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## Comparative Analysis of Distance Learning and Traditional Instructional Delivery Methodologies in Selected Embry-Riddle Aeronautical University Graduate Courses

James T. Gallogly  
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COMPARATIVE ANALYSIS OF DISTANCE LEARNING AND TRADITIONAL  
INSTRUCTIONAL DELIVERY METHODOLOGIES IN SELECTED  
EMBRY-RIDDLE AERONAUTICAL UNIVERSITY  
GRADUATE COURSES

by

James T. Gallogly

A Thesis Submitted to the  
Office of Graduate Programs  
in Partial Fulfillment of the Requirements for the Degree of  
Master of Aeronautical Science

Embry-Riddle Aeronautical University  
Daytona Beach, Florida  
May 7, 1995

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This thesis was prepared under the direction of the candidate's chairman, Dr. Charles Richardson, Department of Aeronautical Science, and has been approved by members of his thesis committee. It was submitted to the Office of Graduate Studies and was accepted in partial fulfillment of requirements for the degree of Master of Aeronautical Science.

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## ABSTRACT

Author: James T. Gallogly  
Title: Comparative Analysis of Distance  
Learning and Traditional Instructional  
Delivery Methodologies in Selected  
Embry-Riddle Aeronautical University  
Graduate Courses  
Institution: Embry-Riddle Aeronautical University  
Degree: Master of Aeronautical Science  
Year: 1995

A causal-comparative study that evaluated the qualitative and quantitative data for selected Embry-Riddle Aeronautical University graduate courses in both the distance learning and traditional classroom delivery methods. The population for this study was made up of two segments. The first segment consisted of all students that completed a particular Master of Aeronautical Science course through distance learning, with the instructor that developed the course. The second segment consisted of all students that completed a particular Master of Aeronautical Science course in the classroom environment with the

instructor that developed the course for distance learning presentation. The primary instrument for this analysis was the grade reports provided by professors. The grade reports were analyzed to determine if any significant difference in outcomes existed between the distance learning and traditional classroom method students. The two-tailed "t" test of significance was administered to the quantitative data. This method of analysis provided statistical data to evaluate the hypothesis that no significant difference exists.

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## INTRODUCTION

Over the years academia and the general public perceived most non-traditional education techniques as second rate delivery methods for training. This perception did not encompass all programs, but was nurtured by a few programs that became known as diploma mills. Non-traditional delivery methods are those programs delivered outside the normal classroom environment and include correspondence, independent study, distance education, and distance learning programs. For this study non-traditional education techniques are referred to as distance learning.

Distance learning controversy in the United States can be traced back to the late 1890's. University of Chicago founder William Rainey Harper initiated a distance learning program when the University opened. Two of the brightest stars he had recruited as deans for the new University threatened to quit when they heard that he intended to introduce correspondence study. This incident foreshadowed a never-ending series of arguments at Chicago that finally ended in 1963, when the University sold its courses to the University of Wisconsin (Pittman, 1993).



Embry-Riddle Aeronautical University offers courses leading to a Master of Aeronautical Science degree through both distance learning and the traditional classroom. The instructional quality of these courses is paramount to the university maintaining a distinguished reputation in the educational and aviation communities.

Distance learning courses are presented to students utilizing video tapes of actual classroom presentations, course study guides, textual materials, and interactive communication with the faculty member. Communications between students and faculty are provided via an electronic bulletin board. This interactive communications enables students to review assignments, query professors, deliver papers and projects to professors, and communicate with fellow students and staff. The faculty member monitors student progress, receives and reviews assignments, and provides feedback to students via the interactive communication network. The electronic bulletin board supports message delivery between students and faculty and on-line conference capability.

Traditional classroom methods are defined for this study as those courses instructed on campus in the classroom environment. Many of Embry-Riddle Aeronautical University on campus courses differ from the traditional classroom setting. Several courses utilize aircraft, simulators, computer based classrooms, and air traffic

control centers to support student learning.

Providing quality education through distance learning techniques is often challenged. Many traditionalists support the theory that the only method that provides quality education is the traditional classroom. Proponents of distance education support the theory that quality education can be delivered outside the traditional classroom. Analysis of distance learning versus traditional classroom instruction outcomes provided qualitative data needed to determine if the desired objectives of Embry-Riddle Aeronautical University were accomplished.

#### Statement of the Problem

This study compared the qualitative and quantitative data for selected Embry-Riddle Aeronautical University graduate courses in both the distance learning and traditional classroom delivery methods. Distance learning at Embry-Riddle Aeronautical University is defined as learning accomplished at a location other than in a classroom. Traditional delivery methods include classroom attendance on campus or at a Embry-Riddle Aeronautical University Center for Career Education.

### Review of Related Literature

There is a significant amount of discussion relating to distance learning, but a limited amount relating to comparison of data for distance learning and traditional classroom methods. The keyword selection process used for electronic scanning of available reference material included: distance learning, distance education, and continuing education.

Distance learning incorporates the latest technologies available to attract students. Major universities around the world recognize the potential exposure from distance learning students and employers. Cotton (1995) states that 30 percent of higher education institutions are currently engaged in some form of distance learning and that an additional 28 percent are planning for it during 1994 and 1995.

The Eleventh Annual UCLA Survey of Business School Computer Usage states that the reason universities are investing in learning technologies were to maintain currency, stay on the leading edge, be competitive with peer institutions, and be able to appeal to new students (Anonymous, 1994). One of the primary motivators in establishing and maintaining an effective state-of-the-art computer system for these universities was support for distance learning programs.

The recent trend towards distance learning has created a new area of concern for educators. Training of faculty, course developers, and instructional designers takes on a new dimension when distance learning is considered. The geographical separation of student and professor present unique factors that do not effect traditional classroom teaching methods. Greene (1993) defines distance learning as any learning that takes place away from the place where the teacher location. The geographical separation is often bridged by communication media that provides contact electronically between the student and faculty member.

Collens (1993) suggests that forces are at work that have the potential to totally reshape the landscape of higher education. Technological force is changing how and where teaching is done, and the nature of the sponsoring organization. Global economic forces are reshaping the requirements for successful business competition and thus changing the kind of preparation necessary for graduates. Educational institutions, corporations, and governments are establishing communications networks to facilitate distance learning.

Today, as adult students struggle with finances and divide their time among work, family, and studies, continuing education courses are an important educational alternative. Close to 400,000 Americans are pursuing a

college education or completing high school requirements in their own homes through distance learning (Geib, 1994).

Professionals in business and education realize the importance of advanced degrees to promotion and professional development. Many organizations support employees in their educational endeavors by subsidizing the costs of tuition and books. Recent developments in telecommunications, software, and the advent of the home computer have provided students the accessibility to education that did not exist 15 years ago. Paul Levinson, director of the On-Line Program for The New York School was quoted in Business Week as stating "On-Line education can be the lifeline to those who have obstacles, such as geographic distances or physical disabilities" (Eng, 1994).

Technological forces are changing how and where teaching is done, and the nature of the sponsoring organization. Many schools have established vast electronic networks for distance learning. Lewis and Hedegaard (1993) state that personal computers and modems are the vehicles for communications. Computer conferencing software defines the classroom. Place independence has made it possible for students living in remote areas to attend accredited college programs.

Vice President Al Gore proposes using the High Performance Computer Act of 1991 for the development of a National Research and Education Network (N.R.E.N.). This

network would raise the capability of data transfer to 3 billion bits per second. This 3 billion bits per second equates to 300 copies of Moby Dick per second (Markoff, 1993).

Distance learning is becoming an increasingly utilized medium of management education and training. It provides the opportunity to reach large numbers of practicing managers who would otherwise be outside the spectrum of educational development (Freatly, 1991). This capability saves critical company resources and provides highly trained managers.

Thornburg (1992) states that modern telecommunications has already made national borders obsolete. Less than one-hundred years ago man participated in the first powered flight of an aircraft. Nearly twenty-five years ago man circled the world in an aircraft in less than forty hours. Today man can deliver a message to nearly any point in the world in less than a second using telecommunications.

In August 1991, 49 participants from 17 countries joined IBM's Institute Europe staff for presentation on all aspects of the current and future use of multimedia in higher education. Nearly half the sessions highlighted the successful use of communications channels between tutors and students to allow more effective open and distance learning (Jones, 1992).

This theory is reinforced by Harper (1993) who states

that flexible learning (distance learning) allows students to study what they want, when they want, where they want, and at their own pace. Flexible learning makes better use of resources and shifts much of the responsibility for the timing, pace, and location of learning away from the college and onto the student. To academics, flexible learning is an educational method that focuses on the student's learning activity, and how best to meet student needs for learning, rather than the teacher's activity.

The flexibility of distance learning and the potential revenue that this program may offer colleges and universities makes the program appealing to many administrators. According to Smith and Hancock (1991), in the face of declining enrollment and budgetary constraints, educational organizations are looking for alternative ways to better use the resources they have to provide the best education for their students.

Around the United States public educators are considering the possibilities of using telecommunication to improve the basic level of education and stretch teaching resources over the miles. As a result, the public education market presents a major opportunity. Distance learning was the focal point for discussion during SUPERCMM 1992 (Wilson, 1992).

An example of colleges opening distance learning to a broader market was Henley Management College, United

Kingdom. In 1992 the college instructed 10,000 managers worldwide and its Master of Business Administration was taken by 5,000 students in 92 countries. Henley has become one of the leaders in distance learning. The college has established agreements with over 20 companies for its tailor-made course and was the first to offer senior tier business qualification, the Doctor of Business Administration (Blackhurst, 1992).

The potential benefits of distance learning will vary from student to student. In a 1993 article, Johnston suggests that the simple increase in knowledge is one reason continuing professional development is needed. The use of distance learning methods is suggested as a singularly appropriate way of meeting professional needs. The increasing interest in continuing vocational education and professional development, particularly as it has been defined by professional institutions, is considered. The use of distance learning methods is suggested as a singularly appropriate way of meeting professional development needs.

In a variation of distance learning, corporations have been collaborating with each other, with educational institutions, and with satellite communications professionals by using the capabilities of satellite broadcast to provide core curriculum courses on a continuing basis to targeted educational markets. GMI



Engineering & Management Institute has teamed up with numerous corporations including Hughes Aircraft Company, private foundations, and government agencies to operate a unique interactive satellite television learning network (Gibson, 1990).

The European Community (EC) is pushing ahead with the development of trans-European services in parallel with ongoing actions designed to encourage the provision of information services. Priority areas include distance learning and trans-European administrative networks. Besides helping to eliminate physical and technological barriers to free movement, information networking on a continental scale will have applications in education, training, health care, and environmental protection (Collada, 1991).

Acceptance of distance learning by academia is on the increase. Melymuka (1993) cites the programs offered by the Columbia University School of Business, Massachusetts Institute of Technology's Sloan School of Management, and the Wharton School as examples of business related programs. She states that taking advantage of educational opportunities can enhance executives' business acumen. Case studies are a primary teaching tool in virtually all these programs, with many computer simulations.

A Staff (1993) author provided the only reference to data that could be applied to this study. The author

states that the Australian Society of Certified Public Accountants (ASCPA) recognizes that development of a higher quality educational program is an ongoing task requiring constant vigilance, analysis, and responsiveness. Over the past eight years, data was compiled that supported the overall acceptance of the Certified Public Accountant (CPA) program by professional accountants as overwhelming.

#### Statement of the Hypothesis

It is expected that the comparison of learning outcomes for distance learning and traditional classroom delivery methods will not vary significantly. The professional approach of students and Embry-Riddle Aeronautical University's administration will provide the constant desired. Therefore, it is hypothesized that the data analyzed for distance learning and the traditional classroom delivery methodologies in selected graduate courses will not vary in any significant manner.

This hypothesis will be supported by four (4) sub-hypothesis. Each Sub-hypothesis represent one of the four core courses required for the Master of Aeronautical Science Degree. The four core courses are: MAS602, The Air Transportation System; MAS603, Aircraft and Spacecraft Development; MAS604, Human Factors in the Aviation/Aerospace Industry; and MAS605, Research Methods and Statistics.

## **METHOD**

### Subjects

The population for this study is made up of two defined segments. The first segment consists of all students that completed the particular Master of Aeronautical Science course through distance learning, with the instructor that developed the course. The second segment consists of all students that completed a particular Master of Aeronautical Science course in the classroom environment with the instructor that developed the course for distance learning presentation. This selection process will limit variables. The professor for the course that is video taped will be the designated instructor for sessions offered by distance learning for the course. The tests, graded assignments, study guides, and textual materials were identical for each segment. The length of the semester and the grading criteria were identical.

This process was repeated for the selection of subsequent groups within the Master of Aeronautical Science program. The rationale for repeating the process is that each additional course that is evaluated will only strengthen the outcome.

Students in both segments are surveyed upon completion of the courses. Surveys query the students perception of knowledge gained from these courses and quality of instruction. Surveys completed by distance learning students are forwarded to Center for Instructional Design and Effectiveness (CID/E), Embry-Riddle Aeronautical University. The surveys for traditional classroom students are forwarded to the department chair and will not be evaluated in this study. The individual final grades for courses considered were also compared. This analysis provided a comparative study between distance learning and traditional classroom methods at Embry-Riddle Aeronautical University.

#### Instrument

A comparative analysis of selected graduate courses offered by Embry-Riddle Aeronautical University through distance learning and traditional classroom methods was studied. The primary instrument for this analysis were the grade reports provided by professors, with the permission of the Aeronautical Science Department Chairman as displayed in Appendix A. These grade reports were analyzed to determine if any significant difference in outcomes exists between the distance learning and traditional classroom method students. The secondary instrument was a review of the surveys of distance learning groups to

determine the students perceptions of the instructional methods. A copy of the survey is included in Appendix B.

The primary instrument focused on the student scores received for graded assignments, midterm examinations, and final examinations. The professors provided the data collected during the semester and this data was analyzed using approved statistical methods. The distance learning and traditional classroom method were statistically compared to determine if any significant difference existed in scores. The validity of this analysis was based on the identical professor instructing both distance learning and traditional classroom methods for a particular course. This insured objectivity and provided the validity needed. The only variable in methods of instruction was the media of delivery by the professor. Distance learning students received video tapes of the classroom sessions while the on-campus students received in class presentations.

The second instrument was a survey of all students in the distance learning program. The survey was designed to collect data on students perceptions of the distance learning method. The reliability of this instrument was determined by the quality of the survey, the appropriateness of the questions, and the honesty of the respondents. The last item, honesty of the respondents, can not be controlled. The only factor that could have an effect on determination of honesty would be to structure

the survey to identify possible erroneous responses. This is accomplished by providing the same question in a positive and negative form.

The surveys were mailed to all students who participated in the distance learning courses after the course is completed. The analysis of the data collected from the surveys was evaluated using approved statistical methods.

The completed surveys were reviewed the Department of Independent Studies for time critical information and delivered to the Center for Instructional Development and Effectiveness (CID/E) for compilation. The raw data provided by the surveys was tabulated to provide manageable feedback.

Students responded by choosing a amplitude of agreement with the statements provided in the survey. The selectors offered were:

- 1 = Strongly Agree
- 2 = Agree
- 3 = Neutral
- 4 = Disagree
- 5 = Strongly Disagree

This method provided numerical data for tabulating mean score results for each question.

The surveys were segmented into six major sections. These sections queried student perceptions of course quality, workload, designated instructor, on-camera instructor, delivery media, and administration. The workload and administration sections are not reviewed indepth in this study. The surveys also included an open ended comments section. A copy of the survey is located in Appendix B with a summary of results.

### Design

The basic causal-comparative design is quite simple, and although the independent variables are not manipulated, there are control procedures that can be exercised. Causal-comparative design involves selecting two groups differing on some independent variable and comparing them on some dependent variable (Gray, 1992).

The independent variable will be the delivery media utilize by the professor. The two techniques that were examined are the distance learning method utilizing video tape presentation and the traditional classroom method. The dependent variable were the grades received by the students on assignments and examinations. The grades of distance learning and traditional classroom method students were analyzed. The students have attended the same course with the same professor presenting the material and grading the course work.

The only criteria used in the selection process for this study was that the students were enrolled in a particular Embry-Riddle Aeronautical University graduate course either through distance learning or traditional method. Acceptance policy of the University for the graduate program provided the only experience differentiation. The number of courses selected and the quantity of the sample from each provided a clear and defined analysis of the outcomes.

This causal-comparative study provided the data needed to examine any differences in outcomes from the two teaching methods. The statistical analysis of this data provided the assessment needed to compare the distance learning and traditional methods. The causal-comparative, or ex post facto, research attempts to determine the cause, or reason, for differences. This after the fact method provides the format required for this thesis.

### Procedures

The control procedures used to collect the data are aligned with Embry-Riddle Aeronautical University policy and procedure for grade reporting. Professors were requested to provide a copy of the grade report for the selected course. The grade reports were compared with that of the segment taking the course in the comparative method.



Statpak, a computer software program written by Frisbie (1987) was utilized to enter data, and calculate statistical information. The t-Test for Independent Samples with a probability ( $P = .05$ ) was used to determine if there is any significant difference in the outcomes. The data collected from the professors and statistically analyzed provided the distribution derived from the differences known as "t" (Elzey, 1971). This method of analysis provided the statistical data to evaluate the hypothesis.

The steps required to facilitate the collection of appropriate data were:

1. Receive written permission from Aeronautical Science Department Chair to contact professors and collect grade data.
2. Contact professors and provide them with a overview of the thesis and request their assistance in data collection.
3. Collect data from professors for distance learning and traditional methods.
4. Perform statistical analysis of the collected data.
5. Compare data from the two groups and determine if any significant difference is apparent.
6. Review data collected and statistics compiled with thesis chairman and advisors.

7. Correct any deficiencies noted by thesis chairman or advisors.
8. Repeat the process for each course that data is collected.
9. Prepare to publish thesis based on guidelines established by the University and thesis chairman.

## **ANALYSIS**

It was anticipated that there would be no significant difference between distance learning and traditional method outcomes. The professional approach of students and control factors that Embry-Riddle Aeronautical University placed on both methods would insure consistency.

If a significant difference is noted during this study the University will be notified of the findings. The practical application of the findings for this study could impact several areas of education. Distance learning may be more readily accepted as a feasible alternative to traditional methods. This acceptance would improve the image of distance learning and possibly provide a larger market. Methodologies utilized in either methods may improve outcomes in the other method.

The results of this study are divided into four primary sections to support the four sub-hypothesis. Each course evaluated constitutes a sub-hypothesis. The courses evaluated were: MAS602, The Air Transportation System; MAS603, Aircraft and Spacecraft Development; MAS604, Human Factors in the Aviation/Aerospace Industry; and MAS605, Research Methods and Statistics.

These courses constitute the core curriculum for the Master of Aeronautical Science (MAS) program at Embry-Riddle Aeronautical University. The MAS core courses are designed to enable the student to estimate the importance of the air transportation system as an integral part of the global, multi-modal transportation system and compare the different methods of inter-modal transportation from a historical, technological, social, environmental, and political perspective. The interrelationships of multi-purpose aviation/aerospace organizations in the development of an aircraft or spacecraft are contrasted and the concepts of planning and control of materials and components are compared. The importance of human factors in all aspects of the aviation/aerospace industry and the identification of basic human engineering factors are analyzed. The development of a proposal related to an aviation problem using the acceptable methods of research are required.

Each sub-hypothesis includes the statistical data gathered during this study and the supportive documentation. Supportive documentation will include: course description, faculty vita for the member that video taped and presented the course through distance learning, term dates of course presentation, subject data, graded course requirements, findings, survey review, and a summary of results for the sub-hypothesis.

## MAS 602, The Air Transportation System

### Course description.

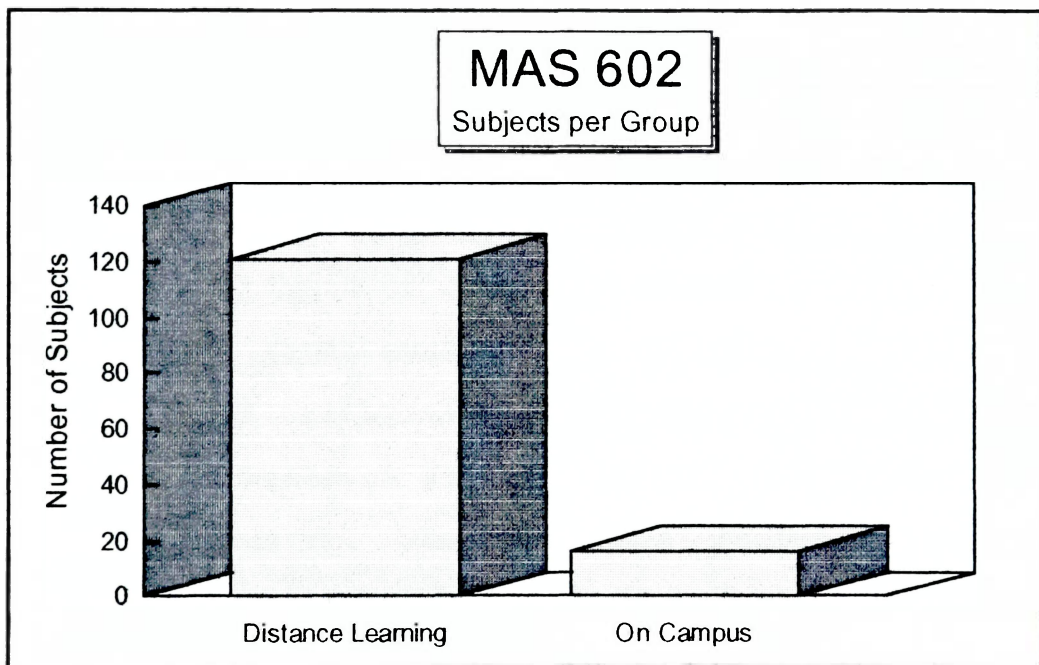
A study of air transportation as part of a global, multi-modal transportation system. The course reviews the evolution of the technological, social, environmental, and political aspects of this system since its inception at the beginning of the century. The long-term and short-term effects of deregulation, energy shortages, governmental restraints, and national and international issues are examined. Passenger and cargo transportation, as well as military and private aircraft modes are studied in relation to the ever changing transportation requirements (Staff, 1994).

### Faculty vita.

Dr. Henry Lehrer developed MAS 602 for video presentation during the Spring 1993 term. The first distance learning presentation was offered during Summer 1993 term. Dr. Lehrer is a Professor of Aeronautical Science at Embry-Riddle Aeronautical University and has presented MAS 602, The Air Transportation System, on campus for over four years.

### Subjects.

The subjects for each method were not selected at random. They were the students that enrolled and participated in the course for that particular delivery method. Distance learning students accounted for 121 participants and 16 on-campus students participated. Figure 1 presents the subject count for both delivery methods.



**Figure 1. MAS 602 Subject Count by Delivery Method.**

Term dates.

The term dates and delivery method for class sections reviewed for this study are listed in Table 1.

---

**Table 1**

**MAS 602 Term Dates by Delivery Method**

<u>Distance Learning</u>	<u>On-Campus</u>
Summer 1993	Spring 1993
Fall 1993	
Spring 1993	
Summer 1994	

---

Graded course requirements.

The graded course requirements consisted of: two critical critiques of scholarly articles, midterm examination, final examination, and class participation.

Critical critiques of scholarly articles required the students to research articles related to aviation or the aviation industry. The requirement included a summary of the article and the students analysis of that article.

Midterm and final examinations evaluated the students comprehension of lectures, text, and supplementary material provided by the professor. The examinations included multiple choice, true/false, and essay questions. Examinations for distance learning students were administered by a university approved proctor in the students geographical area. On-campus students were

administered examinations in the classroom environment.

The class participation grade was based on the students response to questions of the week provided by the professor. These questions were utilized by the professor to stimulate thought and student interaction. Distance learning students received the questions on a weekly basis. Students responded by posting remarks on the bulletin board and through interactive conference with the professor and fellow students. On-campus students received the questions in the classroom and responded in class.

Dr. Lehrer provided percent grades for each requirement. These grades were tabulated and the final percent grade recorded. Final grade percentages for each subject are shown in Appendix C.

The percentages allocated to assignments, examinations, and class participation are listed (see Table 2).

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**Table 2**

**MAS 602 Grade Allocation by Assignment**

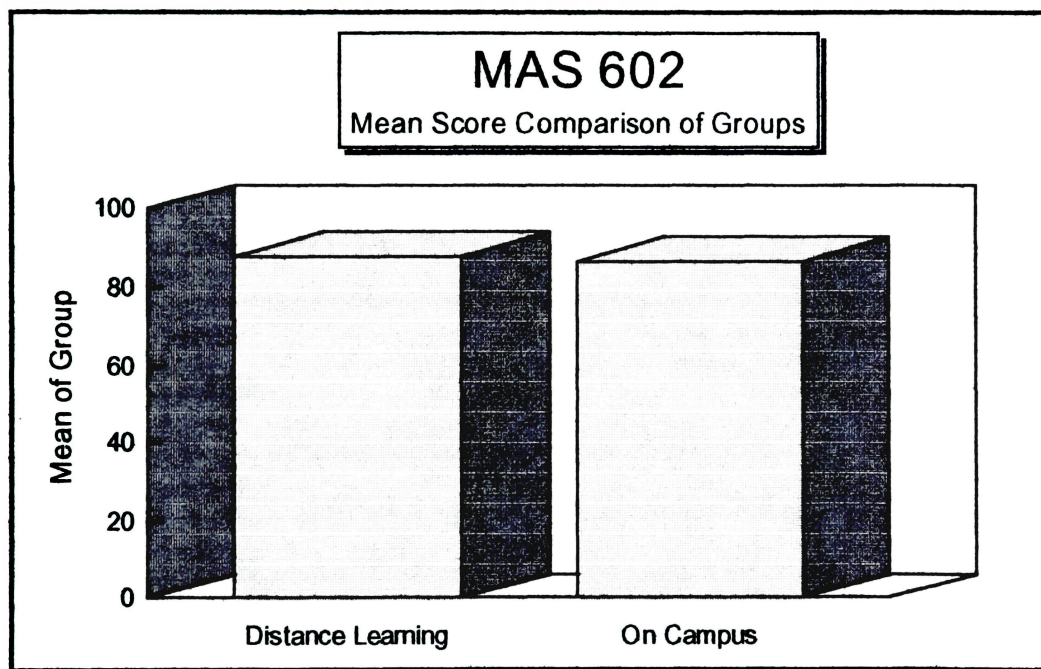
<b><u>Assignment</u></b>	<b><u>Grade Allocation</u></b>
Critical Critique # 1	15%
Midterm Examination	30%
Critical Critique # 2	15%
Final Examination	30%
Class Participation	<u>10%</u>
Total	100%

---



Statistical data.

The data used to analyze the outcomes is located in Appendix C of this document. The statistical results compiled with the Statpak software package, from the outcome data, are shown in Appendix D of this document. Figure 2 illustrates the Mean scores for each method.



**Figure 2.** MAS 602 Comparison of Mean Scores by Delivery Method.

A summary of the results from the t-Test for Independent Samples for MAS 602 are provided in Table 3. These results are based on a probability ( $P = .05$ ).

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**Table 3**

**MAS 602 Summary of t-Test for Independent Samples**

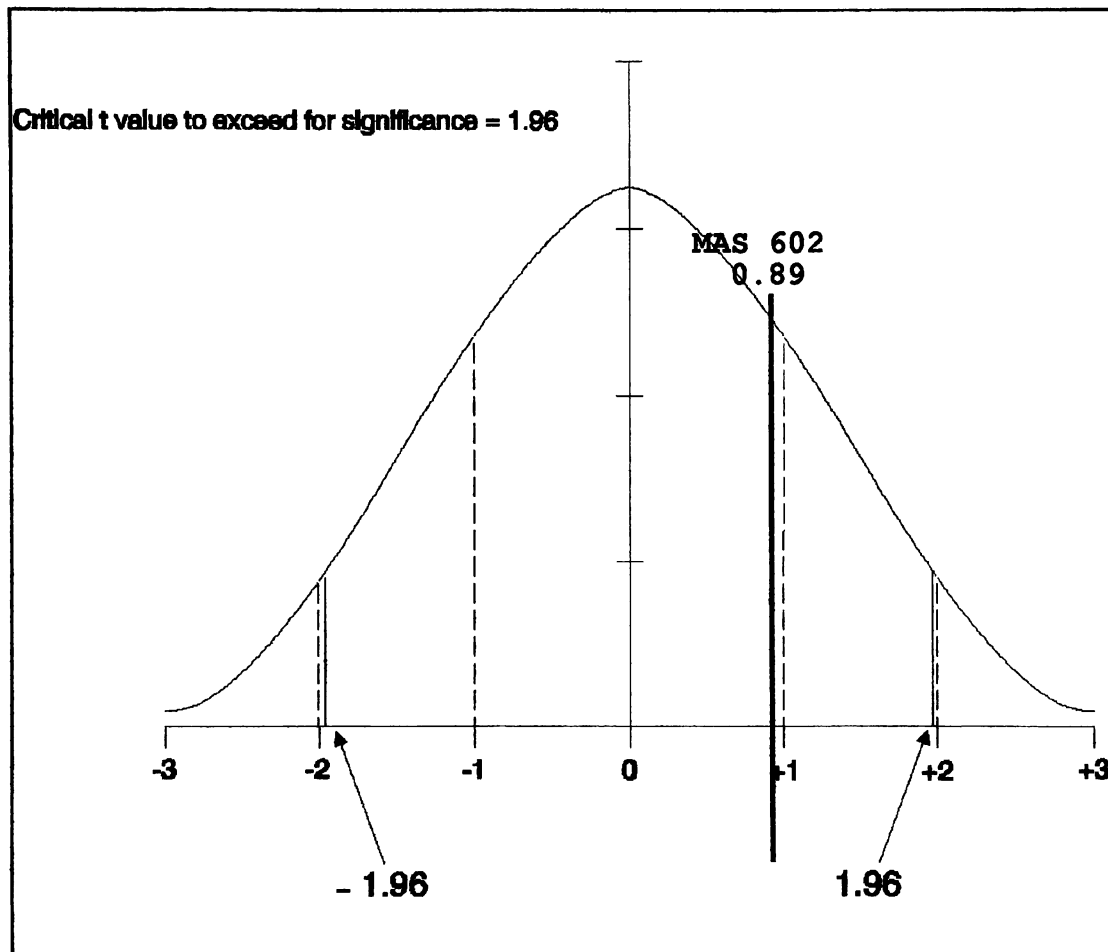
<u>Statistics</u>	<u>Distance Learning</u>	<u>On-Campus</u>
Number of Subjects	121.00	16.00
Sum of Scores	10,652.40	1,387.82
Mean of Group	88.04	86.74
Sum of Squared Scores	941,369.75	120,864.32

<u>Statistical Results</u>	<u>Data</u>
Degrees of Freedom	135.00
t-Value	0.89
Distribution of t	1.96

---

**Findings.**

Using a probability of  $P = .05$  with a distribution of critical  $t = 1.96$  and  $t\text{-Value} = 0.89$  then it can be analyzed that the  $t\text{-Value}$  falls within the range of acceptance of the hypothesis. The finding for the data analyzed in MAS 602, The Air Transportation System, support the hypothesis that there is no significant difference between the two modes of delivery. Figure 3 displays the critical  $t\text{-value}$  and the  $t\text{-value}$  for the distance learning and on-campus subjects.



**Figure 3. MAS 602 t Distribution of Difference Score.**

Survey Data.

Fifty-seven (57) students responded from the original 121 students that completed the course. A review of the survey findings is provided by survey section.

The course quality section contained eight questions related to the students perception of the course content. The questions contained in this section were responded to by all participants. The questions in this section were:

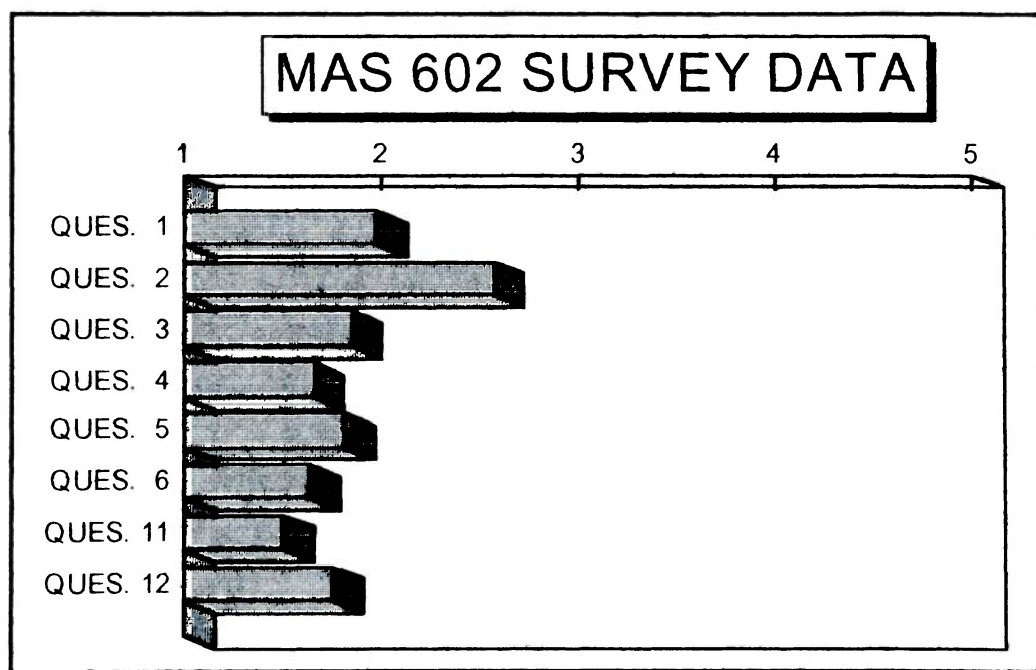
1. I learned as well academically as I would have in a traditional classroom setting.
2. The student-to-student interaction enhanced my learning of the course content.
3. The Unit Learning Outcomes were aligned with course content.
4. The assignments/projects/case studies were appropriate for the course content.
5. The text and/or readings were well-suited for this course.
6. The examinations sampled the important material in the course.
11. I enjoyed this course.
12. I consider this course valuable to my career.

Table 4 shows the mean score and the standard deviation for each question in the course quality section.

**Table 4****Course Quality Mean Scores and Standard Deviation**

<b><u>QUESTION #</u></b>	<b><u>MEAN SCORE</u></b>	<b><u>STANDARD DEVIATION</u></b>
1	1.96	0.96
2	2.56	1.10
3	1.84	0.84
4	1.65	0.72
5	1.80	0.82
6	1.63	0.72
11	1.49	0.78
12	1.74	0.90

Figure 4 displays the survey mean score results for the questions listed in the course quality section.



**Figure 4.** MAS 602 Mean Scores for Course Quality Section of Survey.

Question number 2 compiled a mean score of 2.56 which equates between agree and neutral. Student perceptions appear to be that interaction with other students did not enhance the learning. This is not unusual considering that all the students were new to this subject matter and would find it difficult to support others.

Question number 1 was important to the course developers and the program managers. The student perception that they learned as well academically through distance learning as in the traditional classroom setting supported the theory that students perceived no significant difference between the two delivery methods.

The section related to the designated instructor focused on the electronic delivery techniques of the instructor. These techniques require the professor to interact with the distance learning students utilizing the electronic bulletin board. Interaction and feedback are the keystone to success in distance learning situations. The questions contained in this section were:

13. I was satisfied with the amount of instructor-to-student interaction I experienced.
14. The designated instructor provided appropriate guidance via the BBS.
15. The designated instructor gave useful feedback regarding progress in this class.
16. The designated instructor provided timely responses to my inquiries.

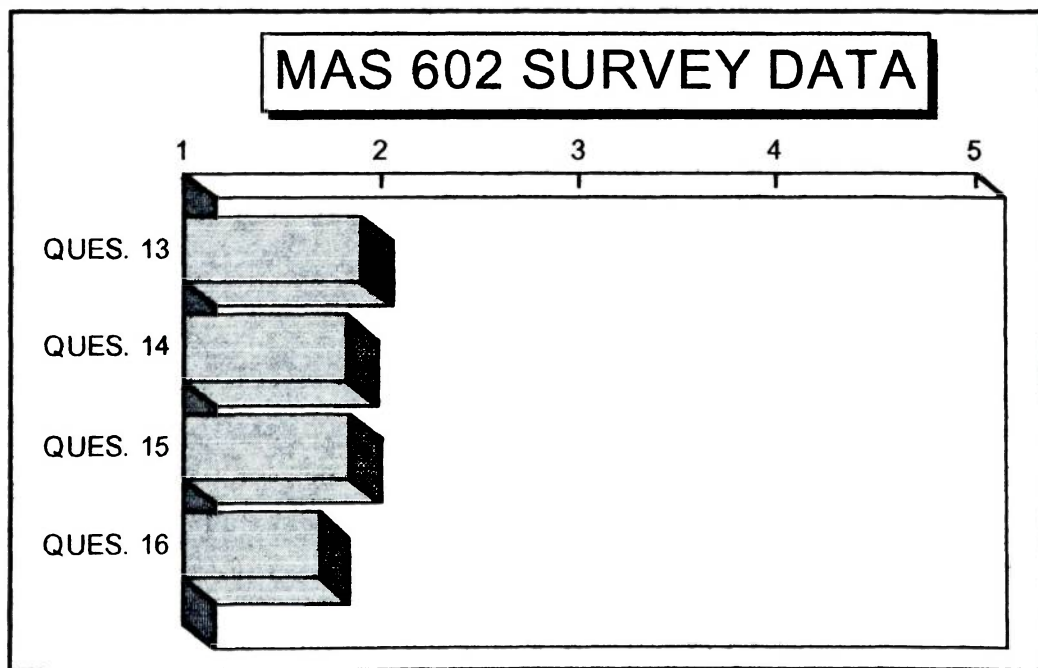
Table 5 shows the mean score and the standard deviation for questions in the designated instructor section.

**Table 5**

**Designated Instructor Mean Scores and Standard Deviation**

<u>QUESTION #</u>	<u>MEAN SCORE</u>	<u>STANDARD DEVIATION</u>
13	1.89	0.99
14	1.82	0.87
15	1.84	0.98
16	1.68	0.83

Figure 5 displays the survey mean score results for the questions listed in the designated instructor section.



**Figure 5. MAS 602 Mean Scores for Designated Instructor Section of Survey.**

The survey results for the designated instructor section reveal that the student perceptions were that the designated instructor provided quality interaction. The mean scores of 1.68 to 1.89 for the four questions in this section support agreement with the question in the survey.

The section dedicated to student perceptions of the on-camera instructor also contained four questions. These questioned focused on the delivery techniques utilized by the instructor during the video filming of the course. The questions contained in this section were:

17. The on-camera instructor frequently addressed independent studies students in his/her classroom presentations.
18. The on camera instructor stimulated creative/critical thinking.
19. The on-camera instructor used instructional aides appropriate for the course content.
20. It was easy to follow the on-camera instructor's presentations.

Table 6 shows the mean score and the standard deviation for the questions related to the on-camera instructor section of the survey.

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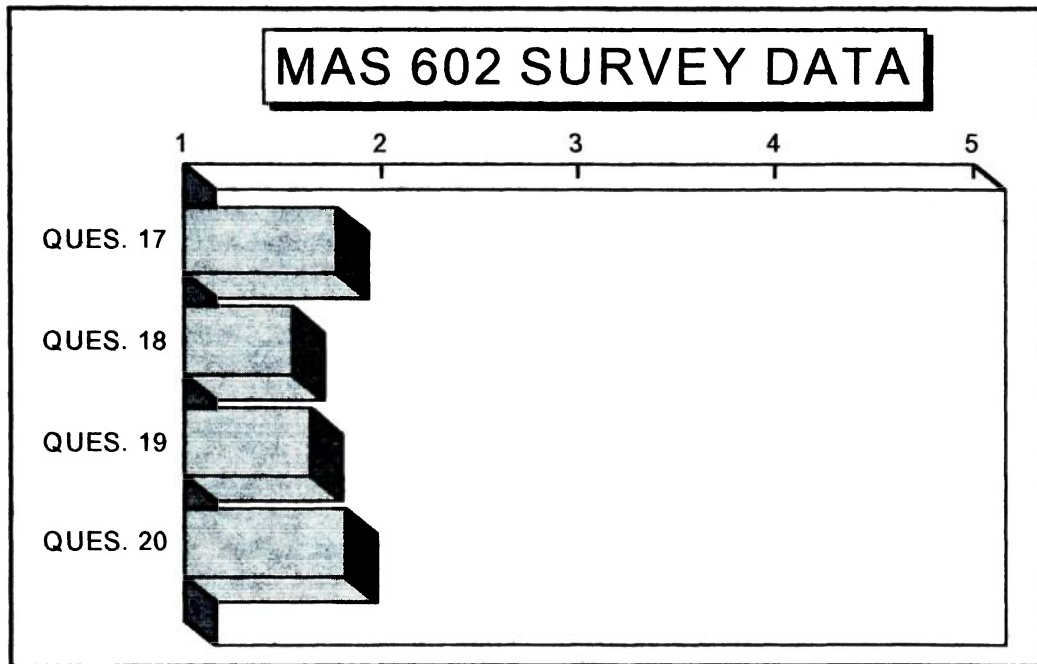
**Table 6**

**On-Camera Instructor Mean Scores and Standard Deviation**

<u>QUESTION #</u>	<u>MEAN SCORE</u>	<u>STANDARD DEVIATION</u>
17	1.77	0.85
18	1.55	0.74
19	1.64	0.80
20	1.82	0.97



Figure 6 displays the survey mean score results for the questions listed in the on-camera instructor section.



**Figure 6.** MAS 602 Mean Scores for On-Camera Instructor Section of Survey.

The students perceived that the on-camera instructor did address the distance learning students during classroom presentations. The over all mean scores for this section suggests that the on-camera instructor and the course developers strived to insure that distance learning students would receive similar benefits as the on-campus students during course presentation.

The section of the survey that focused on the electronic and textual media utilized to support the course contained eight questions. These questions were designed to query the students perceptions relating to the distance learning material developed for the course. The questions in this section were:

21. I think the combination of print, videotape, and bulletin board system (BBS) is an effective way to deliver this course.
22. The BBS is an effective means of facilitating communications.
23. The BBS system was difficult to learn.
24. The SKYTALK manual was helpful in learning/using BBS.
25. I now feel comfortable using the BBS.
26. The videotape picture was of high technical quality.
27. The videotape sound was of high technical quality.
28. The introductory section to the study guide clarified the direction of the course.

Table 7 shows the mean score and the standard deviation for questions in the media section.

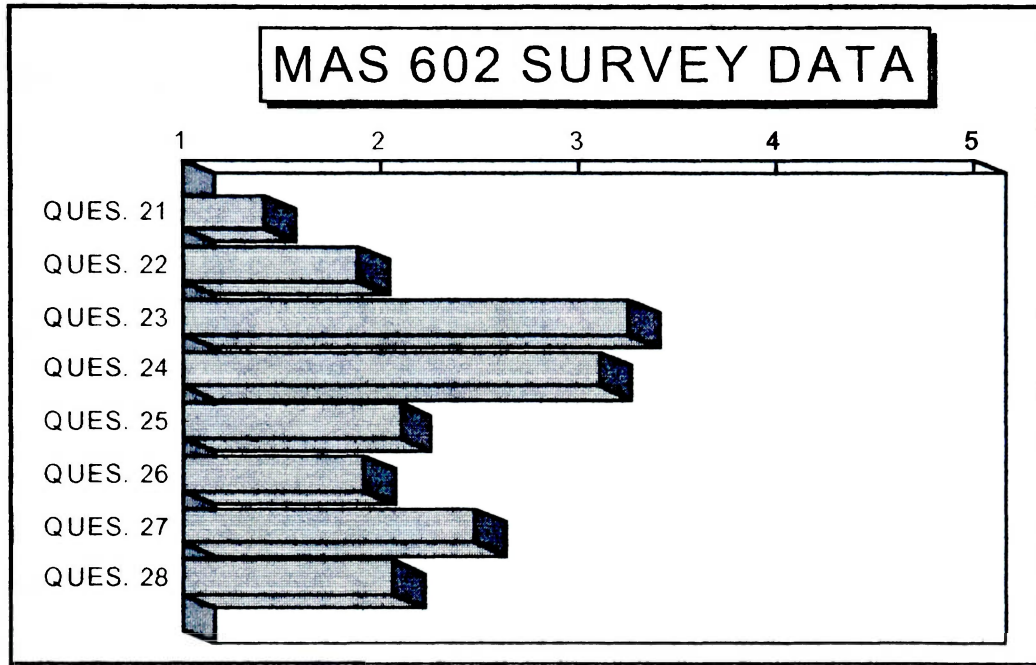
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**Table 7**

**Media Mean Scores and Standard Deviation**

<u>QUESTION #</u>	<u>MEAN SCORE</u>	<u>STANDARD DEVIATION</u>
21	1.41	0.68
22	1.88	0.76
23	3.24	0.93
24	3.10	1.03
25	2.09	0.85
26	1.91	0.82
27	2.46	1.16
28	2.05	0.72

Figure 7 displays the survey mean score results for the questions listed in the media section.



**Figure 7.** MAS 602 Mean Scores for Media section of Survey.

Question 23 was negatively skewed. The mean score for this question was 3.24 and considering the negative skew the responses were positive. Question 24 was positive and reflects the students minor dissatisfaction with the SkyTalk users manual. The overall perception given by the students in this section is that the support material was satisfactory.

## MAS 603, Aircraft and Spacecraft Development

### Course description.

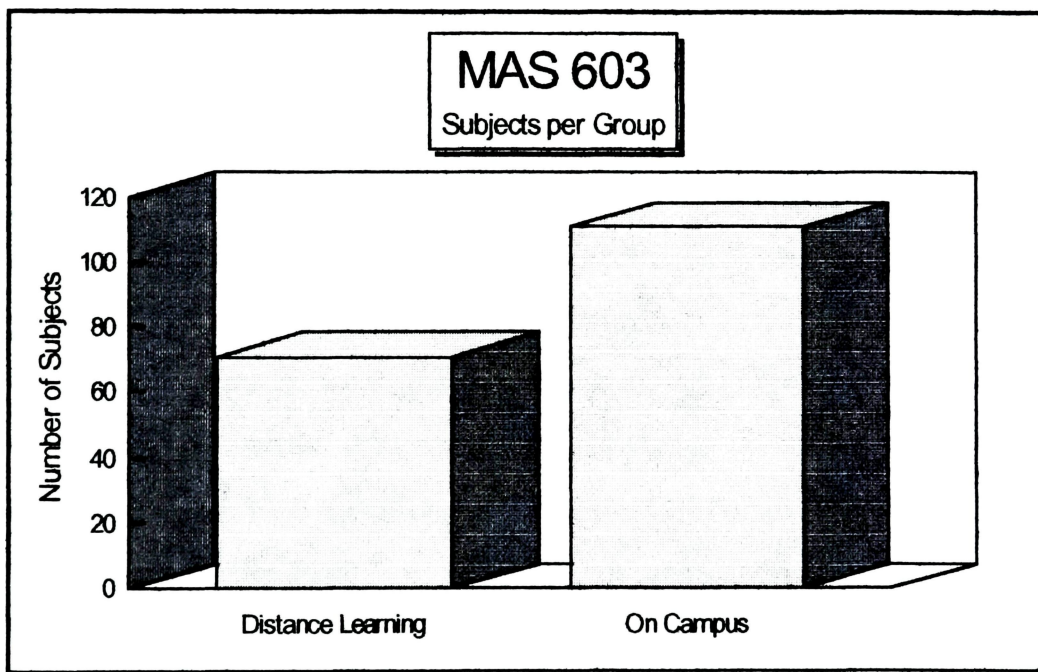
This course is an overview of aircraft and spacecraft development. Included are vehicle mission, the requirements directed by economics, the military and defense considerations, and the research and developmental processes needed to meet the vehicle requirements. Aviation and aerospace manufacturing organizations and techniques are addressed to include planning, scheduling, production, procurement, supply, and distribution systems. The course studies the aviation and aerospace maintenance systems from the built-in test equipment to the latest product support activities.

### Faculty vita.

Mr. Bryant Aumack developed MAS 603 for video presentation during the Fall 1992 term. The first distance learning presentation was offered during the Spring 1993 term. Mr. Aumack is an Adjunct Professor of Aeronautical Science at Embry-Riddle Aeronautical University. He is a full time employee of Lockheed Aerospace Company. His primary duties with Lockheed are quality control with the Total Quality Management (TQM) Branch at the Kennedy Space Center. Mr. Aumack has delivered MAS 602, Aircraft and Spacecraft Development, on-campus for over four years.

### Subjects.

The subjects for each method were not selected at random. They were the students that enrolled and participated in the course for that particular delivery method. A total of 71 students participated in the distance learning method and 111 participated in the on-campus method. Figure 8 presents the subject count for both delivery methods.



**Figure 8. MAS 603 Subject Count by Delivery Method.**

Term dates.

The term dates and delivery method for class sections reviewed for this study are listed in Table 8.

---

**Table 8**

**MAS 603 Term Dates by Delivery Method**

<u>Distance Learning</u>		<u>On-Campus</u>	
Spring	1993	Fall	1992
Fall	1993	Spring	1993
Spring	1994	Fall	1993
Summer	1994	Spring	1994
Fall	1994	Summer	1994
		Fall	1994

---

Graded course requirements.

Final grades were tabulated by Mr. Aumack utilizing the students grades for two case studies, class participation, midterm examination, and final examination.

Case study assignments required the students to analyze the case and provide written recommendations for solution to the problems. Students were required to apply techniques studied in class and provided in the text. Both cases were reviewed by the professor and an overall summary was provided to the class as feedback.

Class participation included students presenting a summary of current event articles. Distance learning students presented their finding on the electronic bulletin board for fellow students to read. On-campus students presented the summaries in classroom environment. Both

methods received feedback and comments from fellow students.

Midterm and final examinations consisted of essay questions. These questions tested the students knowledge of subject matter provided in lecture and reading assignments. Examinations tested the desired course objectives.

Mr. Aumack provided alphabetical grades with plus or minus variant in some cases. To compute statistical data the alphabetical grades were converted to number values. This conversion was consistent as follows: C=75, B=85, A=95. The plus or minus variants were equated to a plus 2.5 or minus 2.5. Therefore, an A- equated to 92.5 and B+ equated to 87.5 for this study.

The final grade was calculated by Mr. Aumack utilizing the percentage allocation for case studies, class participation, and examinations as shown in Table 9.

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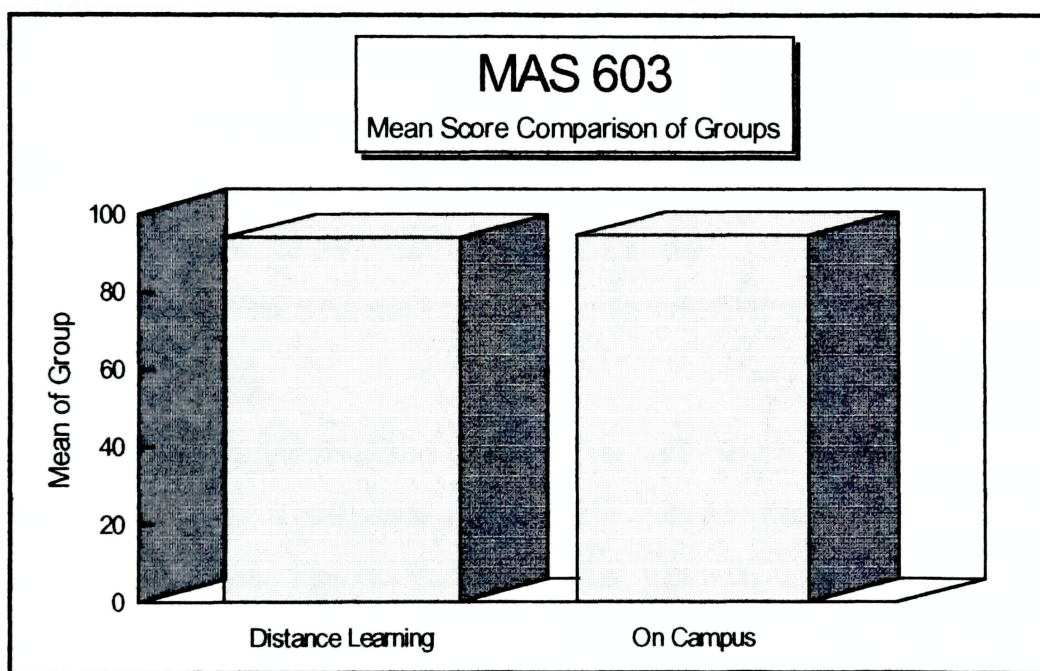
**Table 9**

**MAS 603 Grade Allocations by Assignments**

<u>Assignments</u>	<u>Grade Allocation</u>
Case Study # 1	12.5%
Case Study # 2	12.5%
Class Participation	25.0%
Midterm Examination	25.0%
Final Examination	<u>25.0%</u>
Total	100.0%

Statistical data.

The data on the final grades used to analyze the outcomes is located in Appendix C. The statistical results compiled with the Statpak software package, from the outcome data, are located in Appendix D. Figure 9 illustrates the Mean scores for each method.



**Figure 9. MAS 603 Comparison of Mean Scores by Delivery Method.**



A summary of the results from the t-Test for Independent Samples for MAS 603 are provided in Table 10. These results are based on a probability ( $P = .05$ ).

---

**Table 10**

**MAS 603 Summary of t-Test for Independent Samples**

<u>Statistics</u>	<u>Distance Learning</u>	<u>On-Campus</u>
Number of Subjects	71.00	111.00
Sum of Scores	6,650.00	10,460.00
Mean of Group	93.66	94.23
Sum of Squared Scores	625,250.00	988,050.00
<u>Statistical Results</u>	<u>Data</u>	
Degrees of Freedom	180.00	
t-Value	-0.73	
Distribution of t	1.96	

---

Findings.

Using a probability of  $P = .05$  with a distribution of critical  $t = 1.96$  and  $t\text{-Value} = -0.73$  then it can be analyzed that the  $t\text{-Value}$  falls within the range of acceptance of the hypothesis. The finding for the data analyzed in MAS 603, Aircraft and Spacecraft Development, support the hypothesis that there is no significant difference between the two modes of delivery. Figure 10 displays the critical  $t\text{-value}$  and the  $t\text{-value}$  for the distance learning and on-campus subjects.

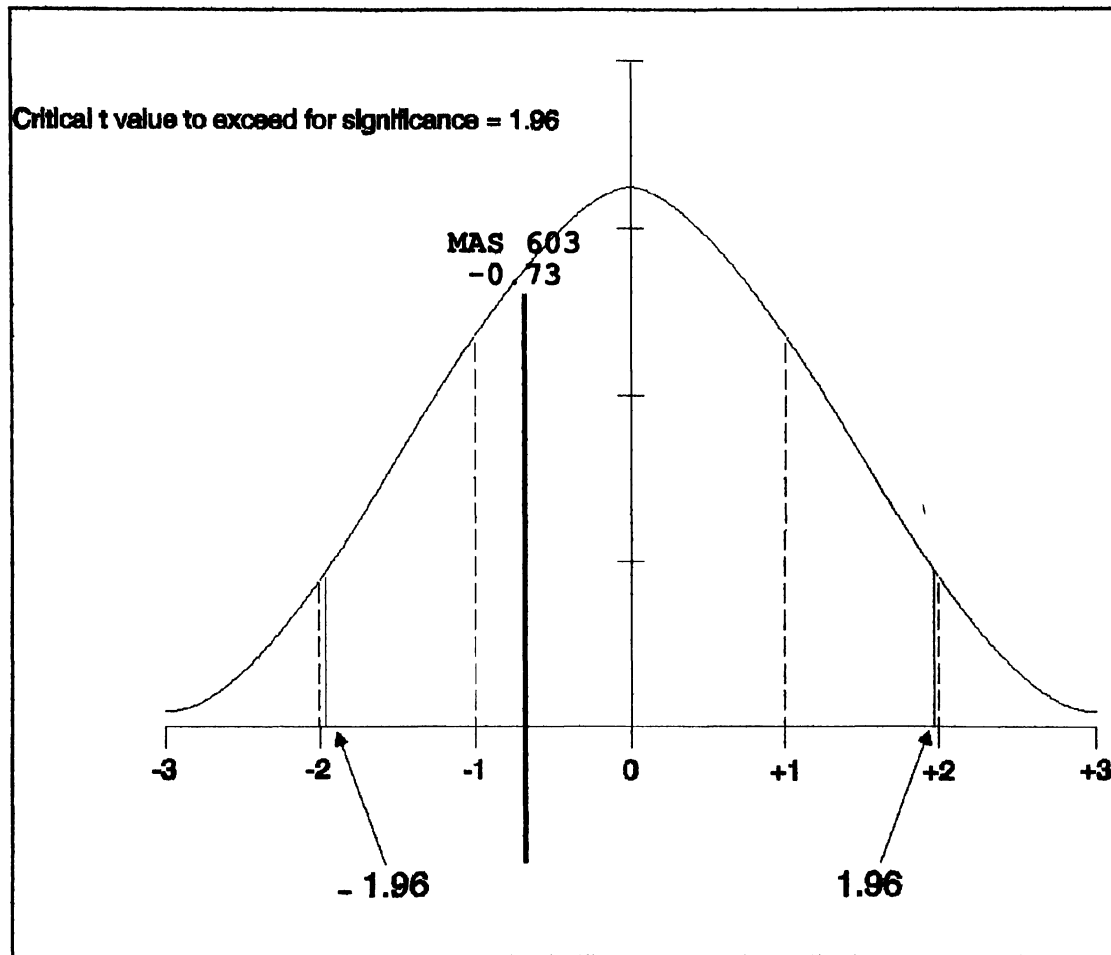


Figure 10. MAS 603 t Distribution of Difference Score.

Survey data.

Twenty-two (22) students responded from the original 71 students that completed the course. A review of the survey findings is provided by survey section.

The course quality section contained eight questions related to the students perception of the course content. The questions contained in this section were responded to by all participants. The questions in this section were:

1. I learned as well academically as I would have in a traditional classroom setting.
2. The student-to-student interaction enhanced my learning of the course content.
3. The Unit Learning Outcomes were aligned with course content.
4. The assignments/projects/case studies were appropriate for the course content.
5. The text and/or readings were well-suited for this course.
6. The examinations sampled the important material in the course.
11. I enjoyed this course.
12. I consider this course valuable to my career.

Table 11 shows the mean score and the standard deviation for each question in the course quality section.

Table 11

Course Quality Mean Scores and Standard Deviation

<u>QUESTION #</u>	<u>MEAN SCORE</u>	<u>STANDARD DEVIATION</u>
1	1.82	0.80
2	2.64	0.95
3	2.05	0.72
4	1.50	0.60
5	2.09	1.02
6	1.73	0.77
11	1.27	0.46
12	1.45	0.60

Figure 11 displays the survey mean score results for the questions listed in the course quality section.

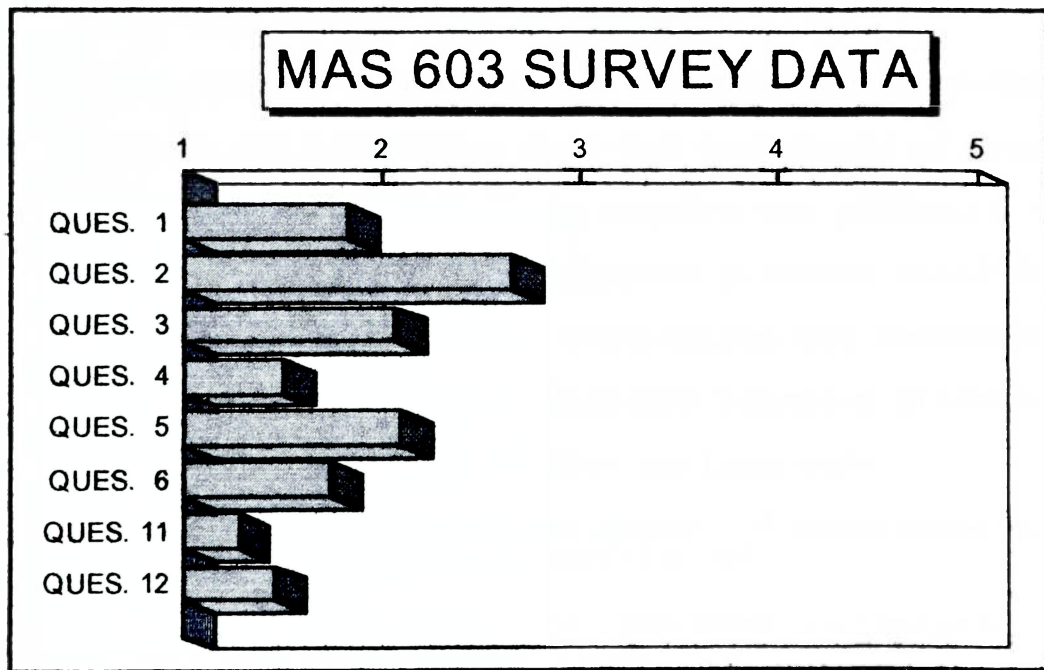


Figure 11. MAS 603 Mean Scores for Course Quality Section of Survey.

Question number 2 compiled a mean score of 2.64 which equates between agree and neutral. Student perceptions appear to be that interaction with other students did not enhance the learning. This is not unusual considering that all the students were new to this subject matter and would find it difficult to support others.

The remaining questions in this section received a mean score of 1.45 to 2.09. This suggests that the students perceived the course quality as comparable to on-campus classes. Question number 11 specifically inquired about the students enjoyment of the course. This question received a mean score of 1.45. This mean score suggests that the students enjoyed the course.

The section related to the designated instructor focused on the electronic delivery techniques of the instructor. These techniques require the professor to interact with the distance learning students utilizing the electronic bulletin board. Interaction and feedback are the keystone to success in distance learning situations. The questions contained in this section were:

13. I was satisfied with the amount of instructor-to-student interaction I experienced.
14. The designated instructor provided appropriate guidance via the BBS.
15. The designated instructor gave useful feedback regarding progress in this class.
16. The designated instructor provided timely responses to my inquiries.

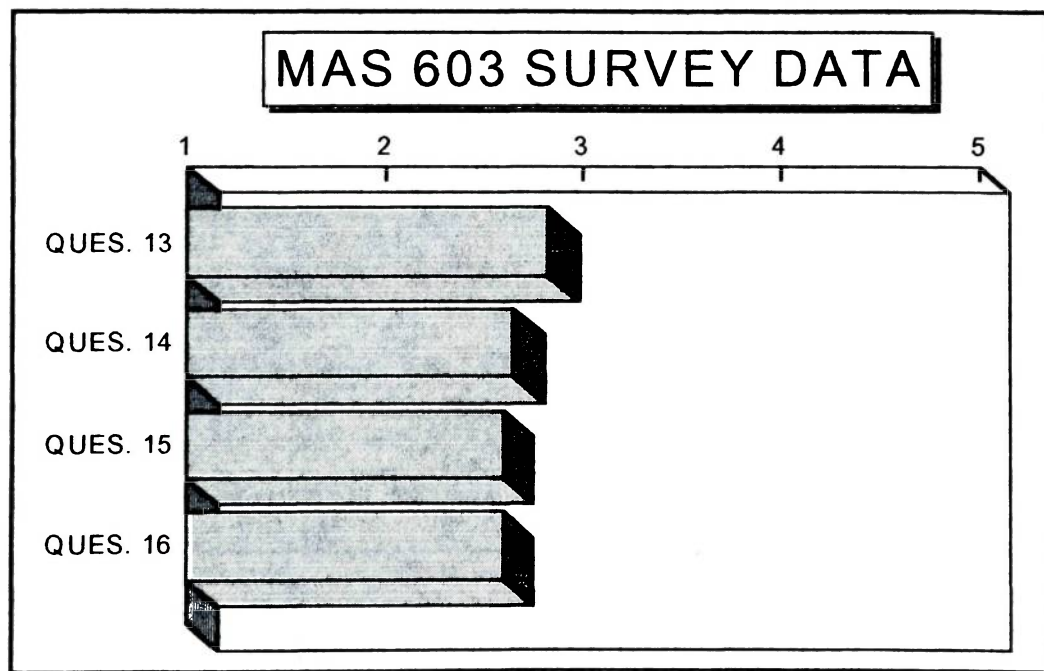
Table 12 shows the mean score and the standard deviation for questions in the designated instructor section.

**Table 12**

**Designated Instructor Mean Scores and Standard Deviation**

<u>QUESTION #</u>	<u>MEAN SCORE</u>	<u>STANDARD DEVIATION</u>
13	2.82	1.33
14	2.64	1.40
15	2.59	1.53
16	2.59	1.50

Figure 12 displays the survey mean score results for the questions listed in the designated instructor section.



**Figure 12. MAS 603 Mean Scores for Designated Instructor Section of Survey.**

The survey results for the designated instructor section reveal that the student perceptions were that the designated instructor did not provided quality interaction. The mean scores of 2.59 to 2.82 for the four questions in this section suggest that the designated instructor fell short of student expectations.

The section dedicated to student perceptions of the on-camera instructor also contained four questions. These questioned focused on the delivery techniques utilized by the instructor during the video filming of the course. The questions contained in this section were:

17. The on-camera instructor frequently addressed independent studies students in his/her classroom presentations.
18. The on camera instructor stimulated creative/critical thinking.
19. The on-camera instructor used instructional aides appropriate for the course content.
20. It was easy to follow the on-camera instructor's presentations.

Table 13 shows the mean score and the standard deviation for the questions related to the on-camera instructor section of the survey.

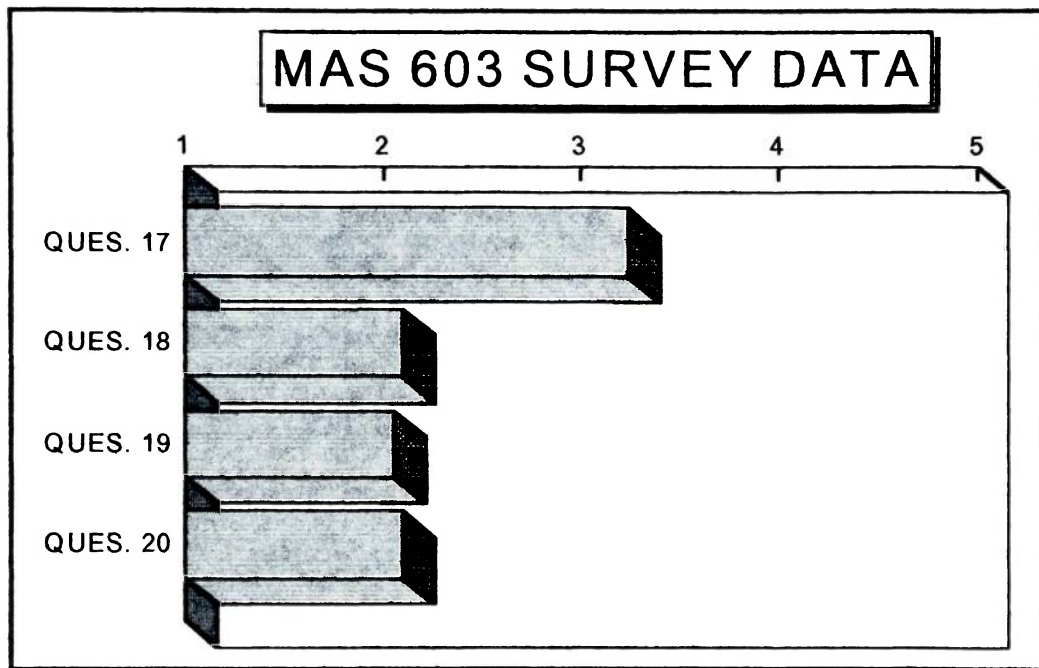
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**Table 13**

**On-Camera Instructor Mean Scores and Standard Deviation**

<u>QUESTION #</u>	<u>MEAN SCORE</u>	<u>STANDARD DEVIATION</u>
17	3.23	1.31
18	2.09	0.75
19	2.05	1.17
20	2.09	0.97

Figure 13 displays the survey mean score results for the questions listed in the on-camera instructor section.



**Figure 13.** MAS 603 Mean Scores for On-Camera Instructor Section of Survey.

The students perceived that the on-camera instructor did not address the distance learning students readily during classroom presentations. The over all mean scores for this section suggests that the on-camera instructor and the course developers should strived harder to insure that distance learning students receive similar benefits as the on-campus students during course presentation.



The section of the survey that focused on the electronic and textual media utilized to support the course contained eight questions. These questions were designed to query the students perceptions relating to the distance learning material developed for the course. The questions in this section were:

21. I think the combination of print, videotape, and bulletin board system (BBS) is an effective way to deliver this course.
22. The BBS is an effective means of facilitating communications.
23. The BBS system was difficult to learn.
24. The SKYTALK manual was helpful in learning/using BBS.
25. I now feel comfortable using the BBS.
26. The videotape picture was of high technical quality.
27. The videotape sound was of high technical quality.
28. The introductory section to the study guide clarified the direction of the course.

Table 14 shows the mean score and the standard deviation for questions in the media section.

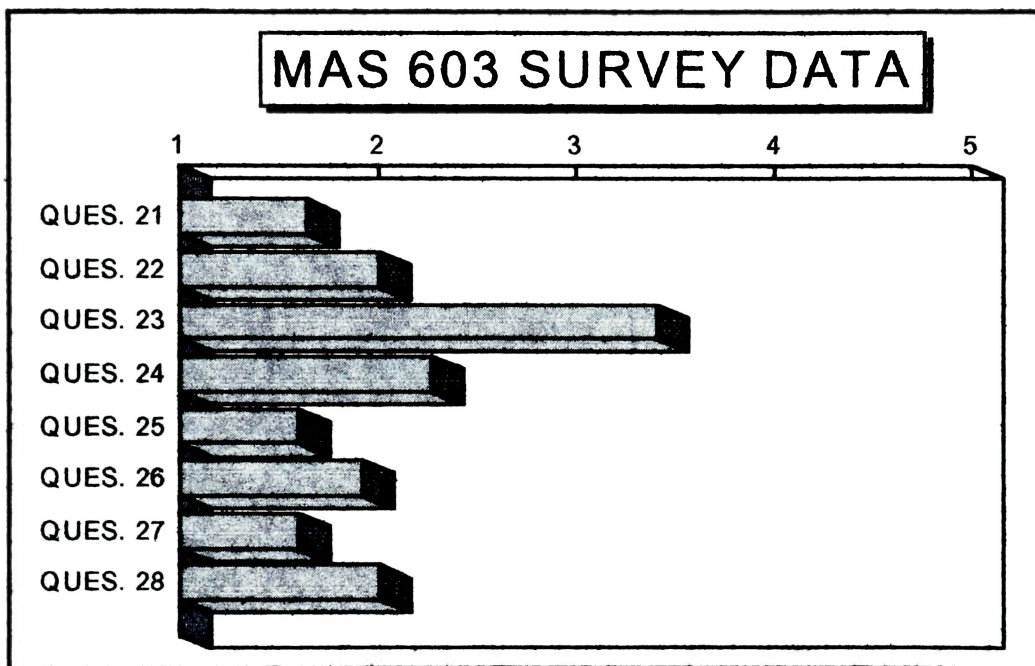
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**Table 14**

**Media Mean Scores and Standard Deviation**

<u>QUESTION #</u>	<u>MEAN SCORE</u>	<u>STANDARD DEVIATION</u>
21	1.64	0.58
22	2.00	0.76
23	3.41	0.91
24	2.27	0.88
25	1.59	0.73
26	1.91	0.61
27	2.59	0.91
28	2.00	0.76

Figure 14 displays the survey mean score results for the questions listed in the media section.



**Figure 14.** MAS 603 Mean Scores for Media section of Survey.

Question 23 was negatively skewed. The mean score for this question was 3.41 and considering the negative skew the responses were positive. The overall perception given by the students in this section is that the support material was satisfactory.

**MAS 604, HUMAN FACTORS IN THE AVIATION/AEROSPACE INDUSTRY****Course description.**

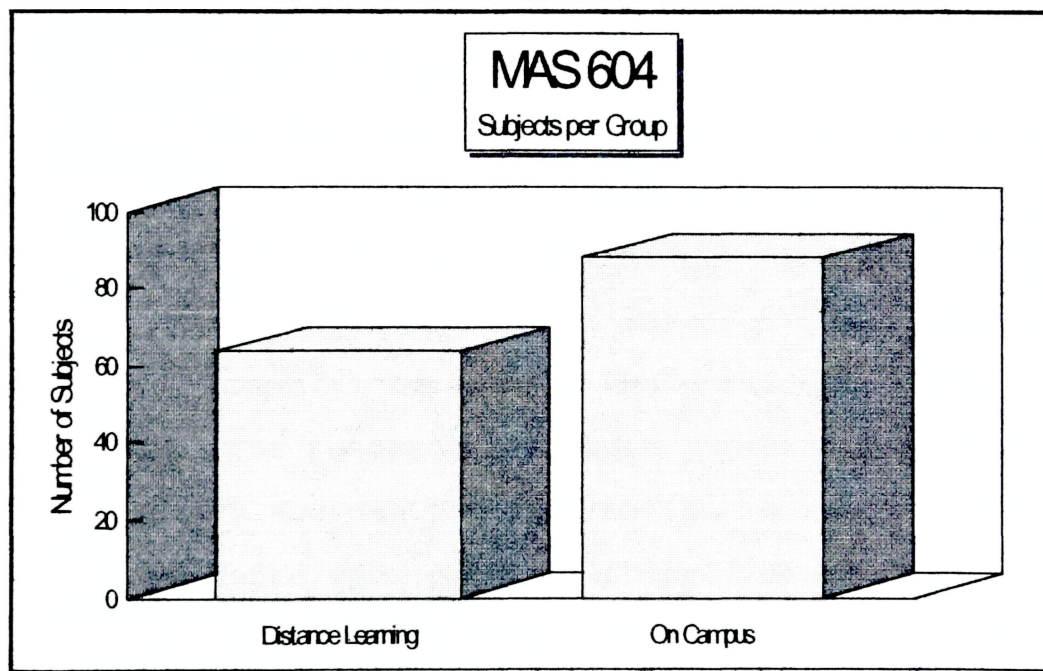
This course presents an overview of the importance of the human role in all aspects of the aviation and aerospace industries. It will emphasize the issues, problems, and solutions of unsafe acts, attitudes, errors, and deliberate actions attributed to human behavior and the role supervisors and management personnel play in these actions. The course will study the human limitations in the light of human engineering, human reliability, stress, medical standards, drug abuse, and human physiology. The course will discuss human behavior as it relates to the aviator's adaptation to the flight environment as well as the entire aviation/aerospace industry's role in meeting the aviator's unique needs.

**Faculty vita.**

Dr. John A. Wise is an Associate Professor, Aeronautical Science. He is the Lead Research Associate, Center for Aviation/Aerospace Research at Embry-Riddle Aeronautical University. Dr. Wise has over 17 years experience in the practice and project management of human factors engineering and information system design since receiving his Ph.D. Dr. Wise has instructed human factors courses at Embry-Riddle Aeronautical University for the past five years.

### Subjects.

The subjects for this course were not selected randomly. The subjects are those students that enrolled in MAS 604, Human Factors in the Aviation/Aerospace Industry, for the delivery method analyzed. Distance learning students accounted for 64 participants and 88 on-campus students participated. Figure 15 presents the subject count for both delivery methods.



**Figure 15. MAS 604 Subject Count by Delivery Method.**

Term dates.

The term dates and delivery method for class sections reviewed for this study are listed in Table 15.

**Table 15****MAS 604 Term Dates by Delivery Method**

<u>Distance Learning</u>		<u>On-Campus</u>	
Summer	1993	Spring	1993
Fall	1993	Fall	1993
Spring	1994	Spring	1994
Summer	1994	Fall	1994
Fall	1994		

Graded course requirements.

Final grades were tabulated by Dr. Wise utilizing the student performance on two scholarly papers, class participation, and final examination. The two scholarly papers required the student to research an instructor approved, human factors topic and provide in-depth analysis. The research for these papers dictated at least five primary sources for information included in the final work. Students were required to provide documentation of primary and secondary source material in the reference section of the paper.

The concept for these papers was to have the students become expert on the topic. There was no specified length requirements, however, each paper was required to be long enough to provide a complete synthesis and evaluation of the topic. Both papers were required to be of publishable

quality. Research requirements consisted of citings from at least five primary literature sources. An approved list of sources was furnished to the students in the study guide.

Class participation for both methods required the students to prepare a short one to two page presentation on a subject which the student selected from a list provided by the professor. Distance learning students selected the topic from a list provided on the electronic bulletin board and on-campus students selected from a list provided in class. The distance learning students prepared the presentation and up-loaded it to the bulletin board for fellow students and Dr. Wise to review. On-campus student presented their papers in the classroom setting.

The final examination was a comprehensive. The examination covered all subject matter presented on the videos or in the classroom. Students were also subject to testing on course material and reading from the text.

Grades were provided as alphabetical with plus or minus variant in some cases. To compute statistical data the alphabetical grades were converted to number values. This conversion was consistent as follows: C=75, B=85, A=95. The plus or minus variants were equated to a plus 2.5 or minus 2.5. Therefore, an A- equated to 92.5 and B+ equated to 87.5 for this study.

The final grade was calculated by Dr. Wise utilizing the percentage allocation for case studies, class participation, and examinations as listed in Table 16.

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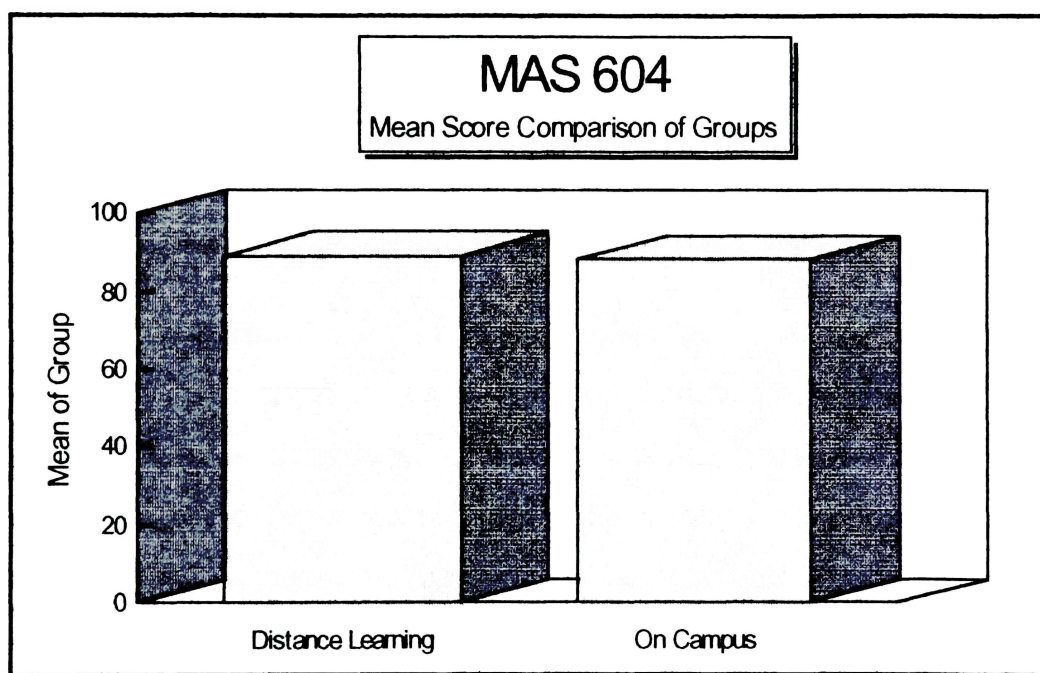
**Table 16**

**MAS 604 Grade Allocations by Assignments**

<b><u>Assignments</u></b>	<b><u>Grade Allocation</u></b>
Scholarly Paper # 1	30%
Scholarly Paper # 2	30%
Class Participation	10%
Final Examination	<u>30%</u>
Total	100.0%

Statistical data.

The data on the final grades used to analyze the outcomes is located in Appendix C. The statistical results compiled with the Statpak software package, from the outcome data, are located in Appendix D. Figure 16 illustrates the Mean scores for each method.



**Figure 16.** MAS 604 Comparison of Mean Scores by Delivery Method.



A summary of the results from the t-Test for Independent Samples for MAS 604 are provided in Table 17. These results are based on a probability ( $P = .05$ ).

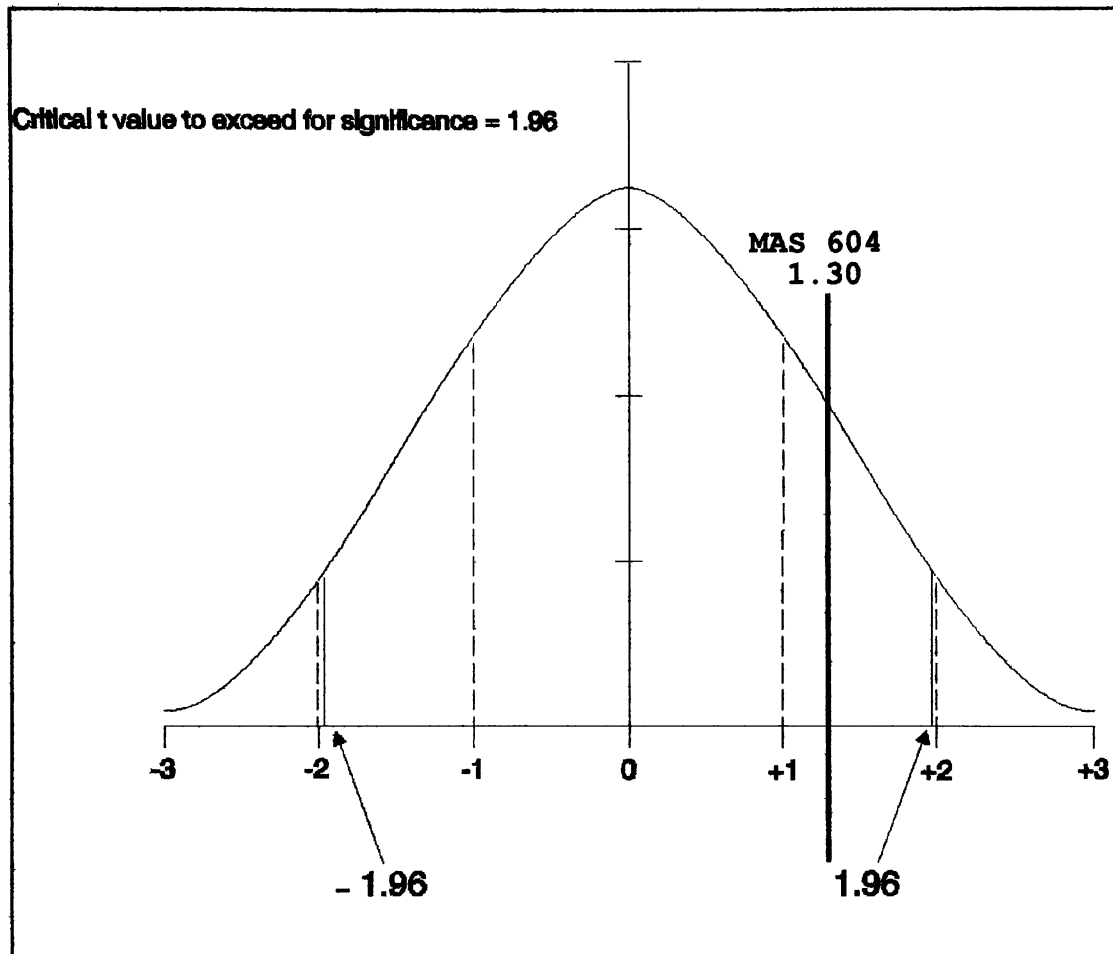
**Table 17**

**MAS 604 Summary of t-Test for Independent Samples**

<u>Statistics</u>	<u>Distance Learning</u>	<u>On-Campus</u>
Number of Subjects	64.00	88.00
Sum of Scores	5,697.25	7,751.25
Mean of Group	89.02	88.08
Sum of Squared Scores	508,270.69	684,554.69
<u>Statistical Results</u>	<u>Data</u>	
Degrees of Freedom	150.00	
t-Value	1.30	
Distribution of t	1.96	

**Findings.**

Using a probability of  $P = .05$  with a distribution of critical  $t = 1.96$  and  $t\text{-Value} = 1.30$  then it can be analyzed that the  $t\text{-Value}$  falls within the range of acceptance of the hypothesis. The finding for the data analyzed in MAS 604, Human Factors in the Aviation/Aerospace Industry, support the hypothesis that there is no significant difference between the two modes of delivery. Figure 17 displays the critical  $t\text{-value}$  and the  $t\text{-value}$  for the distance learning and on-campus subjects.



**Figure 17.** MAS 604 t Distribution of Difference Score.

Survey data.

Twenty-four (24) students responded from the original 64 students that completed the course. A review of the survey findings is provided by survey section.

The course quality section contained eight questions related to the students perception of the course content. The questions contained in this section were responded to by all participants. The questions in this section were:

1. I learned as well academically as I would have in a traditional classroom setting.
2. The student-to-student interaction enhanced my learning of the course content.
3. The Unit Learning Outcomes were aligned with course content.
4. The assignments/projects/case studies were appropriate for the course content.
5. The text and/or readings were well-suited for this course.
6. The examinations sampled the important material in the course.
11. I enjoyed this course.
12. I consider this course valuable to my career.

Table 18 shows the mean score and the standard deviation for each question in the course quality section.

Table 18

Course Quality Mean Scores and Standard Deviation

<u>QUESTION #</u>	<u>MEAN SCORE</u>	<u>STANDARD DEVIATION</u>
1	2.13	1.03
2	3.17	0.96
3	2.33	0.70
4	1.96	0.62
5	2.00	0.72
6	2.21	0.59
11	1.63	0.65
12	1.75	0.74

Figure 18 displays the survey mean score results for the questions listed in the course quality section.

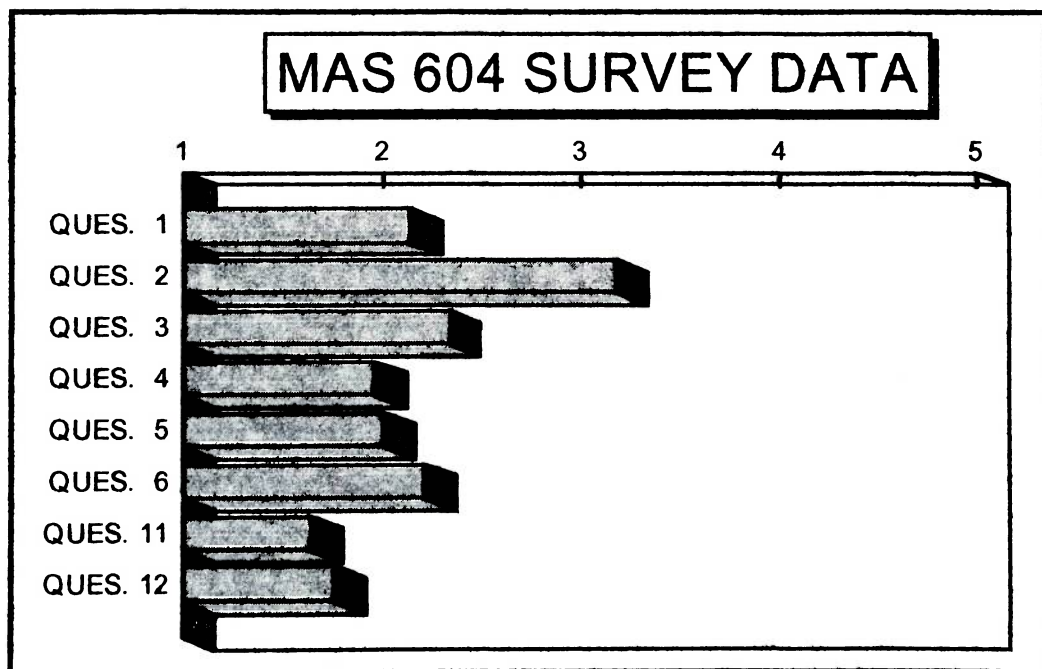


Figure 18. MAS 603 Mean Scores for Course Quality Section of Survey.

Question number 2 compiled a mean score of 3.17 which equates between neutral and disagree. Student perceptions appear to be that interaction with other students did not enhance the learning. The nature of this course and assignments developed by the professor provide for an individual, not group effort.

The remaining questions in this section received a mean score of 1.63 to 2.33. This suggests that the students perceived the course quality as comparable to on-campus classes. Question number 4 queried the students perception of the assignments. This question received a mean score of 1.96. This mean score suggests that the students agreed that the assignments were appropriate.

The section related to the designated instructor focused on the electronic delivery techniques of the instructor. These techniques require the professor to interact with the distance learning students utilizing the electronic bulletin board. Interaction and feedback are the keystone to success in distance learning situations.

The questions contained in this section were:

13. I was satisfied with the amount of instructor-to-student interaction I experienced.
14. The designated instructor provided appropriate guidance via the BBS.
15. The designated instructor gave useful feedback regarding progress in this class.
16. The designated instructor provided timely responses to my inquiries.

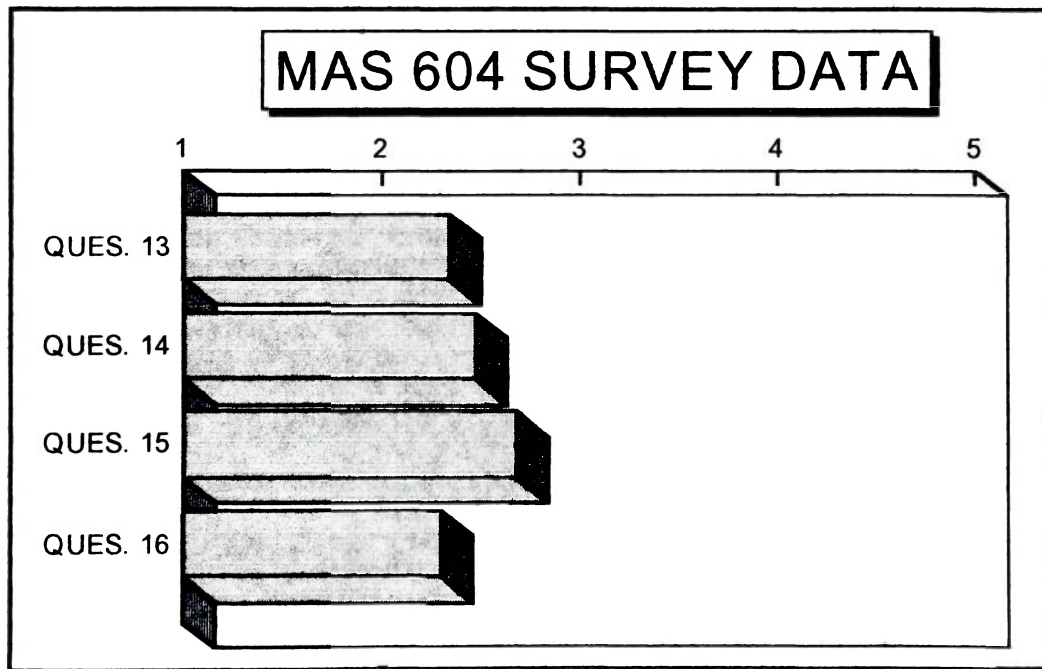
Table 19 shows the mean score and the standard deviation for questions in the designated instructor section.

**Table 19**

**Designated Instructor Mean Scores and Standard Deviation**

<u>QUESTION #</u>	<u>MEAN SCORE</u>	<u>STANDARD DEVIATION</u>
13	2.88	0.96
14	2.46	0.98
15	2.67	1.09
16	2.29	1.00

Figure 19 displays the survey mean score results for the questions listed in the designated instructor section.



**Figure 19. MAS 604 Mean Scores for Designated Instructor Section of Survey.**

The survey results for the designated instructor section reveal that the student perceptions were between agree and neutral. The mean scores of 2.29 to 2.67 for the four questions in this section suggest that the students perceived that the designated instructor interacted, but not at the level they anticipated.

The section dedicated to student perceptions of the on-camera instructor also contained four questions. These questioned focused on the delivery techniques utilized by the instructor during the video filming of the course. The questions contained in this section were:

17. The on-camera instructor frequently addressed independent studies students in his/her classroom presentations.
18. The on camera instructor stimulated creative/critical thinking.
19. The on-camera instructor used instructional aides appropriate for the course content.
20. It was easy to follow the on-camera instructor's presentations.

Table 20 shows the mean score and the standard deviation for the questions related to the on-camera instructor section of the survey.

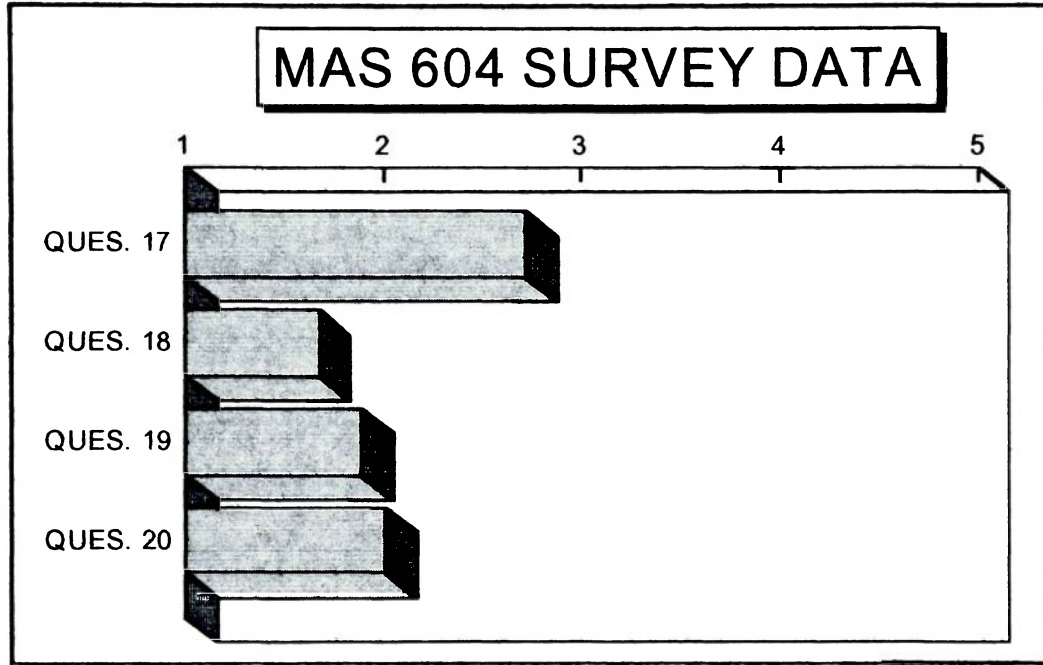
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**Table 20**

**On-Camera Instructor Mean Scores and Standard Deviation**

<u>QUESTION #</u>	<u>MEAN SCORE</u>	<u>STANDARD DEVIATION</u>
17	2.71	1.00
18	1.67	0.76
19	1.88	0.74
20	2.00	0.93

Figure 20 displays the survey mean score results for the questions listed in the on-camera instructor section.



**Figure 20.** MAS 604 Mean Scores for On-Camera Instructor Section of Survey.

The students perceived that the on-camera instructor addressed the distance learning students during the presentations. The students also perceived that the on-camera instructor used visual aids appropriate to the subject and was easy to follow during the presentations. Question number 18, stimulated creative/critical thinking, has a mean score of 1.67. This score relates between strongly agree and agree.



The section of the survey that focused on the electronic and textual media utilized to support the course contained eight questions. These questions were designed to query the students perceptions relating to the distance learning material developed for the course. The questions in this section were:

21. I think the combination of print, videotape, and bulletin board system (BBS) is an effective way to deliver this course.
22. The BBS is an effective means of facilitating communications.
23. The BBS system was difficult to learn.
24. The SKYTALK manual was helpful in learning/using BBS.
25. I now feel comfortable using the BBS.
26. The videotape picture was of high technical quality.
27. The videotape sound was of high technical quality.
28. The introductory section to the study guide clarified the direction of the course.

Table 21 shows the mean score and the standard deviation for questions in the media section.

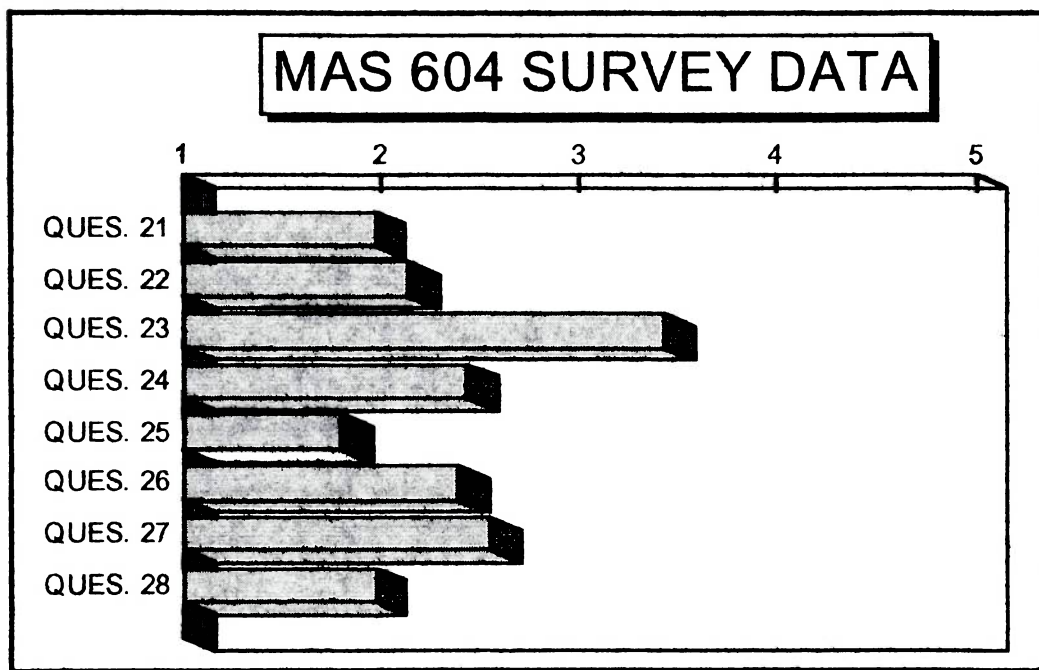
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**Table 21**

**Media Mean Scores and Standard Deviation**

<u>QUESTION #</u>	<u>MEAN SCORE</u>	<u>STANDARD DEVIATION</u>
21	1.96	0.95
22	2.13	0.90
23	3.42	1.02
24	2.42	0.58
25	1.79	0.72
26	2.38	0.92
27	2.54	1.02
28	1.96	0.36

Figure 21 displays the survey mean score results for the questions listed in the media section.



**Figure 21. MAS 604 Mean Scores for Media section of Survey.**

Question 23 was negatively skewed. The mean score for this question was 3.42 and considering the negative skew the responses were positive. Question 25 queried the students comfort level on the bulletin board system. This question was rated a 1.96 mean. Students appear to have achieved somewhat of a comfort level utilizing the electronic media. The overall perception given by the students in this section is that the support material was satisfactory.

**MAS 605, RESEARCH METHODS AND STATISTICS**Course description.

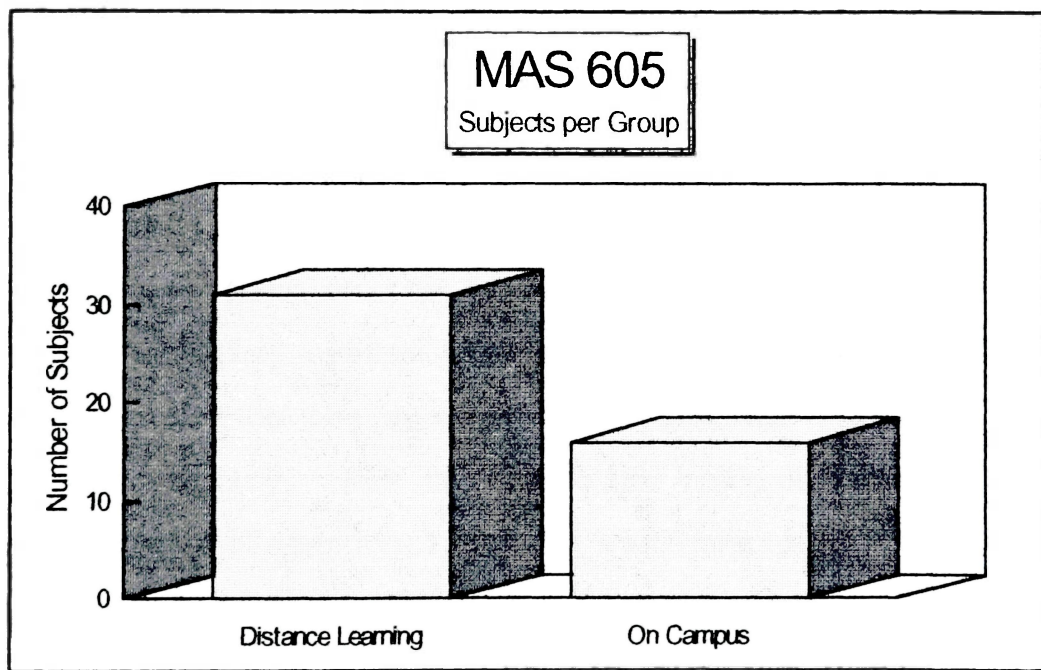
A study of current aviation research methods that include techniques of problem identification, hypothesis formulation, design and use of data gathering instruments, and data analysis. The interpretation of research reports that appear in professional publications are examined through the use of statistical terminology and computations. A formal research proposal will be developed and presented by each student as a basic course requirement.

Faculty vita.

Dr. Henry Lehrer developed MAS 604 for video presentation during the Fall 1993 term. The first distance learning presentation was offered during Spring 1994 term. Dr. Lehrer is a Professor of Aeronautical Science at Embry-Riddle Aeronautical University and has presented MAS 605, Research Methods and Statistics, on campus for over two years.

### Subjects.

The subjects for each method were not selected at random. They were the students that enrolled and participated in the course for that particular delivery method. Distance learning students accounted for 31 participants and 16 on-campus students participated. Figure 22 presents the subject count for both delivery methods.



**Figure 22. MAS 605 Subject Count by Delivery Method.**

Term dates.

The term dates and delivery method for class sections reviewed for this study are listed in Table 22.

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**Table 22**

**MAS 605 Term Dates by Delivery Method**

<u>Distance Learning</u>		<u>On-Campus</u>	
Spring	1994	Fall	1993
Summer	1994		

---

Graded course requirements.

There were several small written assignments required of all students. These assignments carry no specific credit other than pass or fail and are repeated until completed; however, each assignment is an integral and cumulative part of the final proposal. An additional part of the grading system was participation based not necessarily on the quantity of a student's remarks but more on the quality. All the material covered in the textbooks and during classroom lectures was considered appropriate for testing.

There were a number of writing assignments, classroom examinations, and a presentation during the course of the semester. The examinations were a mid-term and final examination and two statistical tests which were given at the same time as the mid-term and the final but have separate grades. In addition, a research paper in the form

of a formal thesis proposal was required and is the capstone assignment of the course.

Dr. Lehrer provided percentage grades for each course requirement. These grades were tabulated and a final percentage grade recorded. Final grade percentage for each subject is located in Appendix C.

The percentages allocated to assignments, examinations, and class participation are listed in Table 23.

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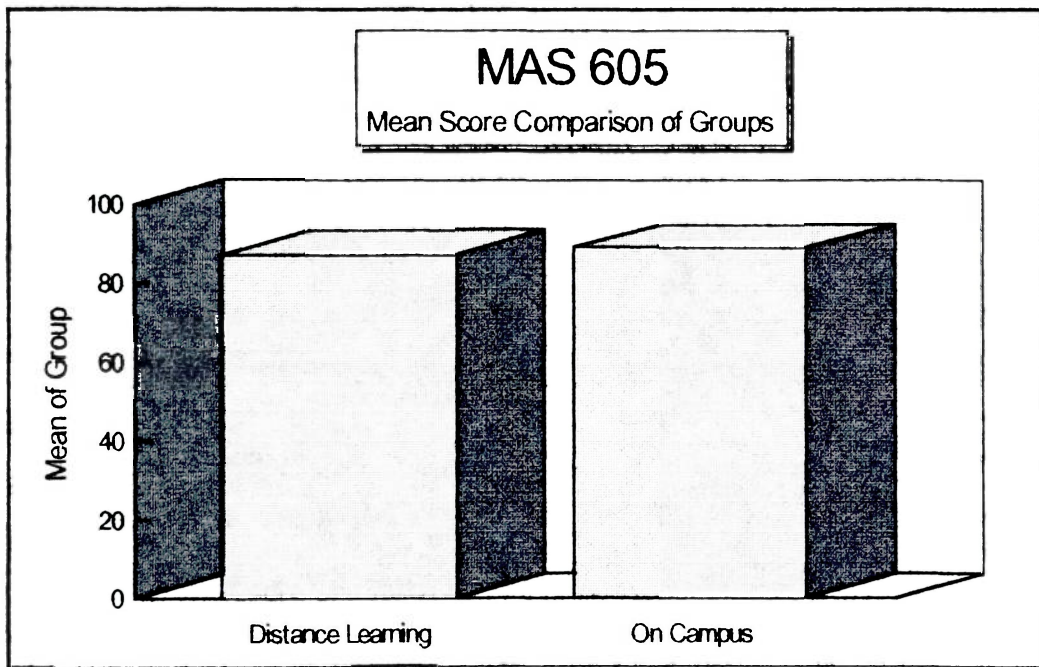
**Table 23**

**MAS 605 Grade Allocation by Assignment**

<b><u>Assignment</u></b>	<b><u>Grade Allocation</u></b>
Statistics Examinations	20%
Midterm Examination	20%
Final Examination	20%
Research Proposal	25%
Defense of Proposal	5%
Class Participation	<u>10%</u>
Total	100%

Statistical data.

The data on the final grades used to analyze the outcomes is located in Appendix C. The statistical results compiled with the Statpak software package, from the outcome data, are located in Appendix D. Figure 23 illustrates the Mean scores for each method.



**Figure 23. MAS 605 Comparison of Mean Scores by Delivery Method.**

A summary of the results from the t-Test for Independent Samples for MAS 605 are provided in Table 24. These results are based on a probability ( $P = .05$ ).

**Table 24**

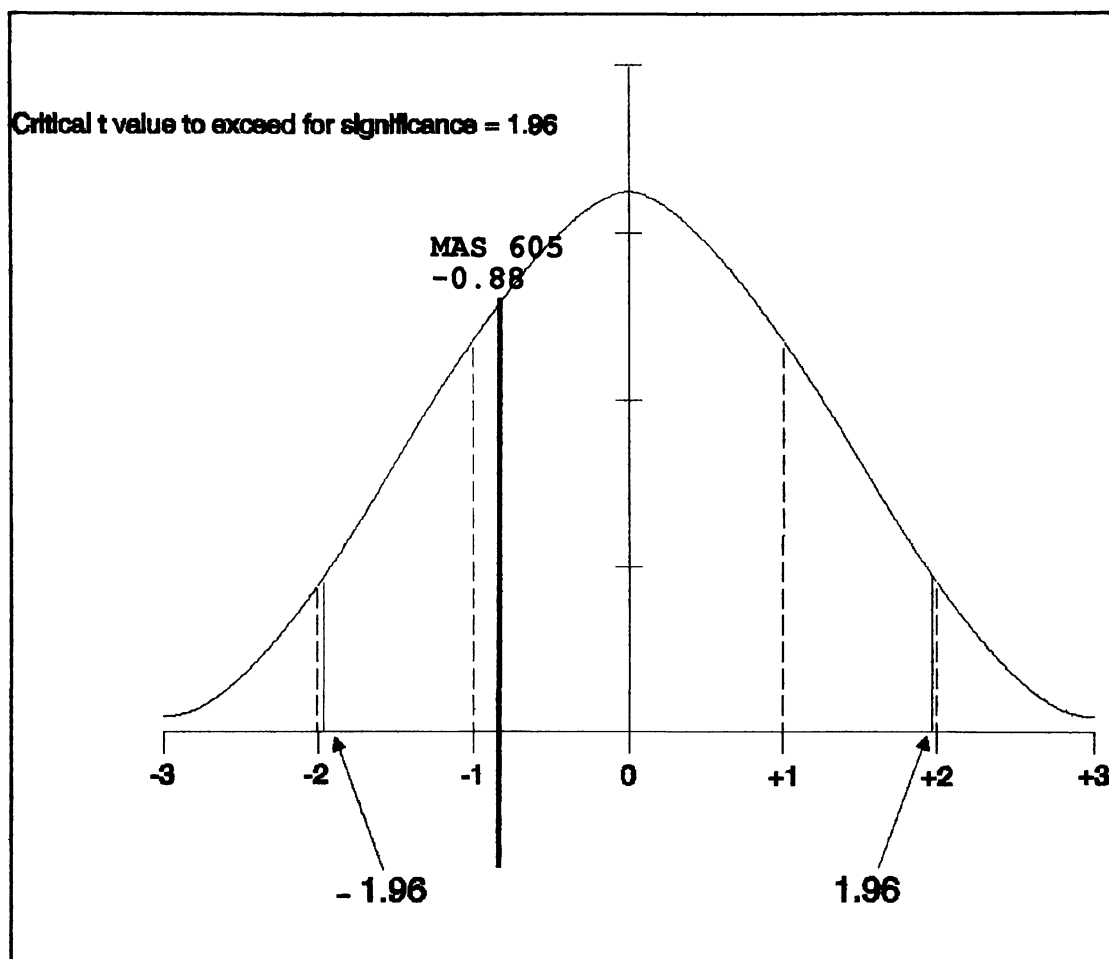
**MAS 605 Summary of t-Test for Independent Samples**

<u>Statistics</u>	<u>Distance Learning</u>	<u>On-Campus</u>
Number of Subjects	31.00	16.00
Sum of Scores	2,702.89	1,421.26
Mean of Group	87.19	88.83
Sum of Squared Scores	236,972.94	126,575.60
<u>Statistical Results</u>	<u>Data</u>	
Degrees of Freedom	45.00	
t-Value	-0.88	
Distribution of t	2.02	

Findings.

Using a probability of  $P = .05$  with a distribution of critical  $t = 2.02$  and  $t\text{-Value} = -0.88$  then it can be analyzed that the  $t\text{-Value}$  falls within the range of acceptance of the hypothesis. The finding for the data analyzed in MAS 605, Research Methods and Statistics, support the hypothesis that there is no significant difference between the two modes of delivery. Figure 24 displays the critical  $t\text{-value}$  and the  $t\text{-value}$  for the distance learning and on-campus subjects.





**Figure 24.** MAS 605 t Distribution of Difference Score.

Survey data.

Fifteen (15) students responded from the original 31 students that completed the course. A review of the survey findings is provided by survey section.

The course quality section contained eight questions related to the students perception of the course content. The questions contained in this section were responded to by all participants. The questions in this section were:

1. I learned as well academically as I would have in a traditional classroom setting.
2. The student-to-student interaction enhanced my learning of the course content.
3. The Unit Learning Outcomes were aligned with course content.
4. The assignments/projects/case studies were appropriate for the course content.
5. The text and/or readings were well-suited for this course.
6. The examinations sampled the important material in the course.
11. I enjoyed this course.
12. I consider this course valuable to my career.

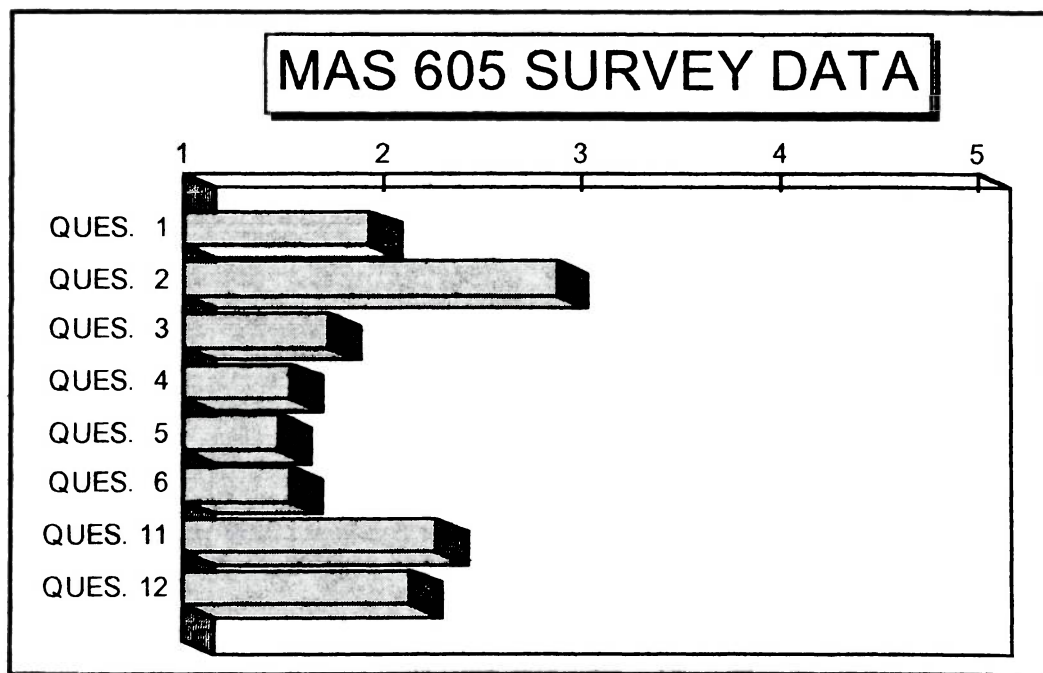
Table 25 shows the mean score and the standard deviation for each question in the course quality section.

Table 25

Course Quality Mean Scores and Standard Deviation

<u>QUESTION #</u>	<u>MEAN SCORE</u>	<u>STANDARD DEVIATION</u>
1	1.93	1.33
2	2.87	1.25
3	1.73	1.03
4	1.53	0.64
5	1.47	0.52
6	1.53	0.64
11	2.27	1.16
12	2.13	1.41

Figure 25 displays the survey mean score results for the questions listed in the course quality section.



**Figure 25.** MAS 605 Mean Scores for Course Quality Section of Survey.

Question number 2 compiled a mean score of 2.87 which equates between neutral and disagree. Student perceptions appear to be that interaction with other students did not enhance the learning. The nature of this course and assignments developed by the professor provide for an individual, not group effort.

The remaining questions in this section received a mean score of 1.47 to 2.87. This suggests that the students perceived the course quality as comparable to on-campus classes. Question number 4 queried the students perception of the assignments. This question received a mean score of 1.53. This mean score suggests that the students agreed that the assignments were appropriate.

The section related to the designated instructor focused on the electronic delivery techniques of the instructor. These techniques require the professor to interact with the distance learning students utilizing the electronic bulletin board. Interaction and feedback are the keystone to success in distance learning situations.

The questions contained in this section were:

13. I was satisfied with the amount of instructor-to-student interaction I experienced.
14. The designated instructor provided appropriate guidance via the BBS.
15. The designated instructor gave useful feedback regarding progress in this class.
16. The designated instructor provided timely responses to my inquiries.

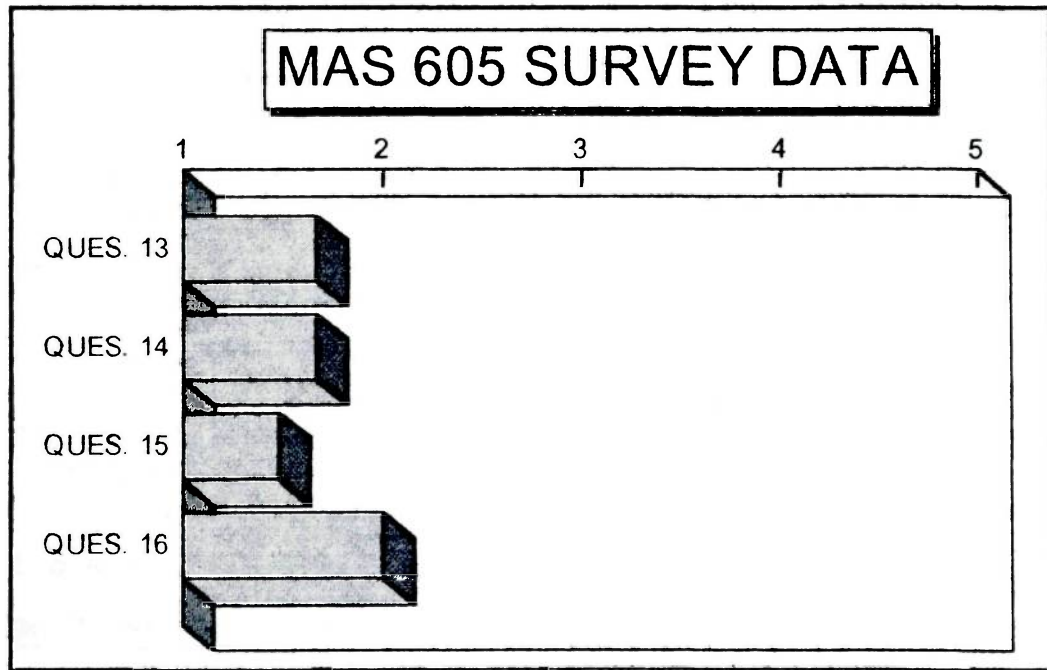
Table 26 shows the mean score and the standard deviation for questions in the designated instructor section.

**Table 26**

**Designated Instructor Mean Scores and Standard Deviation**

<u>QUESTION #</u>	<u>MEAN SCORE</u>	<u>STANDARD DEVIATION</u>
13	1.67	1.11
14	1.67	0.90
15	1.47	0.64
16	2.00	1.20

Figure 26 displays the survey mean score results for the questions listed in the designated instructor section.



**Figure 26. MAS 605 Mean Scores for Designated Instructor Section of Survey.**

The survey results for the designated instructor section reveal that the student perceptions were between strongly agree and agree. The mean scores of 1.47 to 2.00 for the four questions in this section suggest that the students perceived that the designated instructor interacted at the level the students anticipated.

The section dedicated to student perceptions of the on-camera instructor also contained four questions. These questions focused on the delivery techniques utilized by the instructor during the video filming of the course. The questions contained in this section were:

17. The on-camera instructor frequently addressed independent studies students in his/her classroom presentations.
18. The on camera instructor stimulated creative/critical thinking.
19. The on-camera instructor used instructional aides appropriate for the course content.
20. It was easy to follow the on-camera instructor's presentations.

Table 27 shows the mean score and the standard deviation for the questions related to the on-camera instructor section of the survey.

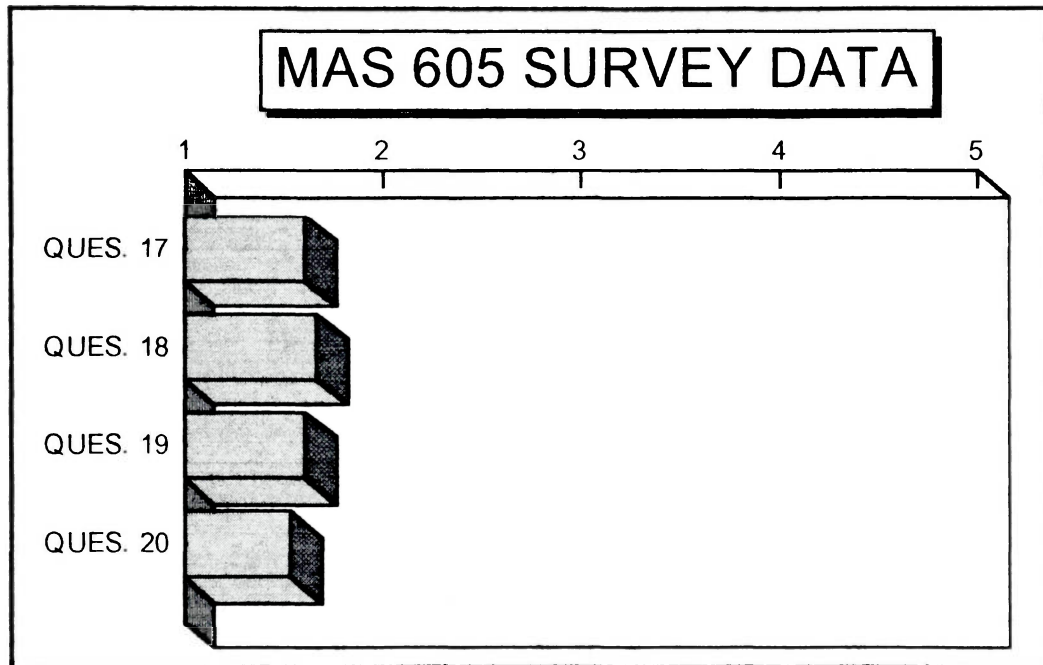
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**Table 27**

**On-Camera Instructor Mean Scores and Standard Deviation**

<u>QUESTION #</u>	<u>MEAN SCORE</u>	<u>STANDARD DEVIATION</u>
17	1.60	0.83
18	1.67	0.90
19	1.60	0.83
20	1.53	0.83

Figure 27 displays the survey mean score results for the questions listed in the on-camera instructor section.



**Figure 27. MAS 605 Mean Scores for On-Camera Instructor Section of Survey.**

The students perceived that the on-camera instructor addressed the distance learning students during the presentations. The students also perceived that the on-camera instructor used visual aids appropriate to the subject and was easy to follow during the presentations. Question number 18, stimulated creative/critical thinking, has a mean score of 1.67. This score relates between strongly agree and agree.

The section of the survey that focused on the electronic and textual media utilized to support the course contained eight questions. These questions were designed to query the students perceptions relating to the distance learning material developed for the course. The questions in this section were:

21. I think the combination of print, videotape, and bulletin board system (BBS) is an effective way to deliver this course.
22. The BBS is an effective means of facilitating communications.
23. The BBS system was difficult to learn.
24. The SKYTALK manual was helpful in learning/using BBS.
25. I now feel comfortable using the BBS.
26. The videotape picture was of high technical quality.
27. The videotape sound was of high technical quality.
28. The introductory section to the study guide clarified the direction of the course.

Table 28 shows the mean score and the standard deviation for questions in the media section.

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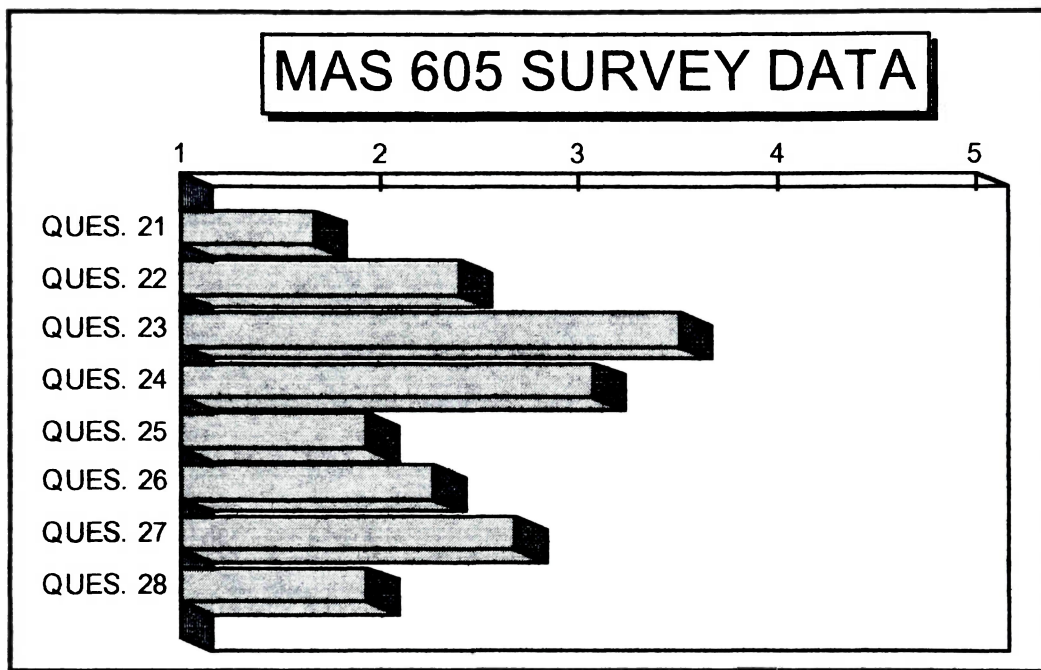
**Table 28**

**Media Mean Scores and Standard Deviation**

<u>QUESTION #</u>	<u>MEAN SCORE</u>	<u>STANDARD DEVIATION</u>
21	1.67	0.90
22	2.40	1.18
23	3.50	1.22
24	3.07	0.73
25	1.93	1.21
26	2.27	1.28
27	2.67	1.29
28	1.93	0.59



Figure 28 displays the survey mean score results for the questions listed in the media section.



**Figure 28. MAS 605 Mean Scores for Media section of Survey.**

Question 23 was negatively skewed. The mean score for this question was 3.50 and considering the negative skew the responses were positive. Question 21 relates to the combination of print, video, and bulletin board system as an effective method to deliver this course. Student perceptions were 1.67 or that they agreed that the combination of delivery media was effective. The overall perception given by the students of other questions in this section is that the support material was satisfactory.

## CONCLUSIONS

The statistical data collected and correlated for this study supports the hypothesis that there is no significant difference in delivery methods when outcomes are compared. Each sub-hypothesis provided a null-hypothesis. The size of the subject pool and the number of terms evaluated provided data that was objective.

The survey data provided insight into the students perceptions of the distance learning method. The majority of students that responded agreed that they learned as well academically in the distance learning method as in the traditional classroom.

The results of this study support distance learning techniques as a competent alternative to the traditional classroom delivery method. The demographics of potential student pool is changing rapidly. The ability to attend classroom courses limits professionals who must maintain employment to support family requirements. The distance learning alternative provides these individuals with the capability to accomplish both goals.

The combination of the statistical and survey data collected for this study confirm Embry-Riddle Aeronautical University's dedication to quality education.

## RECOMMENDATIONS

This initial study provided data that forms the foundation for future analysis. The courses reviewed for this study were limited to the four core courses in the Master of Aeronautical Science degree. The four core courses are: MAS602, The Air Transportation System; MAS603, Aircraft and Spacecraft Development; MAS604, Human Factors in the Aviation/Aerospace Industry; and MAS605, Research Methods and Statistics.

The MAS core courses are designed to enable the student to estimate the importance of the air transportation system as an integral part of the global, multi-modal transportation system and compare the different methods of inter-modal transportation from a historical, technological, social, environmental, and political perspective. The interrelationships of multi-purpose aviation/aerospace organizations in the development of an aircraft or spacecraft are contrasted and the concepts of planning and control of materials and components are compared. The importance of human factors in all aspects of the aviation/aerospace industry and the identification of basic human engineering factors are analyzed. The

development of a proposal related to an aviation problem using the acceptable methods of research are required. Future studies could include specialization and open elective courses.

Further studies should include the specialization courses offered within the Master of Aeronautical Science degree program. These specializations include Aeronautics, Operations, Education, Management, Human Factors, Space Studies, and Safety.

Embry-Riddle Aeronautical University offers the Management and Operations Specialization through distance learning. Expansion of the distance learning program to include the other specializations would dictate validation. Similar studies could provide confirmation of established university goals in quality distance learning.

The survey data reviewed for this study should be disseminated to the instructors, course developers, and administrators of the distance learning program on a periodical basis. Student perceptions are an integral part of the instructional design methodology.

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**APPENDIX A**

**LETTER TO AERONAUTICAL SCIENCE DEPARTMENT, CHAIRMAN**



October 31, 1994

Mr. Shannon L. Trebbe  
Embry-Riddle Aeronautical University  
Aeronautical Science Department, Chairman

Mr. Trebbe:

As partial fulfillment of the requirements for the Master of Aeronautical Science degree I am preparing a thesis. The thesis is titled "Comparative Analysis of Distance Learning and Traditional Instructional Delivery Methodologies in selected Embry-Riddle Aeronautical University Graduate Courses."

The method used to compare distance learning and traditional classroom delivery will be based on statistical analysis of student performance. Grades for both segments will be compiled and compared to evaluate student outcomes. This evaluation will be included in the published thesis.

All reference to individual students will be made by subject/participant number. There will be no direct association with past or current students. In essence, student anonymity will be maintained.

I request permission to contact individual professors and compile grade information required for the thesis. The courses that I am considering for the thesis are: MAS 602, Dr. Lehrer; MAS 603, Mr. Aumack; MAS 604, Dr. Wise; MAS 605, Dr. Lehrer; MAS 608 Mr. Hunt; MAS 636, Mr. Smith.

Thank you for consideration of this request. If I can clarify any points on this matter please contact me immediately.

James T. Gallogly

November 1994

TO: Memo for Record

FROM: Jim Gallogly

SUBJECT: Telephone conversation with Mr. Shannon L. Trebbe,  
Embry-Riddle Aeronautical University, Aeronautical  
Science Department, Chairman

Mr. Trebbe received the letter requesting my authorization to contact professors for grade reports and student data. Mr. Trebbe was supportive of my request and wanted to insure that student were referred to as subject numbers with no association to names or students numbers.

I assured Mr. Trebbe that the student anonymity would be adhered to in the thesis.

**APPENDIX B**  
**SURVEY**

## MAS THROUGH INDEPENDENT STUDIES COURSE EVALUATION

Course Number \_\_\_\_\_ Date \_\_\_\_\_ Semester \_\_\_\_\_

Who was your Designated Instructor? \_\_\_\_\_

1. Please indicate your opinion by circling the appropriate number:  
1= Strongly Agree, 2= Agree, 3= Neutral, 4= Disagree, 5= Strongly Disagree

<u>Course Quality</u>	<u>SA</u>	<u>A</u>	<u>N</u>	<u>D</u>	<u>SD</u>
1. I learned as well academically as I would have in a traditional classroom setting.	1	2	3	4	5
2. The student-to-student interaction enhanced my learning of the course content.	1	2	3	4	5
3. The Unit Learning Outcomes were aligned with course content.	1	2	3	4	5
4. The assignments/projects/case studies were appropriate for the course content.	1	2	3	4	5
5. The text and/or readings were well-suited for this course.	1	2	3	4	5
6. The examinations sampled the important material in the course.	1	2	3	4	5
7. The workload for this course was much heavier than other courses of equal credit.	1	2	3	4	5
8. For my preparation and ability, this course was very difficult.	1	2	3	4	5
9. For me, the pace at which the material was covered during the term was very slow.	1	2	3	4	5
10. Although not on campus, it was easy to access appropriate resources to complete assignments.	1	2	3	4	5
11. I enjoyed this course.	1	2	3	4	5
12. I consider this course valuable to my career.	1	2	3	4	5

### Designated Instructor on the BBS

13. I was satisfied with the amount of instructor-to-student interaction I experienced.	1	2	3	4	5
14. The designated instructor provided appropriate guidance via the BBS.	1	2	3	4	5
15. The designated instructor gave useful feedback regarding progress in this class	1	2	3	4	5
16. The designated instructor provided timely responses to my inquiries.	1	2	3	4	5

### On-Camera Instructor

17. The on-camera instructor frequently addressed independent studies students in his/her classroom presentations.	1	2	3	4	5
18. The on camera instructor stimulated creative/critical thinking.	1	2	3	4	5
19. The on-camera instructor used instructional aides appropriate for the course content.	1	2	3	4	5
20. It was easy to follow the on-camera instructor's presentations.	1	2	3	4	5

**Media**SA A N D SD

21. I think the combination of print, videotape, and bulletin board system (BBS) is an effective way to deliver this course. 1 2 3 4 5
22. The BBS is an effective means of facilitating communications. 1 2 3 4 5
23. The BBS system was difficult to learn. 1 2 3 4 5
24. The SKYTALK manual was helpful in learning/using the BBS. 1 2 3 4 5
25. I now feel comfortable using the BBS. 1 2 3 4 5
26. The videotape picture was of high technical quality. 1 2 3 4 5
27. The videotape sound was of high technical quality. 1 2 3 4 5
28. The introductory section to the study guide clarified the direction of the course. 1 2 3 4 5

**II. Indicate your rating of the following administrative services by circling the appropriate number:**

**1= Excellent, 2 = Good, 3= Satisfactory, 4= Fair, 5= Poor, 6= Does not Apply**

29. I would rate the counseling services as: E G S F P D  
1 2 3 4 5 6
30. I would rate the availability of courses as: 1 2 3 4 5 6
31. I would rate academic advisement as: 1 2 3 4 5 6
32. I would rate distribution of materials as: 1 2 3 4 5 6
33. I would rate financial services as: 1 2 3 4 5 6
34. I would rate veteran services as: 1 2 3 4 5 6
35. I would rate turnaround of grades to students as: 1 2 3 4 5 6
36. I would rate the DIS Graduate Program Office as: 1 2 3 4 5 6
37. What specific problems, errors, etc., did you encounter in the administrative and operational student services areas?

38. How did you learn about Embry-Riddle's Independent Study Programs? \_\_\_\_\_

1= Print Advertising  
2= Trade Show

3= Word of Mouth  
4= Resident Center

5= Previous Independent Study Course  
6= Other (Please Specify)

39. Do you plan to continue your education through Independent Studies? \_\_\_\_\_  
(if no, please explain)
40. How many times per week, on the average, did you access the BBS? \_\_\_\_\_
41. How many minutes, on the average, did you spend each time you accessed the BBS? \_\_\_\_\_
42. What did you like "most" about the course?
43. What did you like "least" about the course?
44. Please provide any additional comments.
45. Please specify your position, title, and company.

**The Center for Instructional Development and Effectiveness is evaluating the feasibility of introducing CD-ROM-based Independent Study course packages. Please provide the following information:**

46. Do you have access to a computer with a CD-ROM drive? \_\_\_\_\_
47. In your opinion, would CD-ROM be an effective medium for course materials? \_\_\_\_\_
48. Would you be interested in CD-ROM-based Independent Study course materials? \_\_\_\_\_
49. Please comment:

APPENDIX C  
OUTCOME DATA

**MAS 602, THE AIR TRANSPORTATION SYSTEM**

**DISTANCE LEARNING OUTCOMES**

SUBJECT	SUM 93	FALL 93	SPRING 94	SPR 94 INT	SUM 94
1	93.84	94.58	94.28	92.65	94.35
2	93.30	94.67	93.55	92.05	92.65
3	92.30	93.08	92.75	91.70	91.75
4	91.53	94.42	92.58	91.35	91.65
5	91.47	92.50	92.13	91.25	91.35
6	90.83	92.08	91.15	91.25	90.40
7	90.71	92.67	90.88	90.90	90.40
8	90.22	91.58	90.68	90.30	90.25
9	89.99	91.17	90.55	90.20	90.25
10	89.71	89.67	89.75	90.08	89.60
11	89.55	89.50	89.75	89.60	89.50
12	89.44	90.33	89.63	88.65	89.48
13	88.38	90.00	89.60	87.25	88.63
14	87.74	88.75	89.40	84.45	88.35
15	87.72	89.25	89.25	79.78	88.10
16	86.12	90.33	88.70		87.95
17	86.07	88.00	86.28		87.83
18	85.99	88.08	86.15		87.65
19	85.15	86.75	86.13		87.58
20	84.80	87.50	84.60		87.55
21	84.69	87.33	84.30		87.40
22	84.16	86.08	80.14		87.15
23	83.75	85.58	52.30		86.05
24	82.71	85.92			83.93
25	82.22	85.00			83.35
26	77.64	83.50			82.93
27	77.56	83.75			81.80
28					79.35
29					72.60



**MAS 602, THE AIR TRANSPORTATION SYSTEM**  
**ON-CAMPUS OUTCOMES**

<b>SUBJECT</b>	<b>SPRING 93</b>
1	92.34
2	91.85
3	91.83
4	90.86
5	89.90
6	90.93
7	90.72
8	88.14
9	89.07
10	86.62
11	85.09
12	84.83
13	86.70
14	77.55
15	76.24
16	75.15

**MAS 603, AIRCRAFT AND SPACECRAFT DEVELOPMENT**  
**DISTANCE LEARNING OUTCOMES**

<b>SUBJECT</b>	<b>SPRING 93</b>	<b>FALL 93</b>	<b>SPRING 94</b>	<b>SUMMER 94</b>	<b>FALL 94</b>
1	95.00	95.00	95.00	95.00	95.00
2	95.00	95.00	95.00	95.00	95.00
3	95.00	95.00	95.00	95.00	95.00
4	95.00	95.00	95.00	95.00	95.00
5	95.00	95.00	95.00	95.00	95.00
6	95.00	95.00	95.00	95.00	95.00
7	95.00	95.00	95.00	95.00	95.00
8	95.00	95.00	95.00		95.00
9	95.00	85.00	95.00		95.00
10	95.00	95.00	95.00		95.00
11	95.00	95.00	95.00		95.00
12	95.00	95.00	95.00		95.00
13	95.00	95.00	95.00		95.00
14	95.00	95.00			95.00
15		95.00			95.00
16		95.00			95.00
17		95.00			95.00
18		95.00			95.00
19					95.00
20					

**MAS 603, AIRCRAFT AND SPACECRAFT DEVELOPMENT**

**ON-CAMPUS OUTCOMES**

SUBJECT	FALL 92	SPR 93	FALL 93	SPR 94	SUM 94	FALL 94
1	95.00	95.00	95.00	95.00	95.00	95.00
2	95.00	95.00	95.00	95.00	95.00	95.00
3	95.00	95.00	95.00	95.00	95.00	95.00
4	95.00	95.00	95.00	95.00	95.00	95.00
5	95.00	95.00	95.00	95.00	95.00	95.00
6	95.00	95.00	95.00	95.00	95.00	95.00
7	95.00	95.00	95.00	85.00	95.00	85.00
8	95.00	95.00	95.00	95.00	95.00	95.00
9	95.00	95.00	95.00	95.00	85.00	95.00
10	95.00	95.00	95.00	95.00	95.00	95.00
11	95.00	95.00	95.00		95.00	95.00
12	85.00	95.00	95.00		95.00	95.00
13	95.00	95.00	95.00		95.00	95.00
14		95.00	95.00		95.00	95.00
15		95.00	95.00		95.00	95.00
16		95.00	95.00		95.00	95.00
17		95.00	95.00			50.00
18		95.00	95.00			95.00
19		95.00	95.00			95.00
20		95.00	95.00			95.00
21		95.00	95.00			
22		95.00	95.00			
23		95.00	95.00			
24		95.00	95.00			
25		95.00	95.00			
26		95.00	95.00			

**MAS 604, HUMAN FACTORS IN THE AVIATION/AEROSPACE INDUSTRY****DISTANCE LEARNING OUTCOMES**

<b>SUBJECT</b>	<b>SUM 93</b>	<b>FALL 93</b>	<b>SP 94</b>	<b>SUM 94</b>	<b>FALL 94</b>
1	86.25	83.75	86.25	85.00	90.00
2	83.50	92.50	93.75	86.25	86.25
3	92.50	83.75	90.00	90.00	95.00
4	90.00	86.25	88.75	85.00	86.25
5	86.25	91.25	95.00	93.75	95.00
6	92.50	95.00	90.00	87.50	90.00
7	93.75	93.75	95.00	83.75	86.25
8	92.50	85.00	95.00	88.75	83.75
9	86.25	86.25		82.50	91.25
10	86.25	82.50		87.50	90.00
11	93.75	87.50		95.00	96.25
12	90.00	82.50		93.75	
13	85.00	83.75		88.75	
14	95.00	85.00			
15	91.25	95.00			
16	83.75				
17	83.75				

**MAS 604, HUMAN FACTORS IN THE AVIATION/AEROSPACE INDUSTRY**  
**ON-CAMPUS OUTCOMES**

<b>SUBJECT</b>	<b>SPRING 93</b>	<b>FALL 93</b>	<b>SPRING 94</b>	<b>FALL 94</b>
1	90.00	83.75	91.25	95.00
2	91.25	82.50	97.50	91.25
3	90.00	92.50	83.75	93.75
4	87.50	88.75	82.50	93.75
5	81.25	92.50	95.00	93.75
6	93.75	93.75	90.00	91.25
7	83.75	85.00	92.50	92.50
8	95.00	95.00	86.25	83.75
9	82.50	86.25	90.00	83.75
10	86.25	86.25	82.50	93.75
11	81.25	82.50	90.00	83.75
12	80.00	95.00	85.00	83.75
13	81.25	85.00	90.00	91.25
14	82.50	91.25	85.00	85.00
15	92.50	90.00	85.00	95.00
16	92.50	92.50	83.75	85.00
17		85.00	85.00	90.00
18		93.75	85.00	86.25
19		81.25	87.50	87.50
20		87.50	88.75	86.25
21		90.00	95.00	90.00
22		85.00	86.25	82.50
23		95.00	82.50	
24		91.25		
25		85.00		
26		80.00		
27		85.00		

**MAS 605, RESEARCH METHODS AND STATISTICS****DISTANCE LEARNING OUTCOMES**

<b>SUBJECT</b>	<b>SPRING 94</b>	<b>SUMMER 94</b>
1	94.60	93.73
2	93.15	93.47
3	93.04	93.21
4	92.32	91.06
5	91.94	90.32
6	91.88	87.58
7	91.74	83.58
8	91.09	83.30
9	89.86	66.42
10	89.78	
11	89.18	
12	88.16	
13	88.22	
14	87.06	
15	86.19	
16	85.84	
17	84.99	
18	81.85	
19	81.20	
20	78.45	
21	75.23	
22	74.45	

**MAS 605, RESEARCH METHODS AND STATISTICS****ON-CAMPUS OUTCOMES**

<b>SUBJECT</b>	<b>FALL 93</b>
1	95.15
2	93.93
3	93.63
4	92.75
5	92.49
6	91.84
7	90.38
8	89.99
9	89.84
10	89.31
11	88.51
12	83.96
13	83.92
14	82.28
15	82.28
16	81.00

**APPENDIX D**  
**t-TESTS FOR INDEPENDENT SAMPLES**



**MAS 602 t-TEST FOR INDEPENDENT SAMPLES**

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<u>STATISTICS</u>	<u>VALUE</u>
Number of Distance Learning Subjects	121.00
Sum of Distance Learning Scores	10,652.40
Mean of Distance Learning Scores	88.04
Sum of Squared Distance Learning Scores	941,369.75
SS of Distance Learning	3,571.25
Number of On-Campus Subjects	16.00
Sum of On-Campus Scores	1,387.82
Mean of On-Campus Scores	86.74
Sum of Squared On-Campus Scores	120,864.32
SS of On-Campus	486.54
t-Value	0.89
Degrees of Freedom	135.00
Distribution of t	1.96

**MAS 603 t-TEST FOR INDEPENDENT SAMPLES**

=====

<u>STATISTICS</u>	<u>VALUE</u>
Number of Distance Learning Subjects	71.00
Sum of Distance Learning Scores	6,650.00
Mean of Distance Learning Scores	93.66
Sum of Squared Distance Learning Scores	625,250.00
SS of Distance Learning	2,397.88
Number of On-Campus Subjects	111.00
Sum of On-Campus Scores	10,460.00
Mean of On-Campus Scores	94.23
Sum of Squared On-Campus Scores	988,050.00
SS of On-Campus	2,359.94
t-Value	-0.73
Degrees of Freedom	180.00
Distribution of t	1.96

**MAS 604 t-TEST FOR INDEPENDENT SAMPLES**

=====

<u>STATISTICS</u>	<u>VALUE</u>
Number of Distance Learning Subjects	64.00
Sum of Distance Learning Scores	5,697.25
Mean of Distance Learning Scores	89.02
Sum of Squared Distance Learning Scores	508,270.69
SS of Distance Learning	1,104.16
Number of On-Campus Subjects	88.00
Sum of On-Campus Scores	7,751.25
Mean of On-Campus Scores	88.08
Sum of Squared On-Campus Scores	684,554.69
SS of On-Campus	1,806.13
t-Value	1.30
Degrees of Freedom	150.00
Distribution of t	1.96

**MAS 605 t-TEST FOR INDEPENDENT SAMPLES**

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<u>STATISTICS</u>	<u>VALUE</u>
Number of Distance Learning Subjects	31.00
Sum of Distance Learning Scores	2,702.89
Mean of Distance Learning Scores	87.19
Sum of Squared Distance Learning Scores	236,972.94
SS of Distance Learning	1,307.97
Number of On-Campus Subjects	16.00
Sum of On-Campus Scores	1,421.26
Mean of On-Campus Scores	88.83
Sum of Squared On-Campus Scores	126,575.60
SS of On-Campus	326.83
t-Value	-0.88
Degrees of Freedom	45.00
Distribution of t	2.02