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Abstract

This action research study compared the ACT scores of students from an online high school and a public high school in Sioux Center, Iowa. ACT scores in Reading, Math and the Composite score were collected for both groups and then the mean was taken for each group. A t-test was performed to evaluate if there is a significant difference in student performance between online delivery and face to face educational delivery. The result shows that online students outperform public school students in the reading portion of the exam; while the public school students out-perform on the math portion showing no statistical difference in the composite. This suggests that online and public students perform similarly overall on the ACT and that further study is warranted on this topic.

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Action Research Report Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Education

A Comparison of Online Student vs. Public Student Performance
on the ACT

by

Sarah Schultz

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Action Research Report
Submitted in Partial Fulfillment
of the Requirements for the
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Dordt College

Sioux Center, Iowa

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Abstract

This action research study compared the ACT scores of students from an online high school and a public high school in Sioux Center, Iowa. ACT scores in Reading, Math and the Composite score were collected for both groups and then the mean was taken for each group. A t-test was performed to evaluate if there is a significant difference in student performance between online delivery and face to face educational delivery. The result shows that online students outperform public school students in the reading portion of the exam; while the public school students outperform on the math portion showing no statistical difference in the composite. This suggests that online and public students perform similarly overall on the ACT and that further study is warranted on this topic.

Introduction

While various forms of online education continue to proliferate at primary, secondary, and graduate levels, the *de facto* view among educators has consistently lingered on that model's perils rather than its potentials. In that received view, online schools have been presumed to be less effective than traditional brick and mortar models on the grounds that teacher quality, student involvement, and the overall academic rigors of online models are inferior to traditional models (University of Illinois). Thus, even while dedicated online schools and online offerings from traditional brick and mortar schools are growing exponentially, educators and academics consider online educations inherently second-class when compared with those delivered by traditional means.

There is valid historical justification for the broader educational world's incredulity toward distance learning. Historically, the only education outside a traditional brick and mortar setting was by correspondence course. While among these there may have been some quality programs, in general, correspondence programs were too frequently little more than diploma mills trading sheep skins for money—so long as students jumped through the proper hoops (Valentine 2002). These correspondence schools were among the first to recognize the potential inherent in distance education conducted over the internet. However, in most cases, establishing distance curricula meant little more than adjusting the mode of content delivery as opposed to adapting existing pedagogies to embrace the unique challenges and benefits of online delivery. For this reason the majority of the first wave of online programs were rightly dismissed by the educational establishment as little more than digital diploma mills—fleecing parents with little concern for the educational value or integrity of the services they provided (Phillips 2009).

However, in spite of the bad reputation that online education earned in those first few years, at the beginning of the Twenty-first Century parent and student interest in online educational models and participation in online programs has continued to grow (Lederman 2013). For many parents and their students the flexibility that online education provides allows students to cope with medical issues, geographic restrictions, or complex travel schedules. If conventional wisdom is to be believed these parents and their students are overlooking considerable loss of educational efficacy for a measure of flexibility and comfort.

Rather than assuming the derisive attitude of the past or jumping aboard the bandwagon of the present, a careful consideration of the effectiveness of online education grounded in actual statistical evidence is prudent. While many concerns have been addressed since the earliest days of online education, some others linger as legitimate shortcomings of that model. Educational commentators are right to note that students do have a harder time connecting with their teachers and other students when using an online program. The lack of robust student/teacher interaction does diminish the richness of relationship enjoyed in face-to-face encounters. Such problems are exacerbated when online programs are little more than ports of older correspondence courses or traditional brick and mortar schools' curricula without any attempt to take advantage of all that the Internet has to offer.

Similarly, educational commentators legitimately note that the training opportunities for teachers to specialize in online pedagogies are few and far between resulting in many educators being thrust into this brave new computerized world only to fall back on less effective traditional techniques intended for use in a face-to-face classroom. Educational pundits may also point out that students engaged in online learning are much more likely to drop out or fail when compared

with those in traditional classrooms (Hawkins et al. p. 11). All of these factors present legitimate concerns for proponents of online education (University of Illinois).

In opposition to the stasis position that sees online pedagogies as, at best, pale imitations of traditional models, a handful of analysts acknowledge some advantages offered by online education not normally present in brick and mortar programs. Some of these advantages are shared by other private educational models. Paying for an educational opportunity has the added value of causing both parents and students to take that education more seriously than if it had been free (Raub p. 3). Similarly, students who enroll online are typically of a higher socioeconomic population which typically correlates with greater academic performance (Cobb and Glass p. 5). However, online school populations are trending toward a greater diversity as more opportunities open up in the realm of public online education which might change the SES statistics over time (Hawkins et al. p. 65).

While it is the intention of this paper to shed statistical light on the debate between online and traditional models of education it is also necessary to state its presuppositions and acknowledge the challenges facing online pedagogies. At this point it is a nearly indisputable truism that teacher interaction is a strong predictor of success in both K-12 learners and adult learners in any program—with online programs being no exception to this rule (Hawkins et al. p. 66). Therefore, it may be assumed that those online programs that make teacher interaction the greatest priority will produce the most favorable results. To this end, teachers in the online arena will likely need to be even more proactive in their engagement of students, making the best use of all tools at their disposal to engage student attention and deliver the material in as many ways as possible. Not surprisingly this new vigilance expected of online educators will need to be

matched by their students exhibiting a greater ability to take a more active role in their own education. Online students may no longer rely passively on the teacher to deliver predigested information. Failure to adapt to this more active educational posture will leave some students frustrated and floundering in the new medium. As Valentine (2002) notes in “Distance Learning: Promises, Problems, and Possibilities,” parents and teachers need to be aware that the first few months of online education will be spent not just learning new material but learning how to learn in the new environment.

Purpose of the Study

The purpose of this study was to examine student performances on the ACT test, comparing results from an online institution and a traditional institution. Student scores were analyzed to see if there was a significant disparity in student performance in the high school years between students in online and traditional settings.

Research Question

The following question was considered: How does annual student performance compare between the two school settings?

Summary

As we evaluate the efficacy of online education as compared to face to face instruction I hope to either statistically dispel its presumed inadequacy in the face of traditional pedagogies or give that prejudice a much needed foundation in actual documented outcomes. However, it must also be acknowledged that this larger research question be understood against and within the real world challenges and limitations of any actual instantiation of a pedagogical approach.

Literature Review

An exhaustive look was conducted into the available literature concerning (1) hypothetical discussions of hypothetical or potential disadvantages of online education and (2) the effectiveness of standardized tests at predicting student's readiness for college. It was demonstrated that while much has been written regarding online pedagogical strategies and still more written regarding the effectiveness of standardized tests to measure educational outcomes, precious little research has been published using actual statistical data from standardized testing to demonstrate that online education is, indeed, less effective than traditional pedagogies in preparing students for college.

Articles highlighting the potential disadvantages of online education will generally concede that there are a variety of reasons students choose an online program of study at the high school level or post-secondary level (Valentine, 2002). Students and their parents may employ online learning solutions for enrichment purposes or to facilitate credit recovery, or because of limitations surrounding their living situation, health and wellness issues, or simply geographic distance from more traditional schools. Online education, then, appeals to students and parents because it affords them the opportunity to work in an environment that is more closely aligned with their lifestyle and allows them a degree of flexibility not possible in more traditional educational models.

However, these same sources are also quick to point out that for all the benefits that online pedagogies afford their constituents, they also suffer from a variety of challenges not present in traditional schools (Valentine, 2002). These challenges include the fact that online environments generally offer less student/teacher interaction, suffer from poor retention rates, and have a generally poor track record in preparing teachers for the unique challenges of online pedagogy.

In “Academic Performance, Course Completion Rates, and Student Perception of the Quality and Frequency of Interaction in a Virtual High School” Hawkins et al. (2012) note online pedagogies generally offer far less student/teacher interaction when compared to traditional schooling, and that increased teacher interaction has been a key indicator for student’s future collegiate success (Hawkins, Graham, Sudewees, and Barbour p. 65).

Other published studies note that online education struggles more than traditional brick and mortar schools with issues related to student retention. While students’ grades tend to be similar or even better than those of their traditional school counterparts, online learners are less likely to remain enrolled (Barbour p.16). This tendency may best be explained by noting that students’ past experiences can sometimes provide a roadblock to their success in online settings. Thus, in online schools aimed at credit recovery, one would expect students’ previous negative experiences to result in reluctance to engage with the material and their teachers. This reluctance to make meaningful connections either with the content or their teachers contributes negatively toward students’ willingness to stay in any educational environment (Barbour p. 18). Finally, the body of literature related to online education argues that the majority of teachers lack sufficient specialized training in the unique skills that are required of an online educator. Just as online students must develop specialized skills in order to be successful in their virtual environment, so too must virtual teachers develop specialized skills for teaching online (Davis, Roblyer p. 400). While all educators are trained toward developing excellent communication skills, online teachers must also develop their understanding of the shift in perception that online environments elicit. For example, the online paradigm necessitates a sense of how the online space allows for distinct pedagogical approaches, the unique limitations of synchronous and asynchronous in-

struction, and the proper use of online management techniques designed to aid in student accountability (Easton p. 89). As a result of these specialized concerns, authors argue that it is imperative that educators avail themselves of programs that aid in the formation of these specialized competencies. However, very few teaching programs are geared toward that end. Four pilot programs that launched in 2004 focused on training in these skill sets. These programs were located at Iowa State University, University of Florida, University of Virginia and Graceland University in Iowa (Davis p. 402). Since that time several more programs have been made available, but most are isolated courses available as electives rather than full university teacher certification majors. In fact in many states online teaching is not counted as teaching experience in the teacher certification process. This state-sanctioned view of online education as inherently second-class places many young teachers at a disadvantage because, while they might prefer to gain experience in the online field, their time working for online institutions does not contribute toward fulfilling the experience requirements of many states' teaching licenses. Therefore, both the lack of appropriate educational degree options and many states' licensing policies that discourage teaching professionals from taking jobs in online environments perpetuate a bias in teacher education that favors traditional educational environments over their online equivalents.

Together, online education's tendency toward less student/ teacher interaction, generally lower retention rates, and a teacher education system ill prepared to provide the specialized training required for successful online pedagogies have been assumed to render online education a poor substitute for more traditional schools. Ironically, one of the very few publications using statistical analysis of standardized tests actually found no statistically significant difference in the college readiness of online students and their traditionally schools counterparts. This meta-anal-

ysis conducted by Cavannah, Gillian, Kromrey, Hess and Blomeyer (2004) evaluated the effectiveness of online programs by comparing the outcomes of fourteen K-12 online programs with traditional learning environments. Data analysis found no significant difference between student performance in these online settings versus a traditional school (Cavannah p. 21). While it was noted by Dickson that a student's success in online schooling was strongly affected by the type of course the students was taking, it was determined that the same subject matter taught virtually and traditionally gave similar rates of student success.

To ascertain academic effectiveness of the various formats, a reliable assessment instrument is useful. The literature generally supports the notion that higher ACT scores indicate a higher degree of college readiness. The ACT has long been relied upon as a measure of a student's college readiness. In research as recent as that of Furgol, Fina, and Welch in 2011 the ACT was further determined to correlate well with the results of the Iowa Test of Basic Skills and College Readiness Boards (CRBs). That is, the scores of ACT takers, when compared with their eventual performance on the CRBs, determined that ACT scores effectively identified students' degree of preparation for college (Furgol et al. p. 22). Since the ACT is a test that is well accepted and widely used in schools across the nation it provides a consistent measure of student performance overall.

Bettinger's study of the ACT's validity suggests that only certain subtests are predictive of student readiness, specifically the Mathematics and English subtests (p.18). The criticisms that are cited for the ACT are focused on the less predictive nature of the Reading and Science subtests (Bettinger p. 18). In summary, the American educational system has long understood that ACT scores can be predictive of college readiness, which supports the use of ACT scores as an indicator of the effectiveness of pre-college pedagogical environments.

Some might wonder whether some standardized state testing or MAP testing might be a better measure of college readiness for the purposes of this study. However, neither any sort of standardized state testing nor MAP testing is as applicable for this particular study as the ACT. This is because of the geographically and academically diverse population that Alpha Omega Academy serves. AOA draws students from all over the world and therefore consistent standardized state testing is not applicable for many students. As such there are very few standard means by which we evaluate student college readiness. AOA does request that students take the MAP test in order to measure their growth from year to year. However, many studies have suggested that the MAP test is not a reliable assessment of college readiness (Brown p. 8). In addition to its questionable reliability the MAP test also gauges growth from one school year to another, and Alpha Omega Academy often has many students who enroll at various points in their education. Therefore the MAP is measuring both their baseline performance and their growth. We also cannot separate students' baseline test scores from their growth scores; therefore, we cannot determine if the values we are looking at are measuring our educational ability or the student's previous school's performance. For the aforementioned reasons, students' ACT results have been determined to provide the best statistical basis for measuring college readiness for the purposes of this comparison.

Methods

Participants

In this study I was comparing and analyzing the differences in ACT scores between two educational institutions. The first institution is an exclusively online school with approximately 2500 students in grades three through twelve. The second institution is a public high school in a small town in Iowa which serves approximately 1100 students. There were 51 participants in the

online school where there was an equal distribution of males and females however age data was not collected. From the public high school there are 67 participants all of whom were juniors with an equal distribution of males and females.

The online school was selected because it is one of the largest online institutions in the country and has been in operation since 1993. The student body hails from over 40 countries and represent a cross section of former homeschooling families, Christian schools, students with medical needs, professional athletes and students from the public school setting. In the online institution the ACT is an optional exam used for college admittance, yielding about 50 students a year who complete the ACT with the school's code and therefore have made their data available.

The public institution was selected because it is a typical public institution in Iowa. However, they require that all students, including those identified as special needs students, take the ACT regardless of their career path. As such, it would be expected that the public institution's results will be skewed toward lower than average scores as that institution's data pool included scores from a portion of the population that typically chooses not to participate in ACT testing.

Materials

The data for this study was provided by the ACT college readiness assessment scores of students at both institutions. This assessment is one of the two commonly utilized tests to predict college readiness in high school students. It is also the more commonly used assessment for both the online institution and the Iowa high school.

Procedure

The participant scores in reading, math and the composite score were compiled and a mean determined for each category. A comparison was made between the mean scores for the online and public institution for each category. A T-test was performed to determine if there was

a statistically significant difference in performance on this assessment between the participants in the online institution and the public institution.

Results

Data Analysis

The independent variable for this comparison was the format of instruction, meaning whether students were enrolled in an online institution or a public high school in a more traditional face-to-face format. The dependent variable for this comparison was the average ACT score on the three scores examined: the student's reading, math and composite scores. Once the ACT scores of both institutions had been gathered a comparison was made between the Reading, Math and Composite scores for both institutions. A T-Test was run between the mean scores of both schools in all three categories.

Findings

Fifty-one online students were sampled from Alpha Omega Academy, while there were 58 students sampled from the public school. Since the public school requires all juniors to take the ACT, the identified special education students were removed from the public school sample since Alpha Omega Academy does not identify or accommodate special education needs. As such there was no way to identify if the students who took the ACT from Alpha Omega Academy were special education or not.

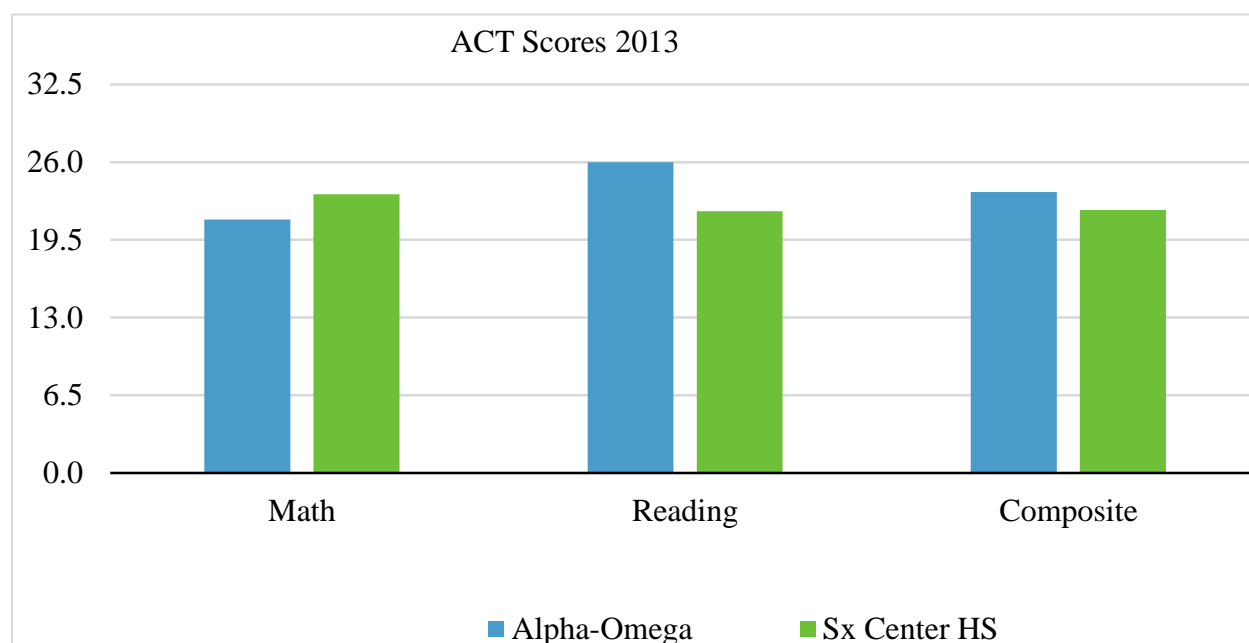
As we can see from the graph below there was a significant difference between the readings scores of students in Alpha Omega Academy vs. the public school ($p < 0.05$). This indicates that the average student from Alpha Omega Academy performed better at reading tasks than comparable students at the public school. There was also a significant difference between

the math scores of the public schools students verses the online students ($p < 0.05$). This indicates that the public schools students outperformed the online students on mathematical tasks. However, on the composite scores from both schools there was not a significant difference between student performances. Test results were also analyzed based on the gender of the student and it was found that there was no significant difference in performance between males and females in either the online institution or the traditional institution or between the two institutions.

Mean values for ACT results

| | Math | Reading | Composite |
|--------------|----------|----------|-----------|
| Alpha-Omega | 21.2 | 26.0 | 23.5 |
| Sx Center HS | 23.3 | 21.9 | 22.0 |
| T-test | 0.015501 | 0.000179 | 0.067001 |

Comparison of mean values for ACT



Discussion

Educators and academics have conventionally presumed that online pedagogies are inherently less effective than traditional models on the grounds that teacher quality, student involvement, and the overall academic rigors of online models make them inferior to traditional models. This perception has resulted in the seeming paradox of the continued growth of “inferior” online pedagogies that—in some cases—have even supplanted the presumptively far more effective face-to-face approaches. This triumph of so-called second-class online pedagogy over traditional and time-tested approaches would be difficult to explain by anything other than the consumer’s demand for flexibility and comfort at the expense of actual preparation for college—if online pedagogies were truly inferior. In this study we attempted to dispel that misconception by comparing the ACT scores of students from an Iowa public high school with the ACT scores of students from an online school to see if there was any significant difference in performance between the two educational settings.

Implications

As we can see from the data provided, student ACT performances at a public high school and an online institution were very similar. The online institution outperformed the public high school on the reading portion of the exam, with AOA performing with an average score of 26.0 and the public school receiving an average score of 21.9. This yields a $p = 0.0001786$, indicating that the online school outperforms the public school consistently on the reading portion of the exam.

For the mathematics portion of the exam the public school scored a mean of 23.3 while AOA scored a mean of 21.2, giving a $p = 0.1550$. This is not surprising since teaching mathematics is particularly challenging in an online setting where one-on-one attention is at more of a premium. It is also harder to establish student weaknesses with mathematical skills in an online format and it can be harder to intervene if there is little student disclosure about their struggles. The composite performances for both schools are more equal with AOA scoring an average composite score of 23.5 and the public school scoring an average 22.0. This similarity in scores means that there was no statistical significance to the difference between the scores of the online institution and the public school. This would seem to indicate that there is little substance to the assertions that online education is of an inferior quality to a more traditional educational setting.

All of the public school findings are values derived after the identified special education students were removed from the sample set. By contrast, the online school might have had special education students participating in the testing since the school does not provide services for special education students and there is no data on that population at the school. Nonetheless, it seemed prudent to remove the identified students from the sample set so as to eliminate that bias.

Therefore, while very little quantitative research has been done contrasting online student performance with traditional pedagogies, the results of this study seem to indicate that it would be advisable to conduct more studies of this type with a larger sample size and a more diverse student population. This would enable researchers to extrapolate the findings to a more general statement of the quality of educational experience that a student receives at online institutions as

compared to traditional face to face models. It would also allow for a more statistically significant sample set so as to reinforce the validity of these results. Further longitudinal studies would also eliminate any chance that the data has been skewed as a result of disproportionately high performing classes of students. While a study of this size and type does not allow for broad conclusions to be drawn, it at least begins to call into question the widespread belief that online pedagogies are inherently less effective in preparing students for success in colleges and universities. For those parents and their students who choose to avail themselves of online educational options, this study should serve as a tentative validation that online education can be a viable and valuable educational opportunity at the secondary level. For other academics attempting to influence the shape of future teacher education, governmental regulation, and public opinion I would hope that this study would be a call to invest their time, effort, and energies in compiling more quantitative, data-driven reports in order to provide a substantial quantitative base from which these policies and decisions can draw conclusions.

Limitations

There are some limitations to the implications of this study, including the fact that at the public high school all students in the eleventh grade take the test such that there are students included in the sample who would normally opt out of this testing. This forced testing could have the tendency to skew the results for the public school downward since many in that group are special education students or are not college track students. Special education students have been removed from the public school test set, but there is no way to separate the non-college bound students from the test results. Another limitation is the difference in student populations

due to geographic considerations. The public high school is drawing students from one particular area while the online school is drawing students from a global population. This diversity of students can affect performance on a test designed for an American middle-class market. In an effort to account for this difference the public school was selected in part to represent the average student of the online institution. Both groups are largely middle class, Protestant, and predominantly Caucasian.

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