Faculty Perceptions and Attitudes of Online Courses in Higher Education:

A Brief Literature Review

by

Patricia J Williams

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**Introduction**

Online learning has been a hot topic subject over that past few years. Many colleges and universities are beginning to increase their offerings with more technology based courses, from basic web-assisted courses to hybrid and fully online courses. Online learning in colleges and universities has been increasing over the past decade. According to Allen and Seaman (2007), more than 66% of higher education institutions have online course models. In the fall of 2011, online enrollment accounted for 32% of total student enrollment in degree granting institutions (Allen & Seaman, 2013).

Colleges and universities began incorporating online education in large part due to the changing demographics of the student population and student need. One large factor that has led to the increase in offerings of online education is the number of students who request education be offered utilizing these formats. It is interesting to note that even though the overall student enrollment has decreased in colleges and universities, there has been a significant increase in students enrolled in some form of online learning over the past few years. Dunbar et al. (2011) found a decline of 3.59% in the full time enrollment in both public and private universities in the southern region of the United States between 2009 and 2010. In a different study, Allen and Seamen (2013) observed that while overall enrollment in post-secondary institutions fell 0.1% in the fall of 2011, online learning enrollment increased 9.3% that same year. Likewise, Bowen, Chingos, Lack, and Nygren (2011) found an increase in the percent of higher education students taking advantage of online courses from approximately 27% in 2009 to 30% in 2010. It is clear from these trends that online learning continues to be in high demand by students enrolled in colleges and universities nationwide. The evidence suggests that colleges and universities across the nation consider online course offerings to be an important part of their educational model. Why, then, is there such a debate within many colleges and universities in offering online courses, given the large percentage of higher education institutions offering at least some form of these course offerings?

One challenge that colleges and universities face is the acceptance of the online course format by their faculty. This can be extremely challenging in smaller colleges and universities due to the close connection between faculty members. Research has indicated that faculty are among the most resistant towards the adoption of the online course format (Mitchell & Geve-May, 2009). Tabata and Johnsrud (2008) found a similar result. They found that faculty members who had never taught online courses viewed the quality of online instruction as lower than faculty who had taught online courses in the past (Tabata & Johnsrud, 2008). This may indicate that the resistance of faculty that was observed by Mitchell and Geve-May (2009) is due to a small number of faculty with experience in online courses within their survey group. Both of these studies indicate that in order to ensure the success of online courses and programs, it is important to look at the perceptions of the faculty that will be delivering these online courses. According to Mitchell and Geve-May (2009), it is important for the faculty members of these institutions to accept and develop challenging and up-to-date online courses. Therefore, understanding faculty perceptions is important in determining the feasibility of offering online courses at colleges and universities in the United States.

Overall, there are a variety of reasons that faculty members are reluctant to teach online courses for the first time. In order to effect change and influence faculty members to teach online courses, the personal reasons for not wanting to teach online courses needs to be established. It is imperative to look into and understand the reluctance of faculty in providing this particular course format at their university. Faculty members, who are unwilling to offer online courses, will resist offering online courses. The reluctance of faculty members is likely based in personal perceptions of online courses. Ward, Peters, and Shelley (2010) found that only 30% of faculty members believed online courses were beneficial and that this low acceptance was a significant hindrance towards implementing more online courses.

If institutions of higher education are offering online courses, yet some faculty are resisting the inclusion of an online educational structure, it is important to understand which faculty members are resisting online education. There is one large population of faculty that have been largely resistant to implementing education in an online format. This is the group of faculty that are teaching science and mathematics. Faculty support in science courses and faculty perceptions of online courses in the sciences is significantly below the average acceptance of online courses in colleges and universities. According to Totaro, Tanner, Noser, Fitzgerald, and Birch (2005), courses with a quantitative focus (such as math and science) lacked faculty support due to their perceived complexity. There appears to be a greater resistance among the sciences in offering online laboratory-based science courses (Tanner, Noser, Fitzgerald, & Birch, 2005). This review will address four major issues in the reluctance of faculty, specifically science faculty, in offering online course offerings at colleges and universities uncovered in my investigations: 1) Faculty Satisfaction and Previous Experience; 2) Faculty Satisfaction and Technology Training; 3) Faculty Satisfaction and Perceived Quality of Online instruction; and 4) Faculty Satisfaction and Online Science Laboratories.

**Major Themes and Issues**

**Faculty Satisfaction and Previous Experience**

One of the most often raised concerns with online education concerns the rigor of online courses. Tanner, Noser, and Totaro (2009) surveyed the views of both faculty and students regarding online courses. While their sample was limited to a couple of regional universities in the southern United States, they found that the faculty tended to believe that in-class exams were more difficult than online exams while the students did not hold the same view.

A study by Parthasarathy and Smith (2009) sampled business faculty at a public university, in an effort to determine what influenced whether or not business faculty members would teach online courses. The researchers found that while the perception of faculty members regarding the rigor of the online courses influenced their decision of whether to teach an online course, their view of the comprehensiveness of the online course played virtually no role in the decision. According to Parthasarathy and Smith (2009), “this bodes well for the quality of online education” (Discussion section, para. 4). They also found unexpected results concerning faculty views of the delivery time and efforts involved in teaching online courses. According to the researchers, the faculty who had perceptions that the course took longer to implement than a regular face-to-face course were more reluctant to offer an online course. The results of this study supported the idea that for faculty members, understanding the reality of online course rigor is very important with regard to their perceptions of online learning.

Mandernach, Mason, Forrest, and Hackathorn (2012) studied the views of psychology faculty members towards teaching online psychology courses. Specifically, the researchers found that “although there is a lack of support for teaching all courses online, most faculty report that at least one course could be taught with equal effectiveness in either format” (p. 207). These researchers found that the faculty they studied believed that some of the classes they taught should not be taught in an online format. The faculty were concerned with how to teach and assess certain skills in an online environment. Specifically, Mandernach, Mason, Forrest, and Hackathorn (2012) found faculty concern about how to implement an “informal assessment of one’s interpersonal abilities” (p. 207). This study highlights an issue that must be addressed in addition to exam rigor, namely that faculty are concerned that certain skills cannot be passed on in an online environment. This certainly holds true in the sciences as well. In a science environment, many skills need to be acquired by the students and there may be reluctance by science faculty to attempt to pass on those skills through online means.

Bolliger and Wasilik (2009) looked at the factors that effected how happy faculty members were in teaching online courses. Bolliger and Wasilik (2009) surveyed an entire population of online instructors at a small public university. Similar to the other studies, Bolliger and Wasilik used a series of questions with a 4-point Likert scale to assess the faculty member’s satisfaction with online courses. Bolliger and Wasilik (2009) found that the faculty-student issues corresponded strongest to faculty perception of the online course. In fact, Bolliger and Wasilik (2009) found that “…the majority of faculty believed that their online students are actively involved in their learning, participate at a good level, and communicate actively with the course instructors” (p. 113).

It would seem from these results that faculty members with experience in teaching online courses would have a higher satisfaction with online courses. This same result has been found elsewhere. Ward, Peters and Shelley (2010) also looked at the student and faculty views of online courses by surveying the faculty at the University of Southern Mississippi. The study by Ward, Peters and Shelley (2010) was limited because 2007 was the first year that the university offered online instruction. In their first year offering online courses, only 14 faculty members taught these courses which also means that these faculty members had only recently taught their first online course at the time with study was conducted. Ward, Peters, and Shelley (2010) found that the faculty members were generally positive concerning online courses and their future involvement in online courses.

Another study by Picciano, Seaman, and Allen (2010) suggested that faculty have a higher acceptance rate with regard to online learning after they teach an online course. According to the researchers, more than half of the faculty who have previously taught an online course thought online courses were at least as good as the face-to-face course. The researchers also noted that more than 80% of faculty that had not previously taught an online course felt that online courses could not be equal or better than the face-to-face equivalent. This research shows a clear disconnect in the faculty with previous experience versus those without. Another finding by the researchers stated that a negative view of online learning by faculty did not stop faculty from recommending online learning to their students. In fact, more than 50% still recommended an online course to their students despite their negative views. According to the researchers, this indicates that faculty members have “mixed feelings” on the issue even if they communicate their negative views (p. 25).

While several studies can be found which support the idea that conducting an online course increases the likelihood of a faculty member teaching future online courses, this might not be entirely the case. The study by Graham and Jones (2011) turned up interesting results in a discussion concerning faculty attitudes toward online courses. The researchers surveyed the views of the faculty at a major state institution toward online courses. According to the researchers, the quantitative portion of their survey did not find any statistical link between previous online courses taught and their attitudes toward online courses. In the qualitative answers portion of the survey, the researchers did find that “the majority of respondents did not see online education in any of the forms explored…as a quality substitute for the traditional face-to-face class experience” (p. 219). It is difficult to determine due to the limited sample size used, whether this negative view of the quality of online education is due to a sampling bias or if it is more indicative of a general view. Since the researchers only explored the views of the faculty at one institution, this result may not be extrapolated to the broad world of higher education.

Zhen, Garthwait, and Pratt (2008) studied the factors that influence faculty members in teaching online. The researchers found that “among the six given independent variables, only self-efficacy and philosophy each had a statistically significant effect in the likelihood of using verses non-using…” online course management applications (Discussion section, para. 4). The same study also found that “Experience, Time, Peer-Pressure, and Class-Innovation had no significant effects on the probability…” of teaching future online courses (Results section, para. 4). This is an interesting result since it suggests that faculty reluctance may have a lot more to do with the personal attitudes of the faculty members rather than anything else. While difficult, it is possible to overcome individual attitudes.

**Faculty Satisfaction and Technology Training**

Technology Training also plays an important role in a faculty member’s willingness to offer online courses in colleges and universities. The study by Bolliger and Wasilik (2009) found that the reliability of the technology being used in the online courses, or difficulties involved in using the technology, had substantial impact on the faculty member’s satisfaction in their courses. The topic of technology support extends beyond the study by these researchers. Wasilik and Bolliger (2009) studied the faculty satisfaction in the online environment at a single pubic research university. While the researchers found that most of the faculty surveyed showed positive views towards teaching another online course in the future, they also found that difficulties using technology was detrimental to the faculty perception of teaching online courses. Additionally, Haber and Mills (2008) studied the perceptions of faculty members teaching online courses. The researchers found that while the faculty members in their study had administrative issues, they also found that the course management system being used had an effect on the level of support from the individual faculty members.

Tabata and Johnsrud (2008) studied the attitudes of faculty toward technology and distance learning. The researchers found that the support services for online courses could increase or decrease the level of faculty implementation of distance education. The support services that the researchers were referencing might not be as simple as a “help desk” to handle online issues.

It is possible that the online course software may play a significant role in determining whether faculty support online courses. Stewart, Bachman, and Johnson (2010) studied the predictors of faculty acceptance of online education. They did not find that ease of use of the technology significantly supported the intent of faculty to teach online courses. The researchers found that institutions must make a concerted effort towards faculty training. Similarly, Gibson, Harris, and Colaric (2008) found that contrary to their prediction, “perceived ease of use did not play a significant role in predicting technology acceptance…” (p. 358). The authors attributed this new finding to their sample population and their ability to learn to use new technology, however they did not research this question. Some indication of whether this is the case may have been found by Zhao, Alexander, Perreault, Waldman, and Truell (2009). The researchers surveyed business students and faculty members on their use of technology in distance learning courses. From the results of the survey it is important to note that faculty viewed TV-based video and audio as more productive and preferential than did the students. It seems likely that these are faculty who are not as comfortable adapting to new technology and have held onto some of the older technologies because they have not been trained in the use of new technologies.

 The importance of faculty training on the acceptance of online education is also evident. Georgina and Olson (2008) studied the influence of technology literacy and training on faculty use of technology in the classroom by surveying the faculty from 15 different university education departments. The researchers found that while the institutions were providing training for the faculty, there was a low attendance rate at these training events. The study by the same researchers also found two different groups within their sample. One group was “…faculty who are willing to learn more about, and to utilize this new technology-based pedagogical approach…” (Georgina & Olson, 2008, p. 5). The other group was “… faculty who altogether disregard this approach for their personal pedagogies” (Georgina and Olson, 2008, p. 5). This study highlights the importance faculty training on acceptance of online education by faculty members.

The implementation of faculty training sessions has also been found to be of some significance. The study by Georgina and Olson (2008) was further researched in Georgina and Hosford (2009). This new analysis looked at determining best practices for introducing faculty to technology. The researchers found that the majority of faculty preferred training in small groups. Additionally, faculty members preferred to learn, if not in small groups then by discussions with their colleagues. The research found that training sessions involving the entire faculty together would seem to be detrimental in increasing the acceptance of online courses. The best training modality would be to use smaller groups rather than large groups.

The importance of institutional technology training was further emphasized in a study by Oomen-Early and Murphy (2009). The researchers studied the faculty perception of the need for institutional training relating to distance learning and found that the significant majority of faculty members reported that support from their institution was the biggest help or biggest hindrance to the implementation of distance learning. According to the researchers, a majority of their respondents reported their own perceived technological readiness in teaching online was a large hindrance in the faculty members feeling like they could handle an online course.

Another study that emphasized the importance of technology training in the classroom was Zhen, Garthwait, and Pratt (2008). According to the researchers, faculty who felt more comfortable with technology were far more willing to invest time in creating courses and then subsequently offer those courses to students. The researchers looked at four main decision factors that encourage online teaching: previous experience or training in technology, time, self-efficacy, and peer-pressure. Of the four decision factors, the highest indicator of a faculty member teaching online was previous experience or training in online instruction. This further demonstrates that faculty members who have previously taught online or have previous training with online instructional technology are more likely to accept and teach online as opposed to those who did not.

Another aspect of previous training and online education has to do with pedagogical training in online course development. According to Chaney, Chaney, and Eddy (2010), faculty must understand how to teach online and how to interact with students. Training in the technology aspect of the course is not enough. Training must extend into the theories and contexts most relevant to online teaching and learning. According to the researchers, increasing pedagogical training would help faculty understand what is required of them in order to teach online. Informing faculty on the skills needed in order to teach online can only serve to reduce faculty reluctance and to lend more support for faculty in offering online courses.

To lend support to this idea, Wickersham and McElhany (2010) surveyed faculty at a Texas institution and found that faculty without significant training in technology had a higher concern for the effectiveness of online courses. In fact, the researchers divided their result by school and found that the sciences had higher concern (95%) than other departments, such as business (80%) in offering online courses. The researchers also noted that, despite their hesitance, they feel their opinions would change if they were offered training on how to teach in an online environment and if they were offered some kind of course release (reduction in the teaching load time) in order to dedicate to learning online teaching skills. This demonstrates a willingness towards learning, even if the faculty has negative opinions of online learning.

**Faculty Perceptions and Perceived Quality**

 Another issue involved in faculty reluctance is the perceived quality of online learning versus that of face-to-face learning (Chaney, Chaney, & Eddy, 2010; Kern, 2010; Wickersham & McElhany, 2010). Faculty who have not taught online are the first to question the quality of the online course versus the face-to-face course (Picciano, Seaman, & Allen, 2010).

In research conducted by Wickersham & McElhany (2010), faculty were asked five open ended questions towards online teaching. The researchers determined that of all the issues faculty had with online learning, perceived quality topped the list in all of the questionnaires. The researchers also noted that the result of this study mirrored the results seen in other studies at other institutions. When the faculty were asked about how the perceived quality could be improved in the online courses, the researchers stated that the solution the faculty recommended would be to have quality assurance standards to ensure the classes had high academic standards. Faculty have been a huge voice in demanding a quality assurance process. According to Barczyk, Buckenmeyer, and Feldman (2010), a “faculty centered, peer review-based process” called “Quality Matters (QM)” exists in order to ensure quality online courses (p. 14). Research has indicated that the QM program has helped maintain quality standards of online learning in Maryland but could be developed elsewhere. This could help reduce the reluctance of faculty in developing online courses.

According to research by Allen and Seaman (2013), the reluctance of faculty in teaching online courses is a “barrier to the growth of online instruction” (p. 28). The researchers note that faculty acceptance of online courses have grown from 61% in 2007 to almost 67%. While growth is positive from the online perspective, the number of students requesting online courses is much higher. This means faculty acceptance is not on par with student and administrative demands. The authors note that a huge setback is the perceived quality of the online course compared to its face-to-face equivalent. Allen and Seaman (2013) also note that while some faculty who teach online believe the quality of the course is just as good or even better than other format, there are still some faculty that teach online (about 5%) who would rank online learning as inferior to face-to-face learning.

Other research by Bolliger and Wasilik (2009) indicated that faculty perception is a very important factor in developing and providing online courses. The researchers stated that faculty perception is centered around three concepts: “student-related, instructor-related, and institution related” concerns (p. 106). While there are several different ideas in each of those categories, the quality of the online course is a key factor in all three of the factors listed. In fact, according to the researchers, the faculty seemed to be more concerned about the quality of the course in context of student learning and engagement. This indicates that many faculty, both fully supporting online courses and those faculty who do not, tend to be student oriented and centered with their concerns about quality.

Ward, Peters, and Shelley (2010) also looked at faculty perceptions of quality in online courses. Specifically, they looked at faculty perceptions after teaching an online class. Their research indicated that out of a sample size of seven instructors, all were likely or highly likely to teach another online class after teaching online and six of the seven participants surveyed stated that they felt the online course offered a quality online learning experience. While the researchers noted that further study is warranted and larger sample sizes are needed, the results indicated that faculty have positive perceptions of online course quality after serving as an instructor in an online course.

Each of the above studies sought to provide support for gathering faculty perceptions of online, laboratory-based science courses. The existing literature offered a wide variety of reasons and explanations for faculty perceptions and attitudes toward online learning. Further research is needed in order to help determine reasons for these varying perceptions at individual colleges and universities.

Faculty Satisfaction and the Science Laboratory Component

When it comes to the sciences, a whole new issue arises. Online science courses have laboratory components and it is these laboratory components that make these courses rather unique in the world on online learning. Kennepohl (2007) noted that “laboratory work is at the heart of many good chemistry courses…” and that labs are also “…one of the most difficult components to deliver effectively at a distance” (p. 337). The difficulty lies at the heart of natural science, namely experimentation. Science faculty members realize that students need to understand the techniques of experimentation. It is understandable that faculty can be concerned with how these critically important skills are taught. Kennepohl (2007), for instance, developed an at-home chemistry lab-kit which students purchase and then conduct the experiments at home. As noted in Gerlich and Mills (2003), one concern of online education raised is that these online labs must prepare the students for real laboratory work, not simply show them how things are done. It is clear that the lab-kit designed and described by Kennepohl (2007) is effective, but it is important for faculty to be informed that kits exist and that they obtain training in using these science kits to help students in online science courses.

In another research study, Reagan (2012) investigated the potential for fully online introductory physics courses. In these courses, the researchers tested several online physics labs where students completed their laboratories completely online. The faculty developed a set of traditional introductory physics laboratories to meet the same goals. While these courses were tests and the author notes that there is work to be done on their development, the author noted that the online laboratory courses were successful. It is important to note; however, that there was still resistance among some faculty participating in the initial venture and demonstrated hesitance toward the online learning aspect of physics. This continues to demonstrate that faculty resistance, especially in the sciences, is due to the laboratory-based nature of the courses.

Other studies have indicated that online, virtual laboratories can be successful in promoting learning (Delgarno, Bishop, & Bedgood, 2012; Dalgarno, Bishop, Adlong, & Bedgood, 2009; Dunham, Ghirtis, & Beleh, 2012; Paulsen, Eichhorn, & Brauer, 2010; Triola & Holloway, 2011; Pyatt & Sims, 2012). A common theme among all these successful online laboratory based classes was finding ways to address the teaching of a laboratory component and gathering support for its implementation. In these studies, the implementation of the laboratory was successful and fully integrated in with the online course. Another study conducted by Bird (2010), addressed the effectiveness of training students with the use and maintenance of a microscope and found that students tended to have a greater mastery of the use of the microscope when utilizing the virtual laboratory on the use of the microscope. Students were given a standardized quiz whether they were enrolled in traditional face-to-face laboratories or in an online versions of the same course. The research indicated that students performed much better in the online laboratory than in face-to-face laboratory. This indicates that students are benefiting from online courses as much, if not more, than in face-to-face classrooms, despite faculty hesitation.

Another study, by Triola and Halloway (2011), looked at the use of a virtual microscope lab in the online environment. This research focused on the effectiveness of virtual microscope labs in a medical histology laboratory. The program wanted to foster a more collaborative student effort by having virtual microscopes and slides available for student use outside of the standard laboratory. The result indicated that the virtual microscope for the histology course was an effective solution and fostered more collaboration among the students and the faculty. The virtual system allowed the students to have some control over their learning. Performance on exams were similar to or better than just using the traditional laboratory setting. The virtual microscope was successful and the program is offering free of charge to other schools.

A couple of studies, by Delgarno, Bishop, and Bedgood (2003 & 2009), looked at the effect of 3D virtual environments on student learning. The researchers looked at the usage rates of a virtual lab (which was optional) that was included for practice in a face-to-face chemistry lab. The researchers found the students who used the resource found it helpful, but less than half of the students even used it. The researchers suggested that the tool was beneficial to student learning for those that chose to use the resource. Students who used the tool became familiar with the laboratory they were working on before coming to the laboratory and helped them understand the concepts better and faster than without the resource. This should lend evidence to faculty who are hesitant in using online course tools. It appears that the research indicates that as long as students use the tool, the online environment can be successful despite faculty perceptions.

**Conclusion**

Despite the overwhelming majority of colleges and universities offering hybrid or online course, the research indicates that one limiting factor in the successful implementation of these courses tend to be faculty and their hesitations about the ability of an online or hybrid course to match the standards of the well established face-to-face approach to collegiate education. This review examined the hesitation of faculty in embracing the implementation of these course types. While the faculty have the best interests of their students in mind, it seems that many collegiate faculty have a misunderstanding of the value online courses have to provide the student. As the research presented above indicates, faculty tend to have a greater hesitations toward online course formats when they have little to no experience in those course platforms. Faculty with the least amount of training, support, and background in the online course format tend to have a more negative perception toward online courses. There are also the faculty that are more hesitant and less open to using online courses in their instruction. The research indicates that when faculty are given training, tools, and understanding of the online environment, they are more amenable to utilizing hybrid and online courses as part of their course delivery methods. It is essential that colleges and universities invest in training faculty and give faculty the experience they need to feel comfortable in offering these different course options. Once the colleges and universities take a more hands on approach to training their faculty, more educators will be on board with teaching using online tools and online formats. This will, in turn, lead to better educational opportunities for students in our colleges and universities.

Resources

Allen, I. E., & Seaman, J. (2007). *Online Nation. Five Years of Growth in Online learning. Needham, Mass.: Sloan Consortium*.

Allen, I. E., & Seaman, J. (2013). *Changing Course: 10 Years of Tracking Online Education in the United States. Needham, Mass.: Sloan Consortium.*

Barczyk, C., Buckenmeyer, J., & Feldman, L. (2010). Mentoring professors: A model for developing quality online instructors and courses in higher education. *International*

*Journal on E-Learning*, *9*(1), 7-26.

Bird, F. (2010, September). A comparison of the effectiveness of an interactive, online module versus a laboratory based exercise which introduces microscopy to first year biology students. In *Proceedings of The Australian Conference on Science and Mathematics Education (formerly UniServe Science Conference)* (Vol. 16).

Bolliger, D. U., & Wasilik, O. (2009). Factors influencing faculty satisfaction with online teaching and learning in higher education. *Distance Education*, *30*(1), 103-116.

Bowen, W. G., Chingos, M. M., Lack, K. A., & Nygren, T. I. (2013, Spring) Online Learning in Higher Education. *Education Next*, 58-64.

Chaney, D., Chaney, E., & Eddy, J. M. (2010). The context of distance learning programs in higher education: Five enabling assumptions. *Online Journal of Distance Learning Administration*, *13*(4).

Dalgarno, B., Bishop, A. G., & Bedgood Jr, D. R. (2003, October). The potential of virtual laboratories for distance education science teaching: reflections from the development and evaluation of a virtual chemistry laboratory. In *UniServe Science Improving Learning Outcomes Symposium Proceedings, Sydney* (Vol. 3).

Dalgarno, B., Bishop, A. G., Adlong, W., & Bedgood Jr., D. R. (2009) Effectiveness of a virtual laboratory as a preparatory resource for distance education chemistry students. *Computers & Education* *53*(3) 853-865.

Dunbar, A., Hossler, D., Shapiro, D., Chen, J., Martin, S., Torres, V., Zerquera, D., & Ziskin, M. (2011). National Postsecondary Enrollment Trends: Before, during, and after the Great Recession. Signature [TM] Report 1. *National Student Clearinghouse*.

Dunham, M. W., Ghirtis, K., & Beleh, M. (2012). The Use of Virtual Laboratories and Other Web-based Tools in a Drug Assay Course. *American Journal of Pharmaceutical Education*, *76*(5).

Georgina, D. A., & Hosford, C. C. (2009). Higher education faculty perceptions on technology integration and training. Teaching and Teacher Education, 25(5), 690-696.

Georgina, D. A., & Olson, M. R. (2008). Integration of technology in higher education: A review of faculty self-perceptions. *The Internet and Higher Education*, *11*(1), 1-8.

Gerlich, R. N., & Mills, L. (2003). The design and delivery of effective Web-based instruction: An analysis of faculty concerns. *Advances In Marketing*, 158.

Gibson, S. G., Harris, M. L., & Colaric, S. M. (2008). Technology acceptance in an academic context: Faculty acceptance of online education. *The Journal of Education for Business*, *83*(6), 355-359.

Graham, C. M., & Jones, N. (2011). Cognitive Dissonance Theory and Distance Education: Faculty Perceptions on the Efficacy of and Resistance to Distance Education. *International Journal Of Business, Humanities & Technology*, *1*(3), 212-227.

Haber, J., & Mills, M. (2008). Perceptions of barriers concerning effective online teaching and policies: Florida community college faculty. *Community College Journal of Research and Practice*, *32*(4-6), 266-283.

Kennepohl, D. (2007). Using home-laboratory kits to teach general chemistry. *Chem. Educ. Res. Pract.*, *8*(3), 337-346.

Mandernach, B. J., Mason, T., Forrest, K. D., and Hackathorn, J. Faculty Views on the Appropriateness of Teaching Undergraduate Psychology Courses Online. *Teaching of Psychology*, 39(3), 203-208.

Mitchell, B., & Geva-May, I. (2009). Attitudes affecting online learning implementation in higher education institutions. *Journal of Distance Education*, 23(1), 71–88.

Oomen-Early, J., & Murphy, L. (2009). Self-Actualization and E-Learning: A Qualitative Investigation of University Faculty’s Perceived Barriers to Effective Online Instruction. *International Journal on E-Learning*, *8*(2), 223-240.

Parker, K., Lenhart, A., & Moore, K. (2011) The Digital Revolution and Higher Education: College Presidents, Public Differ on Value of Online Learning. Washington D.C: Pew Internet & American Life Project.

Parthasarathy, M., & Smith, M. A. (2009). Valuing the institution: An expanded list of factors influencing faculty adoption of online education. *Online Journal of Distance Learning Administration*, *12*(2).

Paulsen, F. P., Eichhorn, M., & Bräuer, L. (2010). Virtual microscopy—The future of teaching histology in the medical curriculum?. *Annals of Anatomy-Anatomischer Anzeiger*, *192*(6), 378-382.

Picciano, A. G., Seaman, J., & Allen, I. E. (2010). Educational transformation through online learning: To be or not to be. *Journal of Asynchronous Learning Networks*, *14*(4), 17-35.

Pyatt, K., & Sims, R. (2012). Virtual and physical experimentation in inquiry-based science labs: attitudes, performance and access. *Journal of Science Education and Technology*, *21*(1), 133-147.

Reagan, A. M. (2012). Online Introductory Physics Labs: Status and Methods. *Journal of the Washington Academy of Sciences, 98*(1), 31.

Stewart, C., Bachman, C., & Johnson, R. (2010). Predictors of faculty acceptance of online education. *MERLOT Journal of Online Learning and Teaching*, *6*(3), 597-616.

Tabata, L. N., & Johnsrud, L. K. (2008). The impact of faculty attitudes toward technology, distance education, and innovation. *Research in Higher Education*, *49*(7), 625-646.

Tanner, J. R., Noser, T. C., & Totaro, M. W. (2009). Business Faculty and Undergraduate Students' Perceptions of Online Learning: A Comparative Study.*Journal of Information Systems Education*, *20*(1), 29-40.

Totaro, M. W., Tanner, J. R., Noser, T., Fitzgerald, J. F., & Birch, R. (2011). Faculty perceptions of distance education courses: a survey. *Journal of College Teaching & Learning (TLC)*, *2*(7).

Triola, M. M., & Holloway, W. J. (2011). Enhanced virtual microscopy for collaborative education. *BMC medical education*, *11*(1), 4.

Ward, M. E., Peters, G., & Shelley, K. (2010). Student and faculty perceptions of the quality of online learning experiences. *The International Review of Research in Open and Distance Learning*, *11*(3), 57-77

Wickersham, L. E., & McElhany, J. A. (2010). BRIDGING THE DIVIDE.Quarterly Review of Distance Education, 11(1), 1-12.

Zhao, J. J., Alexander, M. W., Perreault, H., Waldman, L., & Truell, A. D. (2009). Faculty and student use of technologies, user productivity, and user preference in distance education. *Journal of Education for Business*, *84*(4), 206-212.

Zhen, Y., Garthwait, A., & Pratt, P. (2008). Factors affecting faculty members’ decision to teach or not to teach online in higher education. *Online Journal of Distance Learning Administration*, *11*(3).