Fonolahi, A. V., & Jokhan, A. (2014). Are students studying in the online mode faring as well as students studying in the face-to-face mode? Has equivalence in learning been achieved?. *Journal of Online Learning and Teaching*, *10*(4), 598.

 Fonolahi and Jokhan researched the equivalency of learning in an online and traditional post-secondary mathematics course. The research questions focused on student performance and equivalence achievement between the two modes. The methodology for this study was for four consecutive years, coursework, exam, and overall scores were compared, along with the pass and attrition rate of both course formats. There was a shift in the face-to-face course when the notes were accessible online, but assessments were still done on paper. For both formats, the final exam was done on paper. The results of this study show similar performance from the total scores, but the online students scored better in the coursework, while the face-to-face students scored better in the final exams. These results were partly explained due to online students having more and a wider range of assessments as compared to the face-to-face mode students, and partly due to face-to-face students taking a more familiar paper exam.

There were several factors which could weaken the validity of the results. In this study, the total sample sizes for the delivery methods were considerably different. A much smaller sample size of 300 for the online class, verses a 1500 sample size for the face-to-face, may magnify details in the data for the online class that should not have been observable if equal sample sizes had been compared. In addition, the additional activities of the online classes forced more engagement with different types of assessments, and thus more learning opportunities than the face-to-face mode classes. This was possibly designed so that the additional activities would replace the learning spent in the classroom for a traditional course, but instead these results show that the additional interaction superseded the typical classroom interaction and thus achieved more than the established learning objectives. Finally, despite the use of technology in the face-to-face classroom, the electronic notes did not seem to significantly impact the results of the study as the effect of the method of access may be negligible. Despite a few uncontrolled factors, this study is a solid addition to the collection of research into distance learning.

Jones, S. J., & Long, V. M. (2013). Learning equity between online and on-site mathematics courses. *Journal of Online Learning and Teaching*, *9*(1), 1.

Based on the Equivalency Theory, Jones and Long studied equity in achievement between an online mathematics course and the same mathematics course on-site, with the purpose of contributing essential information for mathematic and general education decisions. The research questions focused on equity in learning between completing the course and successfully completing the course by online and on-site students. For ten semesters, the final course grade was used as measurement with successful completion marked at 70% or higher. The findings of this study were that when all ten semesters are considered, “there was a significant difference between on-site and online course achievement as measured by final course percentage grades, in favor of on-site course students” (p. 8). More analysis took two other factors into consideration -the beginning semesters contained students new to online courses in general, and an easier grading method was employed for the on-site course’s beginning three semesters. All together “since no significant difference was found between the mean scores for on -site and online students for the seven most recent semesters, it seems reasonable to conclude that it is possible for students in both on -site and online sections of a course to achieve equity in mathematics learning as measured by final course grades” (p.11).

There are three possible weaknesses of this study. First, the study only analyzed final course grades, which is not a thorough equity analysis for a semester long course. Second, since each student chose their own course format, there may have been a slant to the results since more organized and self-motivated students will generally choose a more independent format like an online class, while those who need more external motivation will generally chose the more guided class format. Third, the data collection for the on-site course is not consistent because the course changed instructors four times, introducing more uncontrolled variables into the study. Though Jones and Long tried to compensate for this by conducting a variety of statistical analysis, the foundation of the data is still unstable. A unique finding of this study was that both on-site and online had several lower grades that did not fit into the standard deviation, putting the normality of the dataset into question. This opens the study’s results for further analysis. In conclusion, this study does help to fill the research gap of online vs on-site mathematics equivalency learning, but it needs to be followed up by studies done with a more rigorous approach.

Lim, D. H., Morris, M. L., & Kupritz, V. W. (2014). Online vs. blended learning: Differences in instructional outcomes and learner satisfaction.

This study compared two delivery systems; online learning and blended learning. The purpose of this work was to “identify how the two delivery formats are different in their effectiveness for learners’ learning and satisfaction” (p. 28). The researched questions focused on achieved differences in learning, perceived differences in learning and satisfaction, and what facilitates or inhibits the learning in both groups. This study was done with a sample group of 125 students taking a program evaluation course at the University of Tennessee. The method of study was a combination of closed-end and open-ended questions in an online questionnaire. The results of this study showed both learner groups had a significant increase in perceived and actual learning, but with some meaningful differences in perceived difficulty and workload, favoring the blended learning. Instructional effectiveness or lack thereof was the most frequently reported reason for high and low learning between both groups, while the “opportunity to use learning” was less frequently reported by the online learners, than the blended delivery group.

In the literature review section they mentioned the limitations of online learning. These limitations included lack of belonging or community during online learning, necessary self-motivation and strong organizational skills to succeed. These considerations, instead of media differences in the two delivery methods, is a key factor to the success or failure in distance education courses, and therefore necessary to be addressed in research, just as in this study. An important note to consider is, usually due to lack of premeditated design, most online classes do not offer such a variety of media or interactive application activities as this specific course. This online course has clearly been intentionally designed with distance learning principles in mind, which makes the results of the study stronger and more reliable. The final results of this study were interesting because the actual learning increases did not considerably differ between groups, but the perceived difficulty, workload, and isolation were significantly higher for the online learning group. So for future application, distance education designers need to keep in mind, that while the learning objectives may be obtained to the same degree as blended or even traditional learning courses, the student’s perceived level of effort is higher and so will require appropriate course design modifications. This study is an exemplary work that takes in-depth consideration of factors and carefully eliminates extra variables which might disrupt the results. Still, more research is needed like this study concerning student perceptions of distance education.