

Evaluating Distance Learning in Health Informatics Education

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Abstract

The purpose of this study was to compare academic performance between distance-learning and on-campus health informatics students. A quantitative causal-comparative research design was utilized, and academic performance was measured by final GPA scores and Registered Health Information Administrator certification exam scores. Differences in previous academic performance between the two groups were also determined by comparing overall admission GPA and math/science admission GPA. The researchers found no difference in academic performance between the two groups when final GPA scores and total certification scores were compared. However, there were statistically significant differences between the two groups in 4 of the 17 sub-domains of the certification examination, with the on-campus students scoring slightly higher than the distance students. Correlation studies were also performed, and the researchers found significant correlations between overall admission GPA, math/science admission GPA, final GPA, and certification scores.

Key Words: Health informatics, distance learning, distance education, academic performance, comparative studies, allied health.

Introduction

Many colleges and universities now offer individual courses and entire programs through distance learning. The National Center for Education Statistics reported that in the 2000–2001 academic year, more than half of all two-year and four-year degree-granting institutions offered some form of distance learning. Furthermore, of the ones offering distance learning, approximately one-third offered entire programs through distance learning.¹

Concern has been expressed in regard to the academic performance of distance-learning students. For this reason, researchers have compared the academic performance of distance-learning students to their on-campus counterparts. Bernard et al. performed a meta-analysis of 232 comparative studies to determine the effectiveness of distance learning. The constructs that were analyzed were independent achievement (measured by comparing standardized test scores, either researcher-made or teacher-made), attitude, and retention. This meta-analysis found that some researchers reported that distance learning worked well for some students while others reported that it worked very poorly. However, Bernard et al. found that distance-learning students had slightly higher overall achievement than on-campus students.²

Allen et al. performed a meta-analysis of 500 comparative studies. These researchers also found that students in the distance-learning environment showed a small improvement in performance when compared to their on-campus counterparts. They also studied the course content in relation to student success for the two groups, distance-learning and on-campus. In the natural science and education courses, the researchers found no difference in academic performance. However, in military-related instruction the distance-learning students did not perform as well as their on-campus counterparts. Healthcare education was not mentioned in this meta-analysis.³

The field of allied health has seen a significant increase in the number of degrees offered through distance learning.⁴⁻⁷ Recent research studies have focused on comparing the academic performance of distance-learning and on-campus students. Few studies have focused on allied health education, and even fewer have examined the academic performance of students who completed their entire program via distance learning.

In the field of clinical laboratory science, two research studies compared the academic performance of students who took their entire program through distance learning to that of their on-campus counterparts. Crowley et al. found that distance students had a higher certification pass rate than on-campus students.⁸ Russell et al. found no differences in the mean final grade point averages (GPA) and mean external certification scores between the two groups. In addition, the researchers found significant positive correlations between overall admission GPA scores, math/science admission GPA scores, final GPA scores, and certification scores when the two groups, distance and on-campus, were analyzed together and separately.⁹

Olmsted compared the national board examination scores, grades in core curriculum courses, and final GPA scores of distance-learning and on-campus dental hygiene students and found no significant differences. In addition, Olmsted also found a significant positive correlation between final GPA scores and national board examination scores for both on-campus and distance-learning students.¹⁰

The academic performance of health informatics students who have completed distance learning programs as compared to that of students who have completed traditional on-campus programs has not been thoroughly investigated. One study was found that related mean cumulative GPA on admission to certification pass rates. In this study, a survey was sent to all 46 accredited health information administration programs in the United States asking the program directors to report certain program components, such as mean cumulative GPA on admission, and the certification pass rates of graduates. The researchers found a significant positive correlation between the mean cumulative admission GPA and the percentage of graduates passing the RHIA certification examination at the 46 accredited health information administration programs. However, they did not indicate whether any of the programs in the study were offered through distance learning.¹¹

Hersh, Junium, Mailhot, and Tidmarsh compared the academic performance of distance and on-campus students in an introductory medical informatics course. Academic performance was measured by comparing final examination scores and term paper grades. The researchers found that the distance students performed better on the final examination and also received higher grades on the term paper. However, the final examination was administered differently for the two groups. The on-campus students were given three hours to take an in-class exam, and it was open book. The distance students took the exam at home and were given a week to complete the exam. The study did not discuss how the term paper was graded for the two groups.¹²

Conflicting results have been found in regard to gender and age when comparing academic performance of distance-learning and on-campus students. Cheung and Kan found that in the distance-learning environment, gender was significantly related to academic achievement while age was not. In their study, they found that women outperformed men in a business communication course and that age did not make a difference in the scores received for the course.¹³ However, Alstete and Beutell found no relationship between gender and course performance at the undergraduate level in an online business management course, but they did find a significant relationship between age and academic performance, with older students performing better than their younger counterparts. These researchers postulated that

younger students might not do well in a distance-learning course due to the independent learning required in this environment.¹⁴ Finally, Barakzai and Fraser also found no significant difference in academic performance between men and women in two healthcare education courses.¹⁵

Two measures of academic performance that allied healthcare educators were concerned about were final GPA scores and national board or external certification exam scores.¹⁶ A review of the literature documented that most of the research performed has centered on the comparison of allied health students' grades in single courses, and the researchers were able to retrieve only three studies¹⁷⁻¹⁹ that compared academic performance of distance-learning students who took their entire program via distance learning to that of their on-campus counterparts. In addition, no published studies were found that compared the academic performance of health informatics students who completed their entire program via distance learning to that of on-campus health informatics students.

Purpose of the Study

The purpose of this study was to determine if there were differences in academic performance between distance students and on-campus students in health informatics. Another goal was to determine if there were any relationships between age, overall admission GPAs, math/science admission GPAs, final GPAs, and certification scores within the group as a whole and within the groups of students in the two separate learning environments.

Research Questions

The research questions were as follows:

1. To what extent does academic performance (final GPA, calculated from the students' professional courses while enrolled in the health informatics program, and RHIA certification examination scores) differ between distance-learning students and traditional on-campus health informatics students?
2. Are there any relationships between age, overall admission GPA, math/science admission GPA, final GPA, and certification scores within the group as a whole and within the two separate learning environments?

Materials and Methods

The research study was conducted at an academic health sciences "transfer" university. The students transferred into the health informatics program after completing core work at an accredited institution. The health informatics curriculum was offered through both distance-learning and on-campus programs. The sample was derived from the years 2005 and 2006. The total sample was 31 students, with 17 on-campus students and 14 distance students.

The curriculum was the same for the distance and on-campus programs. The students in both environments had exactly the same content, the same instructors for each course, and the same exams throughout the curriculum. The only difference in the two programs was the delivery vehicle. The on-campus students came to class to attend lectures. While the on-campus lectures were delivered, they were also recorded for the distance students through the use of a classroom capture software system. The lectures were then uploaded into the course management software so the distance students could view them. The admission criteria for the distance students and the on-campus students were exactly the same. However, one major difference between the distance and on-campus students was that the distance students were nontraditional students, and the majority of them attempted to hold full-time jobs while completing the full-time curriculum.

The researchers used a causal-comparative research design, and after obtaining approval of the Institutional Review Board (IRB), they collected the following data on each graduate: age, gender, overall admission GPA, math/science admission GPA, and final GPA collected from the registrar's database, and the Registered Health Information Administrator (RHIA) certification exam score collected from the American Health Information Management Association School Score Report for the program. The

dependent variable in this study was the academic performance, and the independent variable was the learning environment, either distance or on-campus.

Descriptive statistics and a chi-square analysis were performed to determine if there were any differences in age between the two groups. Independent two-sample *t*-tests were performed to determine if there were any differences between the two groups for overall admission GPA, math/science admission GPA, final GPA, RHIA examination scores, and scores on sub-domains of the RHIA examination. In addition, correlation studies were performed to determine if there were any relationships between age, overall admission GPA, math/science admission GPA, final GPA, and RHIA exam score. If a relationship was found, then regression studies were performed.

Results

A total of 31 sets of student data were collected for this study; 17 of these were from on-campus students and 14 were from distance students. A total of 21 graduates had taken the RHIA examination at the time of this study. Of these 21 graduates, 11 were on-campus students and 10 were distance students, which accounted for 68 percent of the total sample.

Descriptive statistics showed that 76 percent of the on-campus students were female while 100 percent of the distance students were female. A chi-square test was performed to determine if this difference was statistically significant, and the Pearson chi-square value was 3.78.

Independent two-sample *t*-tests were performed to determine if there were any statistically significant differences between the distance and on-campus learners for age, overall admission GPA, and math/science admission GPA. The mean age for the on-campus students was 27 while the mean age for the distance students was 31. The distance students' mean overall admission GPA was 2.97, and their mean math/science admission GPA was 2.72. The on-campus students had a mean overall admission GPA of 3.10 and a mean math/science admission GPA of 2.86. The results of the *t*-tests for these variables are listed in Table 1.

Final GPA scores and RHIA examination scores were used as a measure of academic performance. Independent two-sample *t*-tests were performed to determine if there were significant differences between these two groups. The mean final GPA score was 3.56 for the distance students and 3.47 for the on-campus students. The mean RHIA examination score was 113.5 for the distance students and 119.7 for the on-campus students. The *t*-test values for these two constructs are listed in Table 1.

The RHIA examination is based on a specific set of competencies determined through a job analysis. From these competencies, five domains were developed as a percentage of the total examination score: Health Data Management (25 percent), Health Statistics, Biomedical Research and Quality Management (10 percent), Health Services Organization and Delivery (20 percent), Information Technology and Systems (20 percent), and Organization and Management (25 percent). Each of these domains are divided into sub-domains. Before October 2005, there were 12 sub-domains within the five domains. In October 2005, the examination was changed from 12 sub-domains to 17 sub-domains.²⁰ For this reason, some sub-domains did not include results from all graduates. The means and independent two-sample *t*-tests for these sub-domains are shown in Table 1.

Correlation studies were performed to determine if there were any relationships between age, overall admission GPA, math/science admission GPA, final GPA, and RHIA examination scores. The correlations were performed for the distance and on-campus students together, and then correlations were performed for the two groups separately. For the combined groups, the correlation coefficient for age and final GPA was 0.22; the correlation coefficient for age and RHIA examination scores was -0.05. For overall admission GPA and final GPA, the correlation coefficient was 0.59; for overall admission GPA and RHIA examination scores it was 0.66. The correlation coefficient for the math/science admission GPA and final GPA was 0.67; for math/science admission GPA and RHIA examination scores it was 0.58. There was a correlation coefficient of 0.57 for final GPA scores and for RHIA examination scores. The overall admission GPA and math/science admission GPA were correlated, and the correlation coefficient was 0.92. These results are shown in Table 2.

Regression studies were performed on the overall admission GPA, math/science GPA, and final GPA with the RHIA examination scores for all examinees. An increase in the overall admission GPA of 1 point correlated with an increase in the RHIA examination scores of 18.16 points. For the math/science admission GPA, an increase of 1 point correlated with an increase of 13.35 points on the RHIA examination. Finally, an increase of 1 point in the final GPA correlated with an increase of 23.27 points on the RHIA examination.

The correlation coefficients were different for some of the variables when the two groups were analyzed separately. For the on-campus students, the correlation coefficient for age and final GPA was 0.07; for age and RHIA examination scores it was 0.04. For the distance students the values were 0.35 and -0.13 respectively. The on-campus students had a correlation coefficient of 0.70 for overall admission GPA and final GPA scores and 0.66 for overall admission GPA and RHIA examination scores. The distance students' correlation coefficients for these variables were 0.49 and 0.60 respectively. The on-campus students' correlation coefficient for math/science admission GPA and final GPA was 0.67; for math/science admission GPA and RHIA examination scores it was 0.61. The distance students' correlation coefficients for these variables were 0.71 and 0.47 respectively. There was a correlation coefficient of 0.80 for final GPA scores and for RHIA examination scores for the on-campus students and a correlation coefficient of 0.35 for the distance students. The correlation coefficient for overall admission GPA and math/science admission GPA for the on-campus students was 0.94, and for the distance students it was 0.90.

Discussion

The descriptive statistics show that more females than males were enrolled in the campus program and that the distance program consisted of all females. Chi-square testing found no statistically significant difference in gender between the two groups. The data show that the distance students, on average, were slightly older than their on-campus counterparts, but the *t*-value is not statistically significant.

Overall admission GPA is used to evaluate students for admission into the health informatics program. The student must have a minimum overall GPA of 2.30 to be admitted into the program. When results for admission GPA were analyzed, differences were found in these two variables between the two groups: the means were slightly higher for the on-campus students when compared to the distance students. However, the results are not statistically significant.

Final GPA and RHIA certification examination results were used as measures of academic performance. The final GPA scores for the distance students were slightly higher than for the on-campus students, but again, the results are not statistically significant. When the certification scores were analyzed for differences between the two groups, the distance students had a slightly lower mean than the on-campus students; however, the results are not statistically significant. As stated earlier, the RHIA certification examination is divided into five major domains, and these domains are divided into 17 sub-domains. The analyses showed no statistical differences in 13 of the sub-domains. However, there were differences in four sub-domains, with the on-campus students scoring slightly higher than their distance counterparts. These sub-domains were 1A Health Data Structure, Content and Standards; 2A Healthcare Statistics and Research; 4A Information and Communication Technologies; and 4B Data, Information, and File Structure.

Correlation analyses to determine relationships between age and academic performance showed no correlation between age and final GPA or age and certification results. However, a moderate positive correlation was found between previous academic performance (measured by overall admission GPA and math/science admission GPA) and final GPA. In addition, there was also a moderate positive correlation between overall admission GPA and certification score as well as between math/science admission GPA and certification scores. Furthermore, there was a moderate positive correlation between final GPA scores and certification scores.

Regression analyses were performed on statistically significant correlations. With an increase of 1 point in the overall admission GPA, there is a significant increase in the certification scores. This

relationship is also seen with a 1-point increase in math/science admission GPA and a 1-point increase in final GPA.

The correlation coefficients are different when the two groups, distance and on-campus, are separated. The correlations for the on-campus students are very similar to the correlations for the two groups combined. However, there are quite a few differences between the distance students and the on-campus students. There is a significant correlation between overall admission GPA, final GPA, and certification scores for the on-campus students, but a significant relationship is not seen for the distance students. There is also a significant relationship between math/science GPA and certification total for the on-campus students, but again, a significant relationship was not found for the distance students. Furthermore, the significant relationship found for the on-campus students between final GPA and certification (0.80) was not found for the distance students (0.35). The sample size is small for both the distance students (10) and the on-campus students (11) who took the certification examination. Further research with a larger sample size is needed to determine why these differences exist.

Conclusion

This study shows that distance students perform academically as well as their on-campus counterparts when comparing final GPA scores and RHIA certification scores. These results are similar to those found by Olmsted and Russell et al.²¹⁻²² Therefore, these results support the use of distance learning in health informatics programs and provide documentation that these programs can successfully educate health informatics professionals.

The correlation studies for the combined groups show that using overall admission GPA and math/science admission GPA as criteria for admission is a good practice because they correlated well with final GPA scores and RHIA certification scores. The statistically significant correlation between overall admission GPA and RHIA certification scores is in agreement with the research performed by McNeill and Brockmeier.²³ The data suggest that the overall admission GPA and math/science admission GPA for on-campus students are strong predictors for final GPA scores and RHIA certification examination scores. However, this is not true for the distance students; only the math/science admission GPA and final GPA were significantly related. The lack of a statistically significant correlation between the overall admission GPA and the RHIA certification examination score, and between the math/science GPA and the RHIA certification examination score, suggests that further studies may need to be performed. Additional research that includes more graduate data will need to be conducted to determine whether the admission criteria should be different for distance students and on-campus students.

Distance learning in allied healthcare education, including health informatics education, is a reality. Individual courses and entire programs are being offered via distance learning. With the current work force shortages in many of the allied health professions, educators are considering offering or currently offer distance learning with the hopes that this venue will boost the number of graduates entering the work force. However, because of the scarcity of research studies, allied health educators need to continue to assess the quality of their distance and on-campus programs. Research such as this will reassure educators, program directors, accrediting bodies, practitioners, and future students that distance learning is a viable alternative to the traditional face-to-face instruction that has dominated healthcare education.

The sample size included in this research study was small. Further research needs to be conducted with larger sample sizes in addition to research studies that examine all disciplines within allied health. In addition, qualitative research studies need to be performed that examine the work quality of practitioners educated via distance learning. With further research the true outcomes of distance learning can finally be realized.

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Table 1***t*-test Values for Outcomes**

Outcome	On-Campus Mean	Distance Mean	<i>t</i>-value
Age	27.06	31.21	-1.32
Overall GPA	3.10	2.97	0.69
Math-Science GPA	2.86	2.72	0.65
Final GPA	3.47	3.56	-0.61
Certification Score Total	119.73	113.50	0.98
Domain I: Health Data Management			
1A	13.73	10.40	2.17*
1B	6.64	7.60	-1.37
1C	5.91	4.70	1.50
1D	4.20	4.67	-0.48
Domain II: Health Statistics, Biomedical Research and Quality Management			
2A	8.73	5.30	2.31*
2B	5.91	5.60	0.40
Domain III: Health Services Organization and Delivery			
3A	9.18	11.30	-1.89
3B	11.00	11.50	-0.49
Domain IV: Information Technology and Systems			
4A	8.45	6.50	2.31*
4B	6.55	3.80	2.46*
4C	5.20	4.89	0.70
4D	4.40	4.00	1.09
4E	5.20	5.33	-0.13
Domain V: Organization and Management			
5A	12.82	9.60	1.86
5B	12.55	9.10	2.01
5C	4.80	4.33	0.88
5D	7.40	7.11	0.37

* $p < 0.05$

Table 2**Correlations and Descriptive Statistics for the Entire Sample**

Outcome	Age	Overall GPA	Math/Science GPA	Final GPA	Certification Score
Age	---	0.043	0.026	0.222	-0.050
Overall GPA	0.043	---	0.920**	0.591**	0.662**
Math/Science GPA	0.026	0.920**	---	0.665**	0.581**
Final GPA	0.222	0.591**	0.665**	---	0.570**
Certification Score	-0.050	0.662**	0.581**	0.570**	---
Mean	28.94	3.04	2.80	3.51	116.76
Standard Deviation	8.86	0.52	0.60	0.39	14.57
Number	31	31	31	31	21

* $p < 0.05$, ** $p < 0.01$