical study in Web vs. lecture instruction	Comparative
70*	Sapp, D. A., & Simon, J.	Comparing grades in online and face-to-face writing courses: Interpersonal accountability and institutional commitment	Comparative
71	Scheetz, N. A., & Gunter, P. L.	Online versus traditional classroom delivery of a course in manual communication	Comparative
72*	Song, H., Kim, J., & Luo, W.	Teacher–student relationship in online classes: A role of teacher self-disclosure	Experimental
73	Steinweg, S. B., Davis, M. L., & Thomson, W. S.	A comparison of traditional and online instruction in an introduction to special education course	Comparative
74	Sue, V. M.	Comparing online and traditional classes	Experimental
75*	Summers, J. J., Waigandt, A., & Whittaker, T. A.	A comparative of student achievement and satisfaction in an online versus a traditional face-to-face statistics class	Comparative
76*	Topper, A.	Are they the same? Comparing the instructional quality of online and face-to-face graduate education courses	Comparative
77*	Tucker, S.	Distance education: Better, worse, or as good as traditional education	Comparative
78*	Tutty, J. I., & Klein, J. D.	Computer-mediated instruction: A comparative of online and face-to-face collaboration	Comparative
79	Urtel, M. G.	Assessing academic performance between traditional and distance education course formats	Comparative
80	Ury, G.	A longitudinal study comparing undergraduate student performance in traditional courses to the performance in online course delivery	Experimental
81	Wagner, S. C., Garippo, S. J., & Lovaas, P.	A longitudinal comparison of online versus traditional instruction	Comparative
82	Wallace, D. R., & Mutooni, P.	A comparative evaluation of World Wide Web-based and classroom teaching	Comparative
83	Weems, G. H.	Comparative of beginning algebra taught onsite versus online	Comparative
84	Wiecha, J. M., Chetty, V. K., Pollard, T., & Shaw, P. F.	Web-based versus face-to-face learning of diabetes management: the results of a comparative trial of educational methods	Comparative
85	Wilson, D., & Allen, D.	Success rates of online versus traditional college students	Comparative