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AUTHOR Iadevaia, David G.
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ABSTRACT

Following an accreditation site visit which determined that the part-time faculty at Pima Community College (PCC) accounted for 80% of the total faculty on a headcount basis, a study was conducted comparing the characteristics of full- and part-time faculty, and, in particular of full- and part-time science faculty. In addition, student grades were examined to determine whether being taught by a full- or part-time faculty member affected student success. Faculty information was collected by the PCC administration via surveys distributed to 1,500 part-time faculty, and to all full-time department chairpersons, while student data were collected from PCC's student information files for the previous 5 years. Major findings included the following: (1) no national standards were discovered for determining an ideal ratio between full- and part-time faculty, and all accreditation agencies, in one form or another, were found to address part-time faculty ratios as an individual institution's concern; (2) a chi square analysis revealed no differences in student success rates for full- and part-time faculty in general, or for science faculty in particular; (3) while significant differences in success rates seemed to be related to student gender, when course completion rates for a random sample of students were examined no significant gender differences were found; and (4) the dominant faculty profile at PCC was a white male, 44 years of age, with a master's degree and 5 years of teaching experience. Appendixes include related memorandums, data summaries, and the survey form. (JMC)

A COMPARISON OF FULL-TIME TO PART-TIME FACULTY AND FULL-TIME TO PART-TIME SCIENCE FACULTY IN TERMS OF STUDENT SUCCESS AT PIMA COMMUNITY COLLEGE

by

David G. Iadevaia

A Major Applied Research Project presented to Nova University in partial fulfillment of the requirements for the degree of Doctor of Education

Nova University

November, 1991

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One does not always know the pressure that accompanies a person in an endeavor. Only by using those close to us as barometers are we able to gauge the magnitude of the tasks we undertake. A Doctoral dissertation is a task of great magnitude and at this time I must acknowledge my barometers:

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finally

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During an accreditation site visit a North Central Accreditation (NCA) team determined that the ratio between full-time and part-time faculty was too high. This determination precipitated concerns from the college administration, the faculty council and a disgruntled part-time faculty member. The problem of increased use of part-time faculty at Pima Community College (Pima College) had surfaced. The purpose of this study was to examine the problem by comparing the full-time and part-time faculty, in general, to the full-time and part-time science faculty, specifically, in terms of student success at Pima College.

Increased use of part-time faculty was found in science courses as well. Currently, the problem of

scientific literacy has been addressed in the literature. Since most students take their only college-level science course at two-year institutions it was important to determine if any differences exist between part-tire/full-time faculty taught courses.

Basic hypotheses were made regarding age, gender, and assessment test scores as to whether there were differences between full-time or part-time faculty and student success. Student success, for this study, was defined as a grade of C or better. A grade of C or better is needed for a student to finish terminal programs or for transfer to a university. While not the only measure of student success, it was appropriate for this study.

Globally, questions directed toward the effects, if any, of part-time faculty on student success in science courses were answered. The question of accreditation agencies defining the ideal full-time to part-time faculty ratios was answered as was the question of any effects proprietary and corporate colleges, which rely almost exclusively on the use of part-time faculty, may have on public sector institutions.

An analysis of student records was made. The data of all students registered for all classes at Pima Community College during the last five years immediately preceding this study were examined.

The data were analyzed based on various student parameters, i.e., assessment test scores, final grade, sex, age, ethnic background, and race. These data were grouped by students having had courses taught by full-time and part-time faculty. A sub-group of students, who had taken science courses, was extracted and analyzed as described above. Those students who had completed the course with a grade of C or above were defined as having been successful in the course.

A random sample was taken from the data. This sample was used to determine if full-time or part-time faculty had achieved greater student success.

A chi square data analysis was made. This analysis revealed that there were no significant differences ($p=0.05$) between the groups of students taught by full-time and part-time science faculty versus the groups of students taught by full-time and part-time faculty from all other courses.

As a result of this study it was found that not one of the national accreditation agencies had a numerical value for the ratio of full-time to part-time faculty; however, all agencies had implied standards. These implied standards invoked such criteria as maintenance of curriculum, student advising and continuity. All of these functions could be handled by a core of full-time faculty.

At best the application of the "non-standard" regarding full-time/part-time ratios seemed arbitrary.

Corporate colleges continue to use part-time faculty. These institutions have been and continue to be successful in the use of part-time faculty almost exclusively.

As a result of this study it was recommended that the national accreditation agencies drop the full-time/part-time faculty ratio "non-standard" since it seemed to be totally irrelevant. It was recommended that full-time/part-time faculty ratios not be an item for concern at Pima College as far as student success is concerned. It was also recommended that further studies into the relationship between gender and student success be conducted.

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Chapter 1

INTRODUCTION

Background and Significance

The increased use of part-time faculty in community colleges is forcing a review of this practice by the educational community (Tyree, 1988). (Originally, the part-time faculty option was invoked to add expertise and a sense of "the state of the art" in the subject being taught by the part-time faculty). The full-time faculty would see to the design of the curriculum and to student guidance.

As administrations became reluctant to hire more full-time faculty for the obvious economic reason that a part-time person did not cost as much, a proliferation of part-time faculty contracts were generated. This practice staffed classes with faculty at a considerable savings to the colleges. The result is that some community colleges can have up to sixty percent part-time faculty. In some subject areas students never take a class from a full-time faculty member. This situation has caused concern with many accreditation agencies (Tyree, 1988).

One subject area that affects society's ability to function in the modern era is science. Most students begin their college and university careers in a community college. Most science is taken in the first two years of college,

which places science education within the community college arena. The increased use of part-time faculty may influence the quality of science education (Tyree, 1988).

Statement of the Problem

It was discovered, as a result of a Nova University practicum (Iadevaia, 1990), that part-time faculty issues at Pima Community College had surfaced as an important matter. The question about part-time faculty had been formally raised by the Faculty Council in a motion to the Vice President for Academic and Student Affairs. The accreditation agency, North Central Association, had also raised the question regarding part-time to full-time faculty ratios. A disgruntled part-time faculty member also raised the issue in a guest editorial of a local newspaper as seen in Appendix A.

In the face of increasing pressures on college budgets, part-time faculty, who have been used to keep the cost of the delivery of education down, present a problem that affects the whole of higher education. As the ratio of part-time to full-time faculty increases, so also do the concerns raised by the educational community (Tyree, 1988).

According to the literature (Miller, 1987, Culliton, 1989, Vagelos, 1989) there is a national problem with science literacy. It is important to study the effects,

if any, that full-time/part-time faculty have on student success in science education.

Brief History

The typical nineteenth century American college teacher was, more often than not, a minister schooled in the classics. This individual was teaching part time. A full-time faculty consisting of lay people was indeed rare during this era (Gappa, 1984).

During the twentieth century, universities and colleges developed specialized and advanced curricula. The change from an agrarian based curriculum precipitated the need for a new type of faculty. The emergence of the teaching profession as a full-time career began. The use of part-time faculty continued because some areas could not justify the use of a full-time faculty member. In these highly specialized areas, part-time faculty continued to be involved. However, the numbers of part-time faculty were limited and were usually found at the graduate or professional level (Gappa, 1984).

Following World War II, the use of part-time faculty began to increase dramatically. An increase in the rapid growth of higher education was the primary reason.

Some colleges began offering part-time teaching to a spouse as a recruiting tool. The lack of resources needed to increase the full-time faculty ranks also played a role in the increased use of part-time faculty (Gappa, 1984).

The increased needs of community colleges were met by part-time faculty. The employment of part-time faculty allowed for an increase in flexibility especially in vocational and technical programs. These courses could be taught on/off campus, day/night, with or without credit, for very reasonable costs.

Full-time positions at community colleges were made available with savings realized by employing part-time faculty. This allowed the community colleges to compete for "teachers bent on academic careers" (Gappa, 1984:3).

Part-time faculty are usually paid less for services rendered than are full-time faculty. However, since it can be argued that part-time faculty perform fewer tasks than full-time faculty and are employed on genuinely different terms, this rationalization is apparently logical. As long as part-time faculty cannot claim property rights, their employment is limited by a semester contract. Since the numbers of part-time faculty are increasing, neither pay or working conditions are a factor in reducing their numbers (Gappa, 1984). The use of part-time faculty is not new. The questions being raised about the use of part-time

faculty have increased as the numbers of part-time faculty increase.

Part-time Faculty Questions at Pima College

Interest was generated when a disgruntled associate faculty member wrote a guest editorial (Appendix A) in a local paper and stated (Grajewski, 1989:7a),

> The ratio of part-time (Let's stop using the bureaucratic euphemism "associate faculty") to full-time faculty is lopsided . . . part-time faculty come cheap and are powerless . . . Student evaluations caution faculty, especially part-time faculty, to be less demanding and more popular, further banalizing the curriculum.

Grajewski's editorial evoked a negative reaction from the faculty at the East Campus. Whether his comments had merit or not was lost in the ensuing emotion that was generated. An immediate rebuttal (Appendix B) came from the Chairman of the East Campus Faculty who states (Davidson, 1989),

> I resent the fact that you have associated your name with Pima College East. The article appears as if you were the "expert in residence" here at the East Campus.

If indeed such perceptions exist, it would seem fair to conclude that an internal environment audit was needed.

An internal environment audit, according to Austin (1990), is used to identify potential problem areas.

The North Central accreditation team also cited the large ratio of associate to full-time faculty in its report (Crawley, 1988:17),

> The associate faculty accounts for 80% of the total faculty on a headcount basis. This seems to be a heavy use of associate faculty.

There may be more to the perception of the part-time faculty problem than either Grajewski or NCA have noted, especially if there is a difference in student success between part-time and full-time faculty. Also, several authors have addressed similar concerns as stated above regarding part-time faculty, for example Willett (1980) and Selvadurai (1989).

Other issues regarding part-time faculty were raised during a seminar held at the college on 21 November 1989. During this seminar, some legal questions were raised regarding "department chairpersons guaranteeing continuing employment to associate faculty" (Iadevaia, 1989a). One concern was the listing of part-time faculty names in the official class schedule. A point was raised that this practice might be misconstrued as a guarantee of continuing employment. Continuing employment on a part-time basis may constitute property rights on the position held each semester by the part-time faculty member. Property rights

can be defined in a court of law, hence a part-time faculty member could sue the college (Iadevaia, 1990). A memo to Gorsuch (Appendix C) put the question in a formal light. The statement of a suggestion by the College's legal counsel that "the names of associate faculty should not appear in the published class schedule until contracts were signed" (Iadevaia, 1990) was addressed by Gorsuch in a return memo (Appendix D). A reluctance to exclude the names from the schedule was apparent in the memo (Gorsuch, 1990),

> The practice of listing the names of part-time faculty in the class schedule is not illegal. The action that you recommend is the most drastic and therefore, should be considered only after all other administrative actions have been taken . . .

At this time the issue of property rights has not been raised regarding the continued use of names of part-time faculty at Pima College.

The Part-time Faculty Issue

The issue of part-time faculty is a major one addressed in a report of The Commission on The Future of Community Colleges. According to Tyree (1988:12), editor of the Commission's report,

> Today part-time teachers comprise about 60 percent of community college faculty, and it is estimated that about 25 percent of all community college credits are earned through classes taught by part-time teachers.

The Commissioners recognized the importance that part-time faculty bring to the colleges as a needed resource of

enrichment and experience. However, Tyree (1988:12) continues,

> . . . that the increasing numbers of part-time faculty at many colleges are a disturbing trend . . . a healthy balance between part-time and full-time faculty is required.

One of the reasons cited for the problem of an increased part-time faculty is, "it is obviously more difficult for them to advise students, to collaborate with colleagues and participate in institutional life" (Tyree, 1988:13).

A major problem, which seems to surface over and over again, deals with support systems available for part-time faculty. Selvaduri found (1989:73) that to "establish deliberate and continuing communications linkages between full-time and part-time faculty" may be useful. This was based on Selvaduri's study used to evaluate the adequacy of selected services in place for part-time faculty. This problem is evident at Pima College as well. As Gorsuch (April, 1990) states, "there is no planned district-wide effort to support . . . associate faculty development efforts."

Another dimension to the problem deals with accreditation agencies' comments about part-time/full-time faculty ratios. Accrediting bodies apparently do not have fixed criteria regarding the ratio of full-time to part-time faculty. A typical response from the nation's accreditation agencies could be summed up by comments from Thrash (1990),

> There are no guidelines or standards that our Commission maintains as the ideal ratio between full-time and part-time faculty.

Ironically, this very agency cited the ratio of full-time to part-time faculty at Pima College to be on the high side in favor of the part-time faculty. Thrash (1990) goes on to state,

> I would however, call your attention to GIR 3.d, "A faculty comprising persons qualified by education and experience is significantly involved in the development and review of the educational programs." There clearly should be a core of full-time faculty to ensure that this requirement is met.

question that comes to mind might be how small can the core be? One aspect of this study was to shed light on this question.

Science Education and the Part-time Faculty Issue

As important as the issues raised by the part-time faculty question are, during the last ten years only one study dealing with science was found in the literature on the instructional effectiveness of full- and part-time faculty. In a study conducted at Elgin Community College Willet (1980:29) concludes,

> The results suggest that a faculty member's status, full- or part-time, is not a significant aspect in student ratings of teaching, in class retention, or in subsequent student achievement in advanced classes.

However, Willet's study excluded the physical sciences, which did not include part-time faculty in the sample.

Willet's conclusion was apparently for advanced classes only.

When Culliton (1989:600) reports that "studies find only 6% of Americans and 7% of British meet standards for science literacy," this may be cause for concern. If the concern is about actual knowledge of science then there may be a problem. According to Culliton (1989:600) the results of a survey developed by Miller (1987) over a ten year period, has been used to test "an understanding of the process and methods of science, a basic vocabulary and recognition of the impact of science and technology on society." This survey is described by its author as the "best measure so far."

Based on his surveys, Miller concludes that people with college experience in science tend to have a higher degree of scientific literacy than people with high school experience in science. According to Miller (1987), all college students should have science courses in order to raise their level of scientific literacy. But Miller's work did not address the success of students in science courses. Since the majority of college students, in the first two years of college are enrolled in two year institutions, it is important to address the quality of science teaching at this level.

Proprietary or Corporate College Issues

Another important area deals with proprietary or corporate colleges. These institutions rely heavily on part-time faculty. Eurich (1985:119) explains that,

> . . . there is a far greater use of part-time faculty in the corporate institution, a practice often frowned upon in traditional higher education and often by accrediting commissions.

The corporate college, while making use of part-time faculty does so, continues Eurich (1985:119) as,

> . . . a deliberate and defended policy . . . They engage experts part-time who continue active research or other employment in the company pertinent to their teaching.

So important is work experience over pedagogy at some corporate institutions, that a dean at Hamburger University (MacDonalds Corporation) said, "We take the experienced men in operations and management, and teach them to teach. We do not take educators" (Eurich, 1985:19). It would seem that corporate institutions are found at one extreme of a continuum with traditional institutions at the other end.

One interesting observation regarding the question of part-time faculty is the reaction by some full-time faculty and administrators to this study. It was observed that when they heard about the study, they immediately assumed that an attack was being made on part-time faculty.

This attitude may be the result from associating part-time employment with temporary help. A lack of commitment may be implied or that part-time faculty are treated as the

"under-dog" and must be protected. The important point is that a sensitivity seems to exist about part-time faculty.

Research Questions

The following research questions were asked, based on findings and observations made to date:

1. Are there national accreditation standards for determining an ideal ratio between full-time and part-time faculty?

Each accreditation agency seems to imply a standard in its statement of the "non-standard." This study attempted to define the implied standard.

2. When comparing full-time and part-time faculty, is there a similar student success rate between those students taught by full-time and those taught by part-time faculty?

The outcome of the educational process as measured by student success is important to an educator if success is defined, as it is in this study, as a student being able to reach the next level in the attainment of an academic goal. It is necessary that all phases of the process that may affect the goal be known. In a community college environment where such a high percentage of the faculty are part-time, the second research question addressed student

success as a function of instruction by part-time or full-time faculty.

3. When comparing full-time and part-time science faculty is there a similar student success rate between those students taught by full-time and those taught by part-time faculty?

Most college students take their only science courses at the college level during their first two years of college. The first two years of college are usually taken at the community college.

4. Do similar or contrasting characteristics exist which may separate part-time and full-time faculty, for example, academic preparation or years of experience which may be seen as contributing to student success?

Is it possible to identify any characteristics which might differentiate between part-time and full-time faculty? Such characteristics, if they exist, might benefit the educational process. For example, if the characteristics can be isolated, this could improve the pedagogical approach taken in training future faculty.

5. What are the trends in proprietary or corporate colleges regarding the use of part-time faculty in their educational programs?

The example which proprietary or corporate colleges may have on state legislators may be used as a base for funding of community colleges (Zoglin, 1976). If the business community continues to provide an efficient educational model this may result in a change for traditional institutions in the form of an even greater use of part-time faculty, not necessarily for the expertise they bring but rather for economic and political concerns.

Hypotheses

Null Hypotheses

Several null hypotheses were examined. They were as follows:

$H_0$1. There is no significant difference (p=0.05) between full-time and part-time faculty and full-time and part-time science faculty and student success as a function of student gender.

$H_0$2. There is no significant difference (p=0.05) between full-time and part-time faculty and full-time and part-time science faculty and student success as a function of student age.

$H_0$3. There is no significant difference (p=0.05) between full-time and part-time faculty and full-time and part-time science faculty and student success as a function of reading assessment test scores.

Alternate Hypothesis

H_A1. There is a significant difference (p=0.05) between full-time and part-time faculty and full-time and part-time science faculty and students success as a function of student gender.

H_A2. There is a significant difference (p=0.05) between full-time and part-time faculty and full-time and part-time science faculty and student success as a function of student age.

H_A3. There is a significant difference (p=0.05) between full-time and part-time faculty and full-time and part-time science faculty and student success as a function of reading assessment test scores.

Definition of Terms

Student success - defined as pertaining to all students who finished the course in which they enrolled with a grade of C or higher.

Grade - an assigned value of A, B, C, D, F, to a student based on course work evaluation.

Grade of C or higher - a grade which is transferable to other college or university programs.

Associate faculty - the term used at Pima College for part-time faculty.

Implied standard - the ratio of part-time to full-time faculty ratio alluded to by the various national accreditation agencies.

Part-time faculty - anyone who teaches less than the average full-time teaching load (15 load hours per semester) and is not a full-time faculty member at Pima College.

Limitations of the Study

The major limitation of this study was the lack of control over any independent variables. There was difficulty in ascertaining which, if any, causative factors were responsible for the outcomes. Finally, because there may be interaction between variables, there was no way to identify a single factor as to the reason for a specific outcome. According to Isaac and Michael (1989:51),

> A phenomenon may result not only from multiple causes but also from one cause in one instance and from another cause in another instance.

It may not be possible to draw inferences over all the combinations analyzed or to apply the inferences drawn to any other setting outside of Pima College.

The random sample, from which the differences between faculty groups where found, may not have been completely representative of the selected categories analyzed. A sample collection technique was selected to minimize any sampling errors.

Assumptions

A number of assumptions were made regarding this study. It was assumed that part-time faculty surveyed were typical of Pima College part-time faculty over the last five years immediately preceding this study.

It was also assumed that the student population over the last five years was homogeneous as to the variables measured. Finally it was assumed that a cause-effect relationship could be inferred between variables and that these relationships were valid.

Chapter 2

REVIEW OF RELATED LITERATURE

Student Success

Many studies have been conducted with regards to relationships between student retention and its causes, but according to North (1988:10),

> . . . although studies have included a wide array of variables . . . few accurate, empirical, relevant relationships between retention and its causes (have been established).

North (1988:22) goes on to state that,

> Whether reviewing the literature on retention and attrition of . . . the two - year college student, research findings are generally inconclusive, contradictory or of limited practical value.

Although it would appear that many studies have been done, for numerous reasons the results of these studies would be of little value. The literature is replete with studies and analyses of studies (Baker, 1980, Boggs, 1984, Davis, 1986, Tinto, 1975) regarding achievement and retention.

A study by Davis (1986), for example, showed that students achieved equal grades and exit exam scores and there was no difference between those taught by full-time or part-time faculty. However, the question of differences between full-time and part-time faculty and student success in science courses has not been examined. There is indication from the literature that science education is now a national priority (Cowley, 1990, Eisenstein, 1991, Yaeger, 1988). One reason for the decline in

science education has been the decline in modernly equipped science labs in our institutions. Interestingly, more attention is being given to the business/academic partnerships. Industry is willing to upgrade science labs, but at what price (Wiggenhorn, 1990)?

Part-time/Full-time Faculty Ratios According to National Accreditation Agencies

The educational community has suggested that an increase in part-time faculty may influence the quality of education (Tyree, 1988). National accreditation agencies also seem to share these concerns. And yet, it seems that while there are concerns, neither the educational community nor the accreditation agencies can define these concerns.

The Commission on Higher Education for the Middle States Association of Colleges and Schools (MSA) (1982:24) defines faculty as having,

> A principal responsibility . . . to supply the instruction necessary to make the curriculum effective. Clearly, in order to provide proper instruction, the faculty must consist of competent, committed individuals, academically prepared and qualified . . .

The Commission goes on to state that (1982:25),

> Full-time faculty are essential for the continuity and coherence of the formal and informal programs of an institution . . .

While defining a full-time faculty in terms of its responsibility and importance for the continuity of the institution, the Commission (1982:25) simply states that,

> Criteria for the appointment of part-time or adjunct faculty and their supervision should be comparable as far as possible to those for full-time faculty . . . The employment of part-time or adjunct faculty, however, requires policies as carefully considered and explicated as those for full-time faculty.

However, the Commission (1982:25) states that the use of part-time faculty should be limited to,

> People with unusual talents or experience, or with special qualifications . . . (and used). . . only on a limited basis.

The use of part-time faculty as resources from a specialization point of view is emphasized by the Commission, but the Commission does not "have prescriptive or quantitative standards . . . for faculty, full or part-time", (Simmons, 1990).

The Southern Association of Colleges and Schools (SACS) (1984:28) states,

> The employment of part-time faculty can provide expertise to enhance the educational effectiveness of an institution. However, the number of part-time faculty must be properly controlled.

In obvious agreement with MSA, SACS expects the use of part-time faculty ascement. SACS would like a control placed on how many part-time faculty are employed; however, they do not offer a guideline as to the value of that number. According to Rogers (1990),

> . . . we do not have specific guidelines governing the ratio between full-time and part-time faculty. Rather, this becomes a matter of professional judgement as exercised through the peer review process of the Commission.

The idea of professional judgement has surfaced possibly implying that the collective wisdom of the school that is being evaluated by the Commission members can be brought to bear on what is an acceptable ratio for that particular school.

The Western Association of Schools and Colleges (WASC), according to Petersen (1990),

> . . . has not established a consistent standard on the part-time / full-time ratio. Institutions and disciplines differ greatly. An acceptable part-time ratio in Law Enforcement or Real Estate might be unacceptable in English or Mathematics.

This accrediting agency addresses the variability of one program of study from another. This variability may preclude the assignment of a fixed value for the ratio between full-time and part-time faculty. However, Petersen (1990) goes on,

> We are concerned about the trend to over dependence on part-time faculty in some institutions. We have established as an eligibility requirement that there be a core of full-time faculty.

The implication might be that the core could maintain the continuity and coherence stated by MSA.

One agency feels that the burden of proof lies on the shoulders of the institution that is being evaluated. According to Malik (1990),

> Institutional accrediting bodies such as the Commission on Colleges of the Northwest Association of Schools and Colleges usually do not have guidelines or standards on the ratio of part-time to full-time faculty. Accreditation is based upon the mission of an institution . . . the nature of the programs offered and a host of other factors.

He went on to quote from his commission's standards that a core of "full-time instructional faculty with major professional commitment to the institution" (Malik, 1990:1) is essential for accreditation. However, if the core is non-existent, the institution could still be accredited if it can "demonstrate clearly and definitively that its students . . . are being well served without it" (Malik, 1990:1). It is conceivable that an institution without any full-time faculty could be accredited under the auspices of the Northwestern Association of Schools and Colleges.

Lezberg, of the New England Association of Schools and Colleges (NEASC) (1990) states,

> We do not have prescriptive standards regarding the ideal ratio between part and full-time faculty membership at our member institutions . . . the issue is not numbers but the ability of the institution to attract and maintain a faculty appropriately qualified to deliver its educational program.

However, to read the standard on faculty contained within NEASC's criteria for accreditation, it seems that there is no distinction between full-time and part-time faculty. NEASC (1990:42) states,

> The institution should maintain a faculty that is academically qualified and numerically sufficient to perform the responsibilities assigned to it.

The standard (NEASC, 1990:43) does, however, maintain concern as to,

> How does the faculty (full-time and part-time) participate in the formulation of academic policies and practices?

This possibly implies that part-time faculty are expected to be part of the process to maintain continuity and coherence of the institution.

Finally, the North Central Association of Colleges and Schools (NCA) (1990:11) defines faculty as

> . . . comprising persons qualified by education and experience to be significantly involved in the development and review of the educational programs.

Nowhere is to be found any reference to part-time faculty. This may imply, as it did for the NEASC criteria, that there is no distinction between full-time and part-time faculty. The NCA does distinguish between full-time and part-time faculty as pointed out by Thrash (1990),

> There are no guidelines or standards that our Commission maintains as the ideal ratio between full-time and part-time faculty.

She continues, "there clearly should be a core of full-time faculty to ensure that this requirement is met" (Thrash, 1990). She is referring to the requirement that the faculty be significantly involved in the educational programs. However, the application of this requirement regarding a core of full-time faculty seems arbitrary at best, when it is not specifically stated in any document. Just as with NWASC, an institution under the auspices of NCA could be accredited without having full-time faculty. However, this is not the case as pointed out by NCA when the Commission stated that the ratio of full-time to part-time faculty was too large at Pima College. (Crawley, 1988).

Gender Issues and Scientific Literacy in Science Education

Scientific literacy and college level science course work have been found to correlate (Miller, 1987) and previous studies were found to reveal possible reasons for differences in student success as defined in the present study. Melissa J. Lane of the National Science Foundation (1988:750) stated that

> Although engineers and scientists constitute only about 4 percent of the U.S. work force, they are critical in expanding the frontiers of knowledge, developing new technologies, and training future generations.

If it is important to have an equal number of females represented in this group of four percent one will find a discrepancy. According to Lane (1988:751) "women constitute only about 15 percent of the total engineering/science work force." As of January 1987, "women accounted for . . . 49 percent of employment in professional and related occupations" (Lane, 1988:751). Since females are approximately 51 percent of the human population, it would be expected to find upwards of this number in the work force. Indeed, women comprise "44 percent of the total employment" (Lane, 1988:751). In the U.S. however, when applied to engineers and scientists as a work force, women represent 15 percent of that population.

Is there a gender-related cause that precludes women from these fields (Etheridge, 1982)? A careful examination of the data reveals that "approximately half of all undergraduate majors in science are female" (Baker, 1983:102). It would seem that through the baccalaureate program women are represented in science classes at a biologically consistent level of approximately 50 percent.

Kahle (1988:382) states that "woman science majors expressed more positive attitudes toward mathematics . . . than did women non-science majors." This is consistent with Dale Baker's (1981:6) findings that "differences in attitudes . . . reflect major (course of study) rather than (did) sex." The idea of attitude seems to be a recurrent theme in the literature with regards to the choice of male or female in selecting science/engineering as a career choice. Baker further states (1981:6) that

> It appears that factors influencing a choice of a career in science are spatial ability and attitude toward science for both males and females. For women, the attitudinal factor is more important than the cognitive factor, although how these two may be related is unclear. Nevertheless, once women are in science it is not possible to distinguish them from men on the basis of attitude or spatial ability.

Can this attitude be conceived in male/female terms? So it would seem. After applying the Personal Attributes Questionnaire and the Myers-Briggs Type Indicators, Baker concluded that there are certain individuals, based on their personalities, who seem to choose science as a

career. Baker (1983:102) found that "they are likely to be intuitive and introverted, preferring to base decisions on logical analysis." Baker also found that most people in science seem to be "masculine" in outlook. This essentially means that these people exhibit "dominance, aloofness, detachment" (Baker, 1983:102). According to Baker (1983:102), female scientists were more "androgynous" . . . and were more "masculine" than college woman in general." Interestingly, more women select biology than the physical sciences, which seems to be stereotypically more "feminine."

From the social perspective, "there may or may not be biological explanations for sex differences in science achievement, but it is obvious that sociological factors play an important role" according to Jones and Wheatly (1988:128). Jones and Wheatly confirm Baker's assumption regarding the masculine/feminine attitudes and conclude that ". . . traits of scientists are more often associated with masculinity" (Baker, 1988:129). The lack of role models may send a subliminal message to females that science is indeed male dominated.

Sex bias, on the part of the professor, either knowingly or not, seems to send the wrong message to females in science classes. How the professor interacts

with males and females seems to indicate attitudes the professor has toward one sex regarding expected achievement (Jones and Wheatly, 1988).

The increased dependency on technology in society must be followed by an increase in scientific literacy, if for no other reason than to understand the use of the tools that result from the new technology. As pointed out by Eisenstein (1991:46),

> Only 20% of American high school graduates have studied physics, and this percentage has not changed much the last couple of decades. . . . In many developed countries including Japan, England and Korea, all high school students study physics. . . .

It appears that of the high school students who enter colleges, 80 percent of them have not had physics. From Eisenstein's comments it may be assumed that a technologically illiterate population is found at the door of two-year colleges.

As reported by Cowley (1990:52),

> . . . a 1989 report by the National Research Council estimates that three-quarters of the nation's graduating high-school seniors leave school without the skills to survive a college-level math or engineering course.

Apparently such reports have boosted concern at the national level and it seems that science education has been restored to the nation's list of unmet crises (Cowley, 1990:52). However, these students find their way to the two-year colleges.

A Corporate College

It is tempting to hold up academic education to corporate education as a means of establishing flaws within the academic system. For some reason, comparison to the corporate model seems to be common. It has been stated by Boyer (1985, XIV)

> . . . that, in a bid for survival, higher education will imitate its rivals, that careerism will dominate the campus as colleges pursue the marketplace goals of corporate education. If that happens, higher learning may discover that, having abandoned its own special mission, it will find itself in a contest it cannot win.

If, when dealing with the question of part-time faculty, one rushes to embrace the corporate model, Boyer's warning could be overlooked. The consequences may be devastating (Eurich, 1985).

A look at Motorola University, one of many successful corporate universities, will shed some light on the corporate model of an educational system. As Eurich (1985:20) reminds us, "The corporate system is educating many millions of adults in this nation." The public is content with a control over its public institutions of education, the corporate schools "want . . . no outside control" (Eurich, 1985:38).

The idea of corporate schools is not new. As far back as 1872 these schools had as a goal cultural

education, training for upper-level occupacions and Americanizing alien labor (Eurich, 1985). As more and more corporations granted employees lifetime employment, the idea of continuing education seemed sound. By the 1980s the corporate concept of manufacturing had changed drastically. A developing world economy was forcing re-evaluation of old "tried and true" business practices. Competition was increasing.

It wasn't enough for a person to understand just one function of their job. Executives at Motorola Corporation had to face the fact that the business climate was changing.

Motivation for Corporate Education

According to Wiggenhorn (1990:71),

> . . . all the rules of manufacturing and competition changed, and in our drive to change with them, we found we had to rewrite the rules of corporate training and education.

Industry discovered that ". . . line workers had to actually understand their work" (Wiggenhorn, 1990:71). Finally it was discovered at Motorola that ". . . much of our work force was illiterate. They couldn't read. They couldn't do simple arithmetic like percentages and fractions." (Wiggenhorn, 1990:71).

Motorola employees were exposed to various teaching techniques; for example, a learning-at-home program. This program failed.

What the corporation executives who were responsible for training discovered was what the educational committee already knew; nct all people learn in the same way. As a result of getting deeper into the problem of a labor force not properly educated, Motorola began to turn to community colleges for assistance. It was soon discovered that the colleges had fallen behind and labs, theories and techniques were not up to industrial standards. A series of educational partnerships were built which finally resulted in Motorola University. The conceptual framework of Motorola University according to (Wiggenhorn, 1990:81) was based on

> Cardinal Newman's The Idea of a University, which, after 150 years, is still the cornerstone of liberal education . . . Newman wanted his university to mold the kind of individual who can "fill any post with credit" and "master any subject with facility" - an excellent description of what we wanted Motorola University to do.

The success of Motorola University lies in the fact that it is modeled after sound academic concepts. While it is a corporate school, the designers of the university have understood the importance of adhering to pedagogy and academic tradition; however, the faculty has a very specific role.

As Wiggenhorn (1990:82) points out,

> The teachers at Motorola University aren't there to implant data. They're there to transfer information and get it applied quickly. We design curricula and train teachers with that end in mind.

The process is controlled in that Motorola trains its own teachers. It is apparently important within the corporate world to control what is being taught and how it is being taught. This is a major departure from the academic tradition. Wiggenhorn (1990:82) goes on to state,

> We don't want them to teach their version of, say, Effective Meetings; we want them to teach ours. Not everyone can deliver on those terms. For example, few academics can do it our way.

As laudable as the concept of Motorola University is, with its success in educating its employees, one should recognize that education within the corporate world does not mean the same as education in the academic world.

Motorola University uses part-time faculty in that most of the faculty do not have teaching as their full commitment to the company. Some faculty are retired employees, some college degreed women who have grown children but have little formal work environment experience and some are early retired Motorola employees. Since all faculty are trained in the Motorola University dogma, there is complete control over content and delivery.

Eurich found that within some of the corporate colleges she studied, even the full-time faculty were paid on a contractual basis "with hours and salaries more comparable to the corporate business world" (Eurich, 1985:119). These faculty were more like part-time in terms of how they were compensated.

Summary of Literature Review

In summary, the literature review suggested the following:

* the relationship between full-time and part-time faculty and student success in science courses had not been examined in great detail (Lane, 1988).
* the decline in modern equipped science laboratories in our educational institutions has been a catalyst for industry to show a willingness to upgrade science laboratories thereby becoming "involved" with public sector education (Wiggenhorn, 1990).
* a numerical limit does not exist (Lezberg,1990, Malik, 1990, Petersen, 1990, Rodgers, 1990, Simmons, 1990, and Thrash, 1990) for the "core" of full-time faculty on an institution's faculty, contrary to what is usually implied by various accreditation agencies.
* studies on gender issues and scientific literacy in science education have seemed to increase during the last five years from when the present study was completed, addressing possible relationships between gender and a student's preference for a particular career choice (Jones and Wheatly, 1988, Eisenstein, 1991.)

CHAPTER 3

PROCEDURES AND METHODOLOGY

Methodology

Descriptive research, as a study of the relationships among variables was used for this study. According to Isaac and Michael (1989:46) the purpose of descriptive research is

> To describe systematically the facts and characteristics of a given population or areas of interest, factually and accurately.

They continue in their definition by implying that descriptive research, as a term, can be broadened to "include all forms of research except historical and experimental," (Isaac and Michael, 1989:46), this as opposed to "a survey or description of existing practices," according to the MARP Guidelines (Nova, 1988).

Procedures

Review of Literature

A review of the literature focused on studies similar in scope to this study. The use of part-time faculty in science courses was examined. Each national accreditation agency was contacted by mail and asked to specify what standards were used to determine requirements for part-time to full-time faculty ratio. The North Central accreditation

agency's part-time to full-time faculty ratio was compared to the other national accreditation agencies.

Faculty Survey

A survey (Appendix E) generated by the institutional research office of Pima College was distributed to all part-time faculty. The Chancellor of the Pima County Community College District sent a letter to each part-time faculty member (Hockaday, 1990 Appendix F) asking for input that would be used to make recommendations to the Board of Governors with regards to part-time faculty. Permission was granted by Silvers (1990) to use the results of the survey in this study. The survey also addressed the perceptions neld by full-time faculty, as represented by department chairpersons, of the part-time faculty.

The survey was developed to elicit certain responses from the college community. The survey was pretested using six part-time faculty. It was reviewed by college administrators in order to correct any problems which resulted from the validation phases. Revisions were made and the survey was distributed to 1,500 part-time faculty (Silvers, 1990).

Gathering of Student Achievement Data

Data were collected from the Pima College Computer Center's student information files. Since all of the data

available for the past five years were used, there was no need to consider problems regarding representative populations. This technique was suggested by Losak (1990). According to the programmer (Rosenberg, 1990), a sample run of the parameters that were analyzed indicated some 750,000 data elements were collected.

Table 1
Definition of Student Variables
Used in the Study by Subgroups

Variable	Sub-groups
Sex	Male, Female
Age (years old)	18-23, 24-29, 30-34, 36-41, 42-47, 48-53
Read Assessment Test Scores by Grade Level	6-9, 10-12, >12, no test score

The data were arranged as follows: all courses completed with a grade of C or better were extracted from the population. This group of data was then subdivided into courses taught by full-time and part-time faculty. All science courses completed with a grade of C or better were extracted from the population. This group of data was then subdivided into courses taught by full-time and part-time faculty. This grouping of all courses completed with a C or better and all science courses completed with a C or better,

as taught by part-time or full-time faculty, were completed for each variable defined as displayed in Table 1.

The data were analyzed first using descriptive statistic techniques. A series of frequency distributions were used to reveal any pattern in the data. This was done for each variable combination.

A random sample was collected from the original data. The random sample included both science and non-science courses taught by full-time and part-time faculty. A sample size of 663 was used. The minimum sample size of a population of approximately 100,000 students was found to be 383 (Isaac and Michael, 1989:193).

The random sample was extracted from the main body of data used for this study. A random number was generated by the computer program. The number was of the form of the course numbers used at Pima College. When the number matched a valid course number that course information was extracted and printed. The data collected was then assembled in appropriate Tables as found in Appendix G. A chi square analysis was made of each variable.

The variables selected were based on demographic standards defined by Pima College. The reading assessment test scores were based on Pima College standards of grouping used by the computer department. The data from the survey were tallied and a series of frequency distributions were made.

Table 2

A Typical Chi Square Cell

Faculty	All Courses Taught	Science Courses Taught	Total
Full-time	37	4	41
Part-time	9	2	11
Total	46	6	52

A sample run was made and the results are found in Table 2 of the data collected for science and non-science courses taken by white, male students between the ages of 24 and 29 years old with no assessment test scores.

A chi square test was done to determine if there was a significant difference (p=0.05) between the full-time or part-time faculty and student success in science or non-science courses. This technique was applied to each variable combination. Each variable chi square value was computed and then evaluated based on a two-tailed test with one degree of freedom.

The use of the chi square statistic was appropriate for the study because the data for this study were expressed as simple tallies, for each variable. Conclusions were then made on inferences about variability, which was what the chi square statistic was designed to do (Johnson, 1988:459).

Summary of Methodology

A summary of the methodology for this study is found below.

1. A search of the literature was made in order to answer research questions one and five.

2. A survey was given to part-time faculty who have taught at Pima College during the past year. A second survey was given to full-time department chairpersons. The results of the surveys, which were designed and validated by the Pima College Institutional Research Department, were analyzed in order to answer research question four.

3. In order to answer research questions two and three the final grades of all students in all courses for the last five years were extracted from the student information file. The data included demographic information, assessment test scores, and whether the course was taught by part- or full-time faculty.

   a. From the data file defined above, all student data from all courses with a C grade or better were extracted.

   b. From the same data file all student data from all science courses with a C grade or better were extracted.

   c. The data were arranged as shown in Table 2 for each variable combination as defined in Table 1 of this report.

d. From the data defined above a random sample of students, both successful and non-successful, were selected. These data were then arranged as shown in the Tables found in Appendix G.

e. A chi square analysis was applied to each variable combination as a function of course taught by a part-time or full-time faculty.

f. Hypotheses were then tested at the 0.05 level.

Chapter 4

PRESENTATION OF RESULTS

Results

Presented are the results of the data analysis regarding student success as a function of part-time versus full-time faculty. Whenever possible data was reduced to tabular form for ease in presentation and interpretation. A simple frequency distribution format was used when appropriate. The extension of the absolute frequencies appear as adjusted frequencies expressed as a percentage.

Also included are the results from the part-time faculty survey. The results from the department chairpersons' survey are found here as well. These data were expressed as percentages by category and can be found in Tables 12 - 27.

Chi square tests were used exclusively for the student success analysis. The chi square results were arranged by age group. The reading scores and gender became variables within the group. Tables 3 - 11 contain the results of the analysis. Tables 3 - 11 represent the results of numerous chi square tests performed on the data collected. These Tables are not chi square cells but a summary display of the chi squares calculated for each two way classification. Each chi square calculation was based on an arrangement of data as displayed in Table 2 which is a two by two cell.

This arrangement was used for all chi square calculations in this study. A two by two chi square cell has one degree of freedom. All data were arranged to answer a two-way classification problem. The general equation used to calculate degrees of freedom (df) was given by Hardyck and Petrinovich (1969:161) as,

$$df = (r - 1) \times (c - 1)$$

where df = degrees of freedom
r = number of rows
c = number of columns

The results of these chi square tests did not indicate a direction either in favor of the full-time or part-time faculty but rather in "the size of the deviation", (Hardyck and Petrinovich, 1969:162), which is consistent with a chi square analysis. However, as a result of the initial analysis, a further analysis was made. From a random sample of students in science and non-science courses taught by full-time and part-time faculty, a chi square test was done on each category found in Tables 12 - 18. This analysis revealed whether full-time or part-time faculty had achieved greater student success.

Results of the Research Questions

Research Question One

Research question one asked, "are there national accreditation standards for determining an ideal ratio

between full-time and part-time faculty?" The responses from the analysis of the accreditation agencies were analyzed (See Table 3). There were no set standards for a numerical value for the full-time/part-time faculty ratio. Instead each agency had an implied standard based on a prescription given to the institution being evaluated.

Table 3

Responses From Accreditation Agencies Regarding Full-time/Part-time Faculty Ratios

Agency	Defined Full-time/Part-time Faculty Ratio
Middle States Association of Colleges and Schools (MSA)	No
New England Association of Schools and Colleges (NEASC)	No
North Central Association of Colleges and Schools (NCA)	No
Northwestern Association of Schools and Colleges (NWASC)	No
Southern Association of Colleges and Schools (SACS)	No
Western Association of Schools and Colleges (WASC)	No

Each agency defended its application of a full-time to part-time faculty ratio not in terms of a number but in terms of a concept. The concept, as best could be

determined, was based on the institution's ability to defend why it had a particular full-time to part-time faculty ratio. The institution could supply documentation which supported its use of part-time faculty. In the case of Pima College, NCA claimed a high percentage of part-time faculty usage at the same time the college was praised by NCA for its fine academic programs (Crawley, 1988).

Research Questions Two and Three

An analysis was done on student success data. This analysis was used to answer research questions two and three. Research question two asked, "when comparing full-time and part-time faculty is there a similar student success rate between those students taught by full-time and those taught by part-time faculty?" Research question three asked, "when comparing full-time and part-time science faculty is there a similar student success rate between those students taught by full-time and those taught by part-time faculty?"

The data were arranged in chi-square cells as shown in Table 2. This was done for each variable, by gender. The Tables displaying student success data show the results of the chi square computation and evaluation of a two-tailed test with one degree of freedom.

Following are the data from the student success analysis. Each table provides a display of the chi-square results and whether or not there was difference. The Tables

indicate whether or not a significant difference (p=0.05) was found. The letter Y was used to indicate that a significant difference (p=0.05) was found. The letter N was used to indicate that no significant difference (p=0.05) was found. The actual chi-square value calculated was displayed in the Tables and is found under the heading, Chi Square.

Table 4

Comparison of Full-time / Part-time Faculty to All Courses / Science Courses and Student Success by Student Age 18 to 23 Years Old

Reading Score Grade Level	Chi Square Gender		Significant Difference p=.05 Gender	
	Female	Male	Female	Male
None	12.50	5.00	Y	Y
0 - 5	36.00	< 1	Y	N
6 - 9	0.68	4.47	N	Y
10 - 12	6.30	3.17	Y	N
>12	9.69	0.36	Y	N

The largest difference was found in the female student population with a reading level between 0 and grade 5. The second largest difference was found in the female student population with a reading level "none".

Table 5

Comparison of Full-time / Part-time Faculty to
All Courses / Science Courses and
Student Success by Student Age
24 to 29 Years Old

Reading Score Grade Level	Chi Square Gender		Significant Difference p=.05 Gender	
	Female	Male	Female	Male
None	3.84	31.41	Y	Y
0 - 5	-	-	-	-
6 - 9	2.09	3.39	N	Y
10 - 12	-	-	-	-
>12	3.89	0.43	Y	N

The largest difference was found in the male student population with no reading score specified.

Table 6

Comparison of Full-time / Part-time Faculty to
All Courses / Science Courses and
Student Success by Student Age
30 to 35 Years Old

Reading Score Grade Level	Chi Square Gender		Significant Difference p=.05 Gender	
	Female	Male	Female	Male
None	16.70	93.00	Y	Y
0 - 5	0.95	3.86	N	Y
6 - 9				
10 - 12	1.06	4.39	N	Y
>12	17.30	29.90	Y	Y

The largest difference was found in the male student population with no reading score.

Table 7

Comparison of Full-time / Part-time Faculty to All Courses / Science Courses and Student Success by Student Age 36 to 41 Years Old

Reading Score Grade Level	Chi Square Gender		Significant Difference p=.05 Gender	
	Female	Male	Female	Male
None	3.45	20.40	N	Y
6 - 9	-	-	-	-
10 - 12	-	-	-	-
>12	13.20	16.40	Y	Y

As displayed in Table 7, when comparing full-time / part-time faculty to all courses / science courses, the greatest difference occurred in the male population, age 36 to 41 years old, with no reported reading scores. The second greatest difference occurred in the same male population with reading scores beyond the grade 12 level. A difference was also found in the female population, age 36 to 41 years old, with reading scores beyond the grade 12 level.

Table 8

Comparison of Full-time / Part-time Faculty to
All Courses / Science Courses and
Student Success by Student Age
42 to 47 Years Old

Reading Score Grade Level	Chi Square Gender		Significant Difference p=.05 Gender	
	Female	Male	Female	Male
None	0.59	30.70	N	Y
6 - 9	-	-	-	-
10 - 12	0.29	3.99	N	Y
>12	3.71	8.64	N	Y

The largest difference was found in the male population with no reading scores.

Table 9

Comparison of Full-time / Part-time Faculty to
All Courses / Science Courses and
Student Success by Student Age
48 to 53 Years

Reading Score Grade Level	Chi Square Gender		Significant Difference p=.05 Gender	
	Female	Male	Female	Male
None	-	-	-	-
6 - 9	-	-	-	-
10 - 12	-	-	-	-
>12	4.45	0.29	Y	N

The largest difference occurred in the female population with a reading score greater than grade 12.

Table 10

Comparison of Full-time / Part-time Faculty to All Courses / Science Courses and Student Success by Student Age >54 Years Old

Reading Score Grade Level	Chi Square Gender		Significant Difference p=.05 Gender	
	Female	Male	Female	Male
None	1.99	11.10	N	Y
6 - 9	-	-	-	-
10 - 12	-	-	-	-
>12	4.01	0.56	Y	N

The largest difference was found in the male population with no reading score.

Table 11

Comparison of Full-time / Part-time Faculty to All Courses / All Science Courses and Student Success by All Variables

Gender	Chi Square	Significant Difference p=.05
Male	543.97	Yes
Female	26.68	Yes

It is seen in Table 11 that there was a significant difference (p=0.05) overall. The greatest difference was within the male category.

When comparing full-time / part-time faculty and science non-science courses with student success, differences were found. Further analysis of the possible direction the differences were in (favoring full-time or part-time faculty) revealed that there were no significant differences between full-time and part-time faculty.

The results of a chi square analysis on the grand totals are found in Appendix H. These data were grouped by gender and combining reading levels. No significant differences (p=0.05) were found for male or females, science or non-science students taught by full-time or part-time faculty.

The data were then grouped by reading level, gender and age, similar to the format found in Tables 4 - 11. However, Tables 12 - 18 included successful and non-successful students comparing full-time to part-time faculty. When analyzed in this manner, the significant differences which were found in the gross analysis were not recovered in the fine analysis. Therefore, to answer research questions two and three, there were no significant differences (p=0.05) between full-time and part-time faculty and science or non-science courses and student success.

Table 12

Comparison of Full-time / Part-time Faculty Taught Courses and Student Success by Student Age 18 to 23 Years Old

Reading Score Grade Level	Chi Square Gender		Significant Difference p=.05	
	Female	Male	Female	Male
Science Courses				
None	-	2.1	N	N
6 - 9	-	-	-	-
10 - 12	UD	UD	N	N
>12	UD	UD	N	N
Non-science Courses				
None	UD	1.07	N	N
6 - 9	-	-	-	-
10 - 12	UD	0.44	N	N
>12	UD	3.60	N	N

The above Table reveals that there was no significant difference (p = 0.05) between students taught by full-time or part-time faculty. When analyzed by reading score grade level, age or gender no significant difference (p = 0.05) was found. However, the Table also revealed a number of "undefined" Chi Square calculations. Within the context of this study these "undefined" Chi Squares are to be interpreted as no significant difference (p = 0.05) because neither full-time or part-time faculty had any students who were non-successful in those cells (see Appendix G).

Table 13

Comparison of Full-time / Part-time Faculty Taught Courses and Student Success by Student Age 24 to 29 Years Old

Reading Score Grade Level	Chi Square Gender		Significant Difference p=.05 Gender	
	Female	Male	Female	Male
Science Courses				
None	0.64	UD	N	N
6 - 9	-	-	-	-
10 - 12	UD	UD	N	N
>12	UD	UD	N	N
Non-science Courses				
None	0.28	2.05	N	N
6 - 9	-	-	-	-
10 - 12	1.15	UD	N	N
>12	UD	UD	N	N

The above Table reveals that there was no significant difference (p = 0.05) between students taught by full-time or part-time faculty. When analyzed by reading score grade level, age or gender no significant difference (p = 0.05) was found. However, the Table also revealed a number of "undefined" Chi Square calculations. Within the context of this study these "undefined" Chi Squares are to be interpreted as no significant difference (p = 0.05) because neither full-time or part-time faculty had any students who were non-successful in those cells (see Appendix G).

Table 14

Comparison of Full-time / Part-time Faculty Taught Courses and Student Success by Student Age 30 to 35 Years Old

Reading Score Grade Level	Chi Square Gender		Significant Difference p=.05 Gender	
	Female	Male	Female	Male
Science Courses				
None	UD	UD	N	N
6 - 9	-	-	-	-
10 - 12	UD	UD	N	N
>12	UD	UD	N	N
Non-science Courses				
None	0.62	0.37	N	N
6 - 9	-	-	-	-
10 - 12	UD	UD	N	N
>12	UD	UD	N	N

The above Table reveals that there was no significant difference (p = 0.05) between students taught by full-time or part-time faculty. When analyzed by reading score grade level, age or gender no significant difference (p = 0.05) was found. However, the Table also revealed a number of "undefined" Chi Square calculations. Within the context of this study these "undefined" Chi Squares are to be interpreted as no significant difference (p = 0.05) because neither full-time or part-time faculty had any students who were non-successful in those cells (see Appendix G).

Table 15

Comparison of Full-time / Part-time Faculty Taught Courses and Student Success by Student Age 36 to 41 Years Old

Reading Score Grade Level	Chi Square Gender		Significant Difference p=.05 Gender	
	Female	Male	Female	Male
Science Courses				
None	0.19	1.41	N	N
6 - 9	-	-	-	-
10 - 12	-	-	-	-
>12	UD	UD	N	N
Non-science Courses				
None	0.56	UD	N	N
6 - 9	-	-	-	-
10 - 12	-	-	-	-
>12	0.899	-	N	N

The above Table reveals that there was no significant difference (p = 0.05) between students taught by full-time or part-time faculty. When analyzed by reading score grade level, age or gender no significant difference (p = 0.05) was found. However, the Table also revealed a number of "undefined" Chi Square calculations. Within the context of this study these "undefined" Chi Squares are to be interpreted as no significant difference (p = 0.05) because neither full-time or part-time faculty had any studerts who were non-successful in those cells (see Appendix G).

Table 16

Comparison of Full-time / Part-time Faculty Taught Courses and Student Success by Student Age 42 to 47 Years Old

Reading Score Grade Level	Chi Square Gender		Significant Difference p=.05 Gender	
	Female	Male	Female	Male
Science Courses				
None	UD	UD	N	N
6 - 9	-	-	-	-
10 - 12	-	-	-	-
>12	UD	UD	N	N
Non-science Courses				
None	UD	UD	N	N
6 - 9	-	-	-	-
10 - 12	-	-	-	-
>12	0.678	0.833	N	N

The above Table reveals that there was no significant difference (p = 0.05) between students taught by full-time or part-time faculty. When analyzed by reading score grade level, age or gender no significant difference (p = 0.05) was found. However, the Table also revealed a number of "undefined" Chi Square calculations. Within the context of this study these "undefined" Chi Squares are to be interpreted as no significant difference (p = 0.05) because neither full-time or part-time faculty had any students who were non-successful in those cells (see Appendix G).

Table 17

Comparison of Full-time / Part-time Faculty Taught Courses and Student Success by Student Age 48 to 53 Years Old

Reading Score Grade Level	Chi Square Gender		Significant Difference p=.05 Gender	
	Female	Male	Female	Male
Science Courses				
None	UD	UD	N	N
6 - 9	-	-	-	-
10 - 12	-	-	-	-
>12	N			N
Non-science Courses				
None	UD	UD	N	N
6 - 9	-	-	-	-
10 - 12	-	-	-	-
>12	UD	UD	N	N

The above Table reveals that there was no significant difference (p = 0.05) between students taught by full-time or part-time faculty. When analyzed by reading score grade level, age or gender no significant difference (p = 0.05) was found. However, the Table also revealed a number of "undefined" Chi Square calculations. Within the context of this study these "undefined" Chi Squares are to be interpreted as no significant difference (p = 0.05) because neither full-time or part-time faculty had any students who were non-successful in those cells (see Appendix G).

Table 18

Comparison of Full-time / Part-time Faculty Taught Courses and Student Success by Student Age > 54 Years Old

Reading Score Grade Level	Chi Square Gender		Significant Difference p=.05 Gender	
	Female	Male	Female	Male
Science Courses				
None	UD	UD	N	N
6 - 9	-	-	-	-
10 - 12	-	-	-	-
>12	UD	UD	N	N
Non-science Courses				
None	UD	UD	N	N
6 - 9	-	-	-	-
10 - 12	-	-	-	-
>12	UD	UD	N	N

The above Table reveals that there was no significant difference (p = 0.05) between students taught by full-time or part-time faculty. When analyzed by reading score grade level, age or gender no significant difference (p = 0.05) was found. However, the Table also revealed a number of "undefined" Chi Square calculations. Within the context of this study these "undefined" Chi Squares are to be interpreted as no significant difference (p = 0.05) because neither full-time or part-time faculty had any students who were non-successful in those cells (see Appendix G).

Research Question Four

Following are the results from which answers to research question four were found. Question four asked, "do similar or contrasting characteristics exist that may separate part-time and full-time faculty?"

The results were presented in two distinct groupings. The first group contained survey results from the perspective of the part-time faculty about themselves. Group two contained the survey results from Department Chairpersons' perspective of the part-time faculty.

Since the respondent percentage was relatively low, a non-response bias analysis was made of the results by the Pima College Office of Institutional Research. No disproportion was found between the responders and the variables (Silvers, 1990). In other words, those who did respond were a fair representative sample of the group surveyed.

Group 1: Results of Part-time Faculty Survey

The results of data collected from the part-time faculty survey is included here. The survey was sent to 1500 associate faculty who taught from July 1989 through June 1990. A total of 757 or fifty one percent responded to the survey. Included in Table 12 is the age distribution of the respondents.

Table 19

Frequency Distribution by Age of Part-time Faculty

Age	Number	Percentage
<25	5	0.7
25 - 29	55	7.3
30 - 39	216	28.5
40 - 49	259	34.2
50 - 59	121	15.9
> 60	80	10.6
No Response	21	2.8
Total	757	100.0

As displayed in Table 19, the majority of associate faculty respondents were less than forty nine years old. The greatest percentage, thirty-four percent, was between 40 and 49 years old. The mean age was found to be 43.8 years old. The median age was 42 years old. Table 19 reveals that a percentage of the part-time faculty at Pima College was over sixty years old (ten percent) and that less than one percent was under twenty five years old.

The overwhelming percentage of part-time faculty through-out the college district, as seen in Table 20, are white. As seen in Table 21, fifty-eight percent of those responding to the survey were found to be male. The demographic portion of the survey indicated that the typical part-time faculty member was a 44 year old, white male.

Table 20

Frequency Distribution by Race/Ethnicity of Part-time Faculty

Group	Number	Percentage
American Indian	8	1.1
Asian	10	1.3
Black	18	2.4
Hispanic	52	6.9
White	652	85.1
No Response	17	2.2
Total	757	100.0

Table 21

Frequency Distribution by Gender of Part-time Faculty

Gender	Number	Percentage
Male	439	58.0
Female	318	42.0
Total	757	100.0

The greatest percentage use of part-time faculty (39.9 percent) was by the Community Campus. The West Campus was second at 27.6 percent and the Downtown Campus ranked third at 21.3

Table 22

Frequency Distribution by Campus of Part-time Faculty

Campus	Number	Percentage
Community	234	30.9
Downtown	161	21.3
East	101	13.3
West	209	27.6
Education Center South	32	4.2
Community Services	3	0.4
Skill Center	6	0.8
No response	11	1.5
Total	757	100.0

percent. According to the survey results the campus least dependant on part-time faculty was Community Services.

Table 23

Frequency Distribution by Academic Degree of Part-time Faculty

Degree	Number	Percentage
Associate	45	5.3
Bachelor	241	28.6
Master	408	48.4
Doctorate	70	8.3
No Response/Other	79	9.4
Total	843*	100.0

* double entries were permitted

Qualifications of part-time faculty were based on academic degree, as displayed in Table 23. Slightly less than half of the respondents had the Master's Degree.

Table 24

Percentage of Part-time Faculty Available To Teach by Time of Day

Category	Percentage
Weekdays	47.4
Weekends	38.6
Anytime	14.0
Mornings	
Afternoons	50.0
Evenings	86.1

It is seen in Table 24 that 86 percent of the part-time faculty were available to teach in the evenings.

Table 25

Percentage of Part-time Faculty Attending Orientation Meetings

Category	Percent
Overall Attendance	69.0
Unaware of meetings	6.3
East Campus Attendance	74.3
Community Campus Attendance	59.8

The East Campus, which of the three permanent campuses had the lowest utilization of part-time faculty (13.3 percent,

Table 26

Years of Teaching Experience of Part-time Faculty

Years of Experience	Percentage
1	7.3
2	8.3
3 - 4	16.6
>5	67.8

Table 7) had the highest attendance of part-time faculty to orientation meetings. The Community Campus was found to utilize the greatest percentage of part-time faculty within the college district (30.9 percent, Table 22) and this campus had the lowest attendance of faculty at orientation meetings.

Table 27

Years of Teaching at Pima College of Part-time Faculty

Years	Percentage
<2	31.0
3 - 9	49.0
>9	20.0

Most part-time faculty have more than five years of teaching experience as indicated by the data displayed in Table 25. The data in Table 27 reveals that 20 percent of the part-time faculty at Pima College have taught for more than nine years. It can also be seen from the data in Table 27 that the greatest percentage of part-time faculty has taught at Pima College between three and nine years. One third of the part-time faculty have taught at Pima College for less than two years.

Table 28

Frequency Distribution by Subject Area of Part-time Faculty

Subject	Number	Percentage
Math	79	10.5
Writing	64	8.5
Computer Science	44	5.8
Office Education	28	3.7
Accounting	28	3.7
Business	24	3.2
Psychology	24	3.2
Spanish	22	2.9
Management	20	2.6
Human Development	16	2.1
Reading	14	1.8
Biology	14	1.8
History	14	1.8
Fitness and Sports	13	1.7
Nursing	12	1.6
ESL	12	1.6
Other	329	43.5
Total	757	100.0

The results found in Table 28 indicate that the subject area with the highest use of part-time faculty was mathematics. The area with the second largest demand for part-time faculty was writing at 8.5 percent. Computer science was third with 5.8 percent use of part-time faculty. The other category, at 43.5 percent, contains all subject areas, both credit and non-credit, which were not specified in Table 28.

Table 29

Frequency Distribution by Current Occupation of Part-time Faculty

Current Occupation	Number	Percentage
Professional	260	34.3
Teacher	198	26.2
Technical	58	7.7
Service	41	5.4
Retired	39	5.1
Self-employed	20	2.6
Unemployed	18	2.4
Other	27	3.6
No response	96	12.7
Total	757	100.0

As displayed in Table 29 it is seen that 26 percent of the part-time faculty have full-time teaching experience, that is, they hold full-time teaching positions at other institutions. The professional occupation category includes

medical doctors, lawyers, and professors at other colleges or universities. Only a small number, 5.1 percent of those teaching at Pima College are retired. Table 29 reveals that by percentage, as many unemployed people teach at Pima College as are self-employed (approximately two and one-half percent).

Table 30

Frequency Distribution by Motivation Statement of Part-time Faculty

Category	Number	Percentage
I just love teaching	204	26.9
Important to me to have someone highly qualified to teach courses	135	17.8
More than one reason	100	13.2
Enjoyable diversion	97	12.8
Need the income	76	10.1
Extra money comes in handy	68	8.9
To keep current	12	1.7
Other	42	5.5
No response	23	3.1
Total	757	100.0

The data found in Table 30 reveals that "love of teaching" accounted for only approximately 27 percent of the motivation for teaching part-time at the college.

Group 2: Results of Department Chairs' View of Part-time Faculty

The department chairpersons of Pima College were surveyed as to their impressions of part-time faculty.

Table 31

Frequency Distribution of Responding Department Chairpersons by Campus

Campus	Number	Percentage
Community	2	5.3
Downtown	9	23.7
East	11	28.9
Education Center South	1	2.6
West	15	39.5
Total	38	100.0

Table 31 contains data as to the percent responding by campus and not by subject area and as such these results can not be used to determine anything about subject area department chair responses. Most department chairs felt that the orientation provided for part-time faculty was acceptable (57.6 percent) as displayed in Table 32.

Table 32

Quality of Part-time Faculty Orientation Program
As Perceived by Department Chairs

Orientation Program Rating	Percentage
Excellent	36.3
Acceptable	57.6
No Orientation	6.1
Total	100.0

From Table 33 it is seen that 71 percent of the department chairpersons rated instruction by part-time faculty as excellent. Table 34 displays percentages of what department

Table 33

Quality of Instruction by Part-time Faculty as
Perceived by Department Chairs

Response	Percentage
Excellent	71.4
Acceptable	26.2
Poor	2.6

chairs viewed as benefits derived by the use of part-time faculty. Each department chair was asked to "vote" for "each benefit and then weigh each benefit by its frequency among the total votes", Silvers (1990:11). The display thus

Table 34

Benefits Derived by Using Part-time Faculty
According to Department Chairs

Benefit	Votes	Percent
Flexibility	21	25.3
Diversity	20	24.1
Expertise	18	21.7
Quality Instruction	6	7.3
Caring Instructors	5	6.0
Financial savings	5	6.0
Applicant Pool for Full-time Faculty	5	6.0
Other	3	3.6
Total	83	100.0

renders the results as a percentage.

Based on the data gathered and analyzed for this study, a statistical composite of the typical part-time faculty teaching within the Pima College District is a white male, 44 years old who has a Master's Degree. While found teaching through out the district, he is usually associated with the Community Campus. Although he could be teaching any subject, he is probably teaching math in the evenings.

By day he is a professional and may also have a full time teaching job elsewhere. He teaches at Pima because he loves to teach and is not particularly motivated by the money he receives for teaching.

The department chairperson evaluating this individual considers his instruction to be excellent. However, the

chair is more concerned with flexibility, diversity and expertise which the part-time faculty member brings to the department than to his instructional quality.

Research Question Five

Research question five asked, "what are the trends in proprietary or corporate colleges regarding the use of part-time faculty in their educational programs?" A literature review yielded information suggesting that the corporate or proprietary colleges will continue to rely on part-time faculty. Economy, efficiency as well as maintaining company policy and control over the curriculum, were cited as the reasons for continuing this practice (Wiggenhorn, 1990).

Results of the Hypotheses

$H_0$1. There is no significant difference (p=0.05) between full-time and part-time faculty and full-time and part-time science faculty and student success as a function of student gender. This hypothesis was accepted. The composite data displayed in Tables H1 and H2 found in Appendix H show no significant difference (p=0.05) for either males or female students.

$H_0$2. There is no significant difference (p=0.05) between full-time and part-time faculty and full-time and part-time science faculty and student success as a function

of student age. This hypothesis was accepted. The analysis of the data displayed in Tables 12 - 18 showed no significant differences (p=0.05) in student age categories.

$H_0$3. There is no significant difference (p=0.05) between full-time and part-time faculty and full-time and part-time science faculty and student success as a function of reading assessment test scores. This hypothesis was accepted. The results displayed in Tables 12 - 18 showed no significant differences (p=0.05) for each reading score category.

Chapter 5

INTERPRETATIONS, CONCLUSIONS, AND RECOMMENDATIONS

Overview

While this study was by no means a prolegomenon to any future investigation into the full-time/part-time faculty question, it should serve as a guide for future investigation. It is not implied that simply because of the plethora of variables which might affect the outcome of such studies one should not attempt to narrow down the variables in order to discover possible cause-effect relationships between the variables.

There may be no connection between outcomes and whether a student was taught by a full-time or part-time teacher, but whether a student was taught by a teacher. This study was not designed to determine what defines a teacher or a non-teacher. But in light of the present study it may be appropriate to ask about the effectiveness of a teacher instead of whether the teacher is full-time or part-time.

Although may studies have been conducted which seem to define the qualities exhibited by good teachers (Cross, 1991), the educational community has failed to apply these standards to those outside of the formal profession. This failure is seen in the form of certification of teachers based not on the effectiveness of a person as a teacher,

but rather on a sequence of courses which upon completion results in a certified teacher.

This process places more emphasis on the "fact of teaching" rather than on the "practice of teaching." A diminishing of the importance of the "fact of teaching" is not implied. It is, however, important to increase the "practice of teaching" as a criteria used to define the teacher versus the non-teacher.

Teachers are found in both the full-time and part-time ranks. The presence of teachers in both ranks may tend to equalize any differences which resulted in the outcome of this study. A solution to the problem might be to hire those part-time faculty who are teachers and fire those full-time faculty who are not teachers.

However, as the study began to take a completed form a trend did begin to emerge, in spite of the fact that the enormous amount of data practically reduced the outcome of this study to absurdity. A trend was found that indicated that male students, regardless of what variable was considered, showed a greater chi square deviation ($p=0.05$) in student success in science courses and all other courses determined by whether the male students were taught by full-time or part-time faculty.

The literature is replete with studies indicating a strong male attitude (Kahle, 1988, Jones and Wheatly 1988, Boucher and Fletcher, 1982, and DeLuca, 1980) in students who succeed in science.

From the data it was concluded that most students in this study were female and most part-time faculty were male. A large number of part-time faculty teach mathematics. There is a large female population in courses which seem to exhibit gender attitudes needed for success, taught by males.

The large chi square deviations for females were generally found for those with low reading scores and young age group and the group consisting of high reading scores and older age. This could possibly be the result of life experience, for example the young, less literate female student not knowing enough to care (Baker's detachment) and the older, more literate female student knowing enough to respond to her environment constructively (Baker's dominance). This is not to imply a negative connotation. It is based on anecdotal classroom experience illuminated by this study. Older, more literate women seem to be more involved in their class work with a male attitude as defined by Baker (1983). If this is consistent with a male attitude for those studying science, then it may explain the greater chi square deviations for older, more literate females.

The male/male conflict may have dominated this study. Gender may play a more important role in science education than part-time or full-time faculty. Gender, specifically not the sex of the faculty member, but the male attitude which defines a successful science student (Baker, 1981), is important.

For the sciences, courses taught by highly qualified individuals probably had nothing to do with whether these courses were taught by full-time or part-time faculty. It was beyond the scope of this study to conclude whether other subject areas may have been influenced by factors other than full-time or part-time faculty status. It would appear that full-time or part-time faculty status had no bearing on science students. This conclusion does not imply that science courses should be taught only by part-time faculty.

Interpretation of Results

According to North (1988:22), "research findings are generally inconclusive" regarding relationships between student retention and its causes. This present study seems to have yielded similar findings. Hence, North's assessment seems to be valid although it was found that the underlining "inconclusiveness" begs further study.

The gender question seems to have been a consistent thread throughout this study, more so than the full-

time/part-time faculty question. As Lane (1988:751) pointed out, "women constitute only about 15 percent of the total engineering/science work force," and yet, according to Baker (1983:102), "approximately half of all undergraduate majors in science are female." The ratio between student gender and which gender takes science courses at Pima College is approximately fifty-percent, consistent with the biological distribution of gender (Iadevaia, 1989).

The "male" attitude question was raised by Kahle (1988) and Baker (1981) as a possible explanation of the low numbers of woman who actually finish science degrees beyond the bachelor's level. The dominant "male" attitude seemed prevalent in their studies. The present study did not address the attitudes of science students at the College. Since Pima College is a two-year institution, those characteristics of students in a four-year science sequence would not be fully manifested at Pima College.

Accreditation Agencies

Research Question One dealt with the standards from which national accreditation agencies' definition of the ideal full-time to part-time faculty ratio emerges. While subject to many interpretations, the fact remained that these standards did not specifically state what the ideal ratio might be. Public institutions may become increasingly dependant on the use of part-time faculty. As before, this

statement should not be taken as a judgement on the practice of increased use of part-time faculty but as a caution, a reason to further studies into these questions.

The agencies all very artfully dodged the full-time/part-time faculty ratio question as far as an actual number was concerned. The dodge has resulted in an interpretation of a definition of a faculty that could be used to grant accreditation to institutions that have no full-time faculty. This statement also is not one of judgement but one of caution.

The lack of a numerical ratio between full-time and part-time faculty determined by accreditation agencies does not imply a deficiency on their part. There are a variety of institutions each with specific needs. To mandate a fixed ratio between full-time and part-time faculty may be an extreme measure; however, to hold an institution accountable to such a fixed ratio is equally extreme.

There is at least one way to determine whether or not an institution has a problem with its own full-time to part-time ratio and that is to determine if the institution is fulfilling its mission. This is exactly what all of the accreditation agencies seemed to have implied and yet they speak of some ideal ratio between full-time and part-time faculty if such a ratio could really exist. Until the ramifications are understood, a faculty composed of all part-time personnel should be carefully considered.

Student Success

Research Questions Two and Three, dealing with student success overall and in science, specifically, as a result of being taught by full-time or part-time faculty, did not reveal a difference (p=0.05). When gender was considered large chi square deviations were found. The parameters used as variables provided inconclusive results so a second analysis was made using a random sample. One explanation could be that the test applied to find differences did not probe deeply enough. As it happened, the present study produced results that indicated further work in this area would be justified. Each pass through the data seems to produce refinements in the outcome. The present study yielded inconclusive results, as were expected according to North (1988). However, a refinement of previous work such as North's (1988) produced a new bit of information, namely the gender question. This process is analogous to panning a stream for gold. Within the abundant muck and water found in the pan is a small amount of gold. If one carefully manipulates the pan the gold will remain while the water swirls out carrying the muck with it. So it seems to be with studies of this type. However, when the random sample of student success and faculty status data was examined, no significant differences (p=0.05) were found.

Faculty Survey

Research Question Four, which dealt with similar or contrasting characteristics between part-time and full-time faculty, was answered satisfactorily. An analysis of the fifty-one percent of the part-time faculty who returned the survey did not reveal any unexpected bias from any responding group. The gender distribution of respondents was not skewed heavily toward either gender. No major characteristic differences were found between full-time and part-time faculty.

The Department Chair survey results reflected, for the most part, the perceptions had by the part-time faculty of themselves. The surveys' results did not indicate any overwhelming differences between full-time and part-time faculty at Pima College as related to the instructional process.

Corporate Colleges

As budgets become more limited, alternative approaches to fund the educational process will emerge. How corporate colleges are structured could be a tempting model to emulate.

Research Question Five, which dealt with trends in proprietary or corporate college use of part-time faculty was answered. It was found that corporate colleges use

part-time faculty almost exclusively and that they are very efficient in conveying a very specific body of knowledge to its "student body." However, corporate colleges have a very restrictive mission. These colleges exist primarily to teach a company philosophy motivated by profit (Wiggenhorn, 1990). This is not to cast a shadow of disparagement on that mission but it should be taken as a word of caution by public institutions. The mission of a public institution is unique.

The interpretation of the results of research Question Five sheds light on the unique mission of institutions of higher education. These institutions, especially those funded by public monies, educate not for any specific dogma but for understanding on the part of the learner. This is not always an efficient or profitable way in the short term but pays handsome dividends over time.

Caution must prevail when trying to model a public college after a corporate college. In the short term efficiency will be gained at the expense of freedom.

Coupled with the attractiveness of the corporate model of efficiency and the economy of hiring part-time teachers, a new structure may be emerging for public institutions of higher education. The new structure may be efficient but very restrictive. Scientific thought can flourish best in the least restrictive academic environment in other words a free environment.

In an interview with the Chinese physicist Fang Lizhi, Tang (1991:23) quoted Lizhi as saying,

> I think scientists are naturally pro-freedom. We need freedom to do research and to circulate our ideas.

If a new structure for public institutions emerged, which might restrict the academic environment because of economic pressures, then the process of science education would be severely hampered. The questions raised about women in science or of societal scientific literacy would go begging for answers.

Conclusions

When trying to interpret the outcome of this study conflicting results were found. When the individual chi square cells were examined for any disproportionate tallies a cautious approach was taken. All the data was weighted against the criteria established by the research questions and any skewed results seemed to be balanced.

Overall no differences were found. The nature of the chi square test is such that the size of the deviation is important and not the direction. The study was not designed to point to full-time or part-time faculty as having a greater student success rate, but rather to determine if differences ($p=0.05$) did exist. Although not designed to

reveal direction, the analysis of the random sample data did show that full-time or part-time faculty status had no bearing on student success; although, gender effect, seemed to be indicated based on the initial analysis.

Answers to Research Questions

Five research questions were asked in the study. The answers to these questions are found in this section.

1. Are there national accreditation standards for determining an ideal ratio between full-time and part-time faculty?

It was found that there are no national standards for determining an ideal ratio between full-time and part-time faculty. It was concluded from the findings that all accreditation agencies, in some form or another, addressed part-time faculty ratios as an individual institution's concern.

2. When comparing full-time and part-time faculty, is there a similar student success rate between those students taught by full-time and those taught by part-time faculty? Overall, it was found that there was not a different student success rate between full-time and part-time faculty. It was concluded that any differences found in the initial analysis seemed to be gender related based on the large chi square deviations found as seen in Table 5.

However, when a random sample of students was examined as to successful or non-successful completion of courses, no differences (p=0.05) were found.

3. When comparing full-time and part-time science faculty, is there a similar student success rate between those students taught by full-time and those taught by part-time faculty?

There was a success rate difference overall. Based on the initial data analysis, it was concluded that a gender related effect may have been the cause for the difference. However, when a random sample of students was examined as to successful or non-successful completion of courses, no differences (p=0.05) were found.

4. Do similar or contrasting characteristics exist which may separate part-time and full-time faculty, for example, academic preparation or years of experience which may be seen as contributing to student success?

The part-time faculty survey indicated a wide range of characteristics. The dominant characteristics indicate that the typical part-time faculty member at Pima College is a white male, 44 years old, with a Master's Degree and five years of teaching experience. The dominant part-time faculty characteristic, male, may have had an effect on the outcome of this study.

Hypotheses

The null hypothesis, $H_0$1 was accepted:

$H_0$1. There is no significant difference (p=0.05) between full-time and part-time faculty and full-time and part-time science faculty and student success as a function of student gender.

The null hypotheses $H_0$2 was accepted:

$H_0$2. There is no significant difference (p=0.05) between full-time and part-time faculty and full-time and part-time science faculty and student success as a function of student age.

The null hypotheses $H_0$3 was accepted:

$H_0$3. There is no significant difference (p=0.05) between full-time and part-time faculty and full-time and part-time science faculty and student success as a function of reading assessment test scores.

Recommendations

In order to maintain a science department, full-time faculty are needed. This faculty must see to the curriculum, departmental and student needs in order to

maintain a consistent environment in which the paradigm of a particular science can unfold.

Full-time faculty interface with the remainder of the college community. While it is conceivable to hire part-time science faculty to teach a particular class, the use of part-time science faculty can only occur within a framework, a structure established and maintained by full-time faculty. This is especially important within the first two years of a student's experience within the science curriculum.

It is equally important that full-time faculty be given the time to maintain expertise in their particular field. Encouragement of research should occur, not motivated by publication, but by purpose of enhancing and staying current. Science is a dynamic area of knowledge. For students to excel they must be taught by professors who are current. The survey of department chairs revealed that flexibility, diversity and expertise were important characteristics for hiring part-time faculty. These characteristics should also be applied to the full-time science faculty as well.

It was recommended that the full-time/part-time ratio as it applies to the accreditation standards be relegated to a position of non-importance. An institution of higher education should not be judged on the basis of the total number of full-time faculty, but rather on the outcome of the educational process. More research is needed to

determine if there is an ideal ratio, by subject area, of full-time to part-time faculty.

This study produced results which seem to indicate that other, more measurable factors, such as gender effects, may have a greater impact on student success than faculty employment status. It was recommended that those effects be identified and further research be done. These effects seemed to have produced a difference in how students deal with science courses.

The special nature of science as a subject and as a vocation must be addressed. In order to maintain the most efficient educational delivery system, the use of qualified science teachers must be a priority.

If gender attitudes are a dominant factor as to student success in science, these attitudes must be understood. It was recommended that further research be conducted in this area. Results from this research should improve science education opportunities for all students especially women.

Concerning the influence proprietary schools and corporate universities have on the public institutions, it seems that all involved in the business of education share the same frustrations. However, it was recommended that the public institutions maintain an autonomy apart from institutions with narrow goals. It is important for society that educational institutions not be driven by immediate needs.

To remain free a society must educate itself without regards to dogma or ideals which are confined by one view. Unfortunately, this is costly and as economic pressures mount, the temptation for the "quick fix" may lead educators astray. As ideal as the corporate system seems, its goal is not to educate a person for free thought but for an end result in an economic process. It was recommended that the public and corporate institutions assist each other in those areas in which they seem to excel: pedagogy for public institutions and efficiency for corporate institutions.

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APPENDIX A

DISGRUNTLED PART-TIME FACULTY EDITORIAL

Guest opinion

By JULIAN GRAJEWSKI

Educational standards are collapsing at Pima College and in grade schools, high schools and colleges throughout the United States. Graduate schools seem to be still keeping up their standards.

GRAJEWSKI

Only a small percentage of enrolling students are capable of doing college-level work. For this, the high schools must be blamed.

The drop rate for many courses at Pima is 30 percent to 50 percent. Only 16 percent of incoming freshmen at Pima and other community colleges complete a four-year-degree. Forty percent do so at the University of Arizona and other four-year schools.

This means we are creating a two-tier educational system where minority and other categories of students are being tracked into menial careers with little hope of advancement. This is a threat to democratic society.

The ratio of part-time (Let's stop using the burueaucratic euphemism "associate faculty") to full-time faculty is lopsided. The community campus, with as many as 800 classes per semester, is all part-time. Part-time faculty come cheap and are powerless. Their hugely disproportionate numbers threaten the integrity of the university system by tipping power away from tenured faculty to semi-educated administrators who treat higher education as a business and proceed to banalize it.

It's interesting to note that the first major response to the accreditation report, "The Task Force on a Comprehensive and Integrated Recruitment, Selection, Orientation, Development and Evaluation Program for Associate and Regular Faculty"(TA_OACLAIRSODAEPFAARF?), is an attempt to implement evaluation and control mechanisms of faculty, not of administrators.

Student evaluations caution faculty, especially part-time faculty, to be less demanding and more popular, further banalizing the curriculum. Students come to class stoned or recovering from drug effects. Their sensitivity and intellect are trashed out first and foremost by television, then by rock music, drugs and spectator sports.

The salaries of professional administrators are far higher than those of instructors. The highest-paid full-time instructor at Pima College makes about $130,000 a year. A part-time instructor makes $1,110 per class or $14,440 a year, devoid of any benefits.

No one seems to know why education is important. Bromides are offered as answers.

Solutions include firing, transferring, demoting or removing most of our professional administrators. Let them find jobs in advertising, public relations, banking, the stock market, real estate, the military, sales, counseling and other non-productive or speculative enterprises they can run on a quarterly, bottom-line basis to make paper profits.

Divide the administrative load, and exhorbitant administrative salaries and perks, among the full-time faculty. Give them plenty of clerks and secretaries to help out. No one in charge of the budget should be teaching fewer than two real classes — science, math, literature, history, engineering, music, art history, etc. This is largely as it was 25 years ago before academia became bureaucratized, and should not be considered radical.

The president of Pima College should not be called a CEO, for the business of education is not business. The president should have an academic or scientific degree, not one in education, administration or business. He should have no truck with Harvard Business School methods or with any version of systems analysis. He should be teaching two classes per semester.

Part-time instructors should become full-time, with the concomitant salaries, benefits and power to fearlessly direct educational policy.

Change budgeting procedure, a huge political task at the state level, so Pima is not a slave to footsies, 45-day reporting procedures, and other gimmicks which raise ethical problems and further banalize education.

Fund according to how many students actually complete courses. Better yet, fund for how many students Tucson, the state, the nation and this Mexican border region needs to engender an agricultural-industrial economy instead of a speculative, service economy.

Reach back into the high schools to upgrade the quality of their graduates.

Shut down teacher colleges that crank out grammar and high school teachers who study how to teach a subject instead of studying the subject itself. They seem to be a transmission belt for the "dumbing-down" phenomenon in education. They have created an educational superstructure which legitimizes the granting of academically dubious degrees in education, fostering armies of bureaucratic careerists who "interface" with foundations, government bodies, associations, publishers, political and religious organizations which corrupt education with their not-so-hidden agendas of social control. This is one measure that would cost nothing and would actually save money.

Reach into mass culture to study and counteract its deleterious effects upon the intellectual development of students: television, rock music, drugs, spectator sports and other banalizers of the creative process. Confront the materialism and consumerism of students and replace it with an ethic that emphasizes the production of tangible goods for the benefit of all humanity.

Julian Grajewski is a writing instructor at Pima Community College's East Campus.

APPENDIX B

REBUTTAL FROM FACULTY CHAIRMAN

Inter-OfficeMemorandum
PimaCommunityCollege

TO: Mr. Julian Grajewski

FROM: Arnold C. Davidson, Chairperson of the Faculty, EC

DATE: December 1, 1989

SUBJECT: Article on "Mediocrity"

While it is generally true that present-day education is suffering from the malady of mediocrity, from grade schools to the universities, I resent the fact that you have associated your name with Pima College East. The article appears as if you were the "expert in residence" here at the East Campus.

Those of us who have been with Pima College for many years, and at the East Campus for several more, have built, patiently and devotedly, have taught the mediocre as well as the gifted, have scratched and fought, for this campus. And I resent the fact that someone like you, without so much as consulting anyone of us, would write such an article, designating yourself as an "East Campus writing faculty."

My resentment is so strong that I am forced to say that you're really no colleague of mine. I have worked very hard for this campus in particular and for Pima College in general, and no one, least of all you, will call my work mediocre. Incidentally, I don't make $131,000 a year. I don't know of anyone who does at PCC. If you hunger for notoriety, seek it elsewhere, but not at our expense.

cc
Staff and faculty, administration

APPENDIX C

MEMORANDUM TO GORSUCH

MEMORANDUM

To: C. Gorsuch

From: D.G. Iadevaia

Re: Associate Faculty Listing in Class Schedule

Date: 25 January 1990

On 22 November 1989 a seminar for department chairs was held at the Downtown Campus. Topics presented at the seminar included some of the legal concepts which umbrella associate faculty and their relationship to Pima College. It was stated at this seminar, by R. Stolkin, that associate faculty do not have property rights at the college, and that associate faculty are semester by semester contract teachers. Mr. Stolkin stated that to give an associate faculty the impression of continuing employment beyond the current semester for which they have a valid contract could cause legal problems. It was suggested by Mr. Stolkin that the names of associate faculty should not appear in the published class schedules until contracts were signed. Some people assume, incorrectly, that if their name appears in the class schedule they in fact will be guaranteed the class.

In keeping with the suggestions that came out of the seminar, I would like to recommend that all classes displayed in the Pima College class schedule be assigned the term STAFF to those sections which are not taught by full-time faculty, thus removing any perception that the assignment of a section to an associate faculty is complete prior to the generation of a valid contract.

In other words only full-time faculty names should appear in the class schedule.

cc: P. Welsh
A. Davidson
T. Hines
S. Witt
Faculty Council

APPENDIX D

MEMORANDUM FROM GORSUCH

Inter-OfficeMemorandum
PimaCommunityCollege

TO: David G. Iadevaia, Faculty, East Campus

FROM: Carol A. Gorsuch, Acting Executive Vice President for Academic and Student Affairs

DATE: February 5, 1990

SUBJECT: Associate Faculty Listing in Class Schedule

My office is in receipt of your memorandum in which you request that all classes displayed in the Pima College Schedule of Classes that are not taught by full-time faculty be assigned the term "staff." The practice of listing the names of part-time faculty in the class schedule is not illegal. The action that you recommend is the most drastic and, therefore, should be considered only after all other administrative actions have been taken to reduce or eliminate the confusion or false impression created by listing associate faculty names in the schedule of classes. The number of associate faculty who have attempted to use this reason as legal grounds to gain full-time employment is practically nil.

Two activities are currently underway that seek to minimize this confusion. At the request of my office, Dr. Linta is reviewing the Associate Faculty Agreement to incorporate language that will more clearly convey the terms of employment for part-time temporary faculty. Secondly, the Task Force on Recruitment/ Selection, Orientation, Development and Evaluation of Regular and Associate Faculty has designed a brochure entitled Associate Faculty Employment Procedures: A User Friendly Information Resource. A copy of this draft brochure is attached for your information. (Refer to Section III, Terms and Conditions of Employment.) Eva Yanez, Coordinator of Educational Development in the Office of Instructional Support Services, will be sending the brochure to Academic and Student Affairs administrators, department chairpersons and Faculty Council members for their review and comments.

Although it will never be possible to eliminate all areas of confusion in a multi-campus organization, the task force and the Office of Instructional Support Services will continue their collaborative efforts to provide accurate information and enhanced educational opportunities to both regular and associate

faculty. Each new project will be evaluated to determine its overall effectiveness. Through our collective efforts, the college should never have to resort to designating all class sections taught by part-time faculty as only "staff."

CAG/jw

cc: H. Rebeske
E. Yanez
Academic Affairs Executive Council
I. Garcia
J. Gibson
F. Montes
M. Palacios
W. Soderquist
P. Welsh
Instructional Affairs Council
E. Acuna
I. Garcia
G. Smart
C. Webb
K. White
S. Witt
Faculty Council
S. Barr
B. Coleman
R. Flattley
R. Fridena
L. Haugh
J. Hixon
M. Irell
B. Jacobs
M. Mitchell
R. Moody
B. Moore
A. Pitucco
B. Porreca
F. Rizzuto
A. Stevens
J. Torchiana
D. Yoder
D. Young
P. Young
T. Zsitvay

APPENDIX E

PART-TIME FACULTY SURVEY

PimaCommunityCollege

Survey of Associate Faculty

July 2, 1990

1. What courses (credit and non-credit) have you taught at Pima Community College since July 1, 1989?

Prefix	Number	Course Title	Credit Hours	Number of Sections
____	____	_____	_____	_____
____	____	_____	_____	_____
____	____	_____	_____	_____
____	____	_____	_____	_____
____	____	_____	_____	_____

2. At which location(s) have you taught since July 1, 1989?

1. Community Campus
2. Downtown Campus
3. East Campus
4. West Campus
5. Education Center-South
6. Community Services (non-credit)
7. Skill Center

3. If you checked more than one location above, at which campus do you teach most often?

1. Community Campus
2. Downtown Campus
3. East Campus
4. West Campus
5. Education Center-South
6. Community Services (non-credit)
7. Skill Center

4. Have you ever turned down a part-time teaching position at Pima Community College?

1. Yes.
2. No.

_____ 5. If you answered yes to question 4, what was the most important reason you declined the offer?_____

6. Do you attend orientation sessions?

   1. Yes. 2. No. 3. What orientation sessions?

7. If you have attended orientation, how would you rate the quality of it?

Poor		Acceptable		Excellent
0	1	2	3	4 5

8. Please indicate your credentials that directly relate to the area(s) in which you teach:

   A. Academic qualifications:

      1. Associate's degree
      2. Bachelor's degree
      3. Master's degree
      4. Doctorate degree
      5. Other. Please specify:_____

   B. Number of years of directly-related work experience:_____

   C. Number of years of teaching experience:_____

9. What is the primary reason you teach at Pima Community College? (Please circle one.)

   1. I just love to teach.
   2. The extra money comes in handy.
   3. It is important to me that someone highly-qualified teach this particular subject.
   4. I find teaching an enjoyable diversion from my regular job.
   5. I am in need of the income.
   6. Other. Please specify:_____

10. When were you first employed as an associate faculty member?

    Year:_____ 1. Fall 2. Spring 3. Summer

11. Do you teach:

    1. every semester?
    2. once a year?
    3. less than once a year?

12. How many credit hours do you normally teach at Pima Community College each semester?_____

13. Do you also teach at an institution other than Pima Community College?

A. If yes:

1. Full-time?
2. Part-time?

B. Type:

1. Elementary
2. Secondary
3. Four-year or university
4. Proprietary
5. Military
6. Other. Please specify_____

14. Please answer the following questions:

A. Please circle the answer which most closely describes your current employment status:

1. I work as an associate faculty member only.
2. I have a full-time job.
3. I have a part-time job.
4. I am waiting for full-time employment in my field.
5. Other. Please explain:_____

B. Please indicate your occupation and the industry in which you work:

1. Occupation:_____ 2. Industry:_____

C. Please indicate the range of your individual annual gross income. (All sources.)

1. Less than $10,000
2. $10,000 - $19,999
3. $20,000 - $29,999
4. $30,000 - $39,999
5. $40,000 - $49,999
6. $50,000 or more

15. If a full-time teaching position were opening now in my subject area I would apply for it.

1. Yes. 2. No. (Please skip to question 17.)

16. If a position were offered to me, I would accept it:

1. Outright.
2. Provided:_____

17. I have been an applicant for a full-time faculty position at Pima Community College in the past two years.

1. Yes. 2. No.

18. I teach on a part-time basis at Pima Community College only because I have been unable to secure a full-time position at the college.

1. Yes. 2. No.

19. I am available to teach: (Circle all that apply.)

A. Weekdays:
1. in the morning.
2. in the afternoon.
3. in the evening.

B. Weekends.

C. Location:
1. at any location.
2. only on the following campus(es).

1. Community Campus
2. Downtown Campus
3. East Campus
4. West Campus
5. Education Center-South
6. Community Services (non-credit)
7. Skill Center

20. I keep in regular contact with others who teach in the same subject area(s).

1. Yes. 2. No.

21. Information about you:

A. Gender:
1. male
2. female

B. Age:_____

C. Ethnicity
1. American Indian
2. Asian
3. Black
4. Hispanic
5. White

22. Other comments you may have:

APPENDIX F

CHANCELLOR'S LETTER TO PART-TIME FACULTY

Pima Community College
District Service Center
200 North Stone Avenue
P.O. Box 3010
Tucson, Arizona 85702-3010

Office of the President
(602) 884-6047
FAX (602) 884-6290

June 28, 1990

Dear Associate Faculty Member:

Over the past several weeks, the role of Associate Faculty at Pima Community College has been the point of considerable discussion by the Board of Governors, the Faculty Council, and the College administration.

I need your help in making some recommendations to the Board of Governors about the role and function of Associate Faculty. The attached questionnaire will take only about ten minutes to complete. It will provide us with invaluable information for decision-making.

I hope you will do me the favor of filling out this questionnaire and returning it to me by return mail today, but no later than July 11. A postage-paid envelope is enclosed. I realize that this request comes in the heat of summer and with short turnaround, but I have promised the Board and the Faculty Council a report by the end of July.

If you have any questions regarding this survey, please contact Ms. Helen Rebeske (884-6228) or Dr. Philip Silvers (884-6745).

Please know that I value this information which only you can provide.

Thank you.

Sincerely,

Jeff Hockaday

Jeff Hockaday

APPENDIX G

RAW DATA FROM THE RANDOM STUDENT SAMPLE

Table G1

Raw Data of Full-time / Part-time Faculty Taught Courses and Student Success by Student Age 18 to 23 Years Old

Reading Score Grade Level	Frequencies: Male Students Part-time S	Male Students Part-time NS	Male Students Full-time S	Male Students Full-time NS	Female Students Part-time S	Female Students Part-time NS	Female Students Full-time S	Female Students Full-time NS
Science Courses								
None	2	2	3	0	2	0	0	0
6 - 9	-	-	-	-	-	-	-	-
10 - 12	0	0	2	0	0	0	0	0
>12	4	0	5	0	3	0	5	0
Non-science Courses								
None	5	2	3	0	4	0	6	0
6 - 9	-	-	-	-	-	-	-	-
10 - 12	0	1	1	2	3	0	5	0
>12	2	1	10	0	6	0	20	0

The part-time / full-time heading in the above Table refers to part-time or full-time faculty. The S is defined as successful student and the NS is defined as non-successful student. The Frequencies heading defines the actual number of students, from the random sample, corresponding to the appropriate category for each Table displayed in Appendix G.

Table G2

Raw Data of Full-time / Part-time Faculty Taught Courses and Student Success by Student Age 24 to 29 Years Old

Reading Score Grade Level	Frequencies: Male Students Part-time S	Male Students Part-time NS	Male Students Full-time S	Male Students Full-time NS	Female Students Part-time S	Female Students Part-time NS	Female Students Full-time S	Female Students Full-time NS
Science Courses								
None	6	0	4	0	8	1	5	0
6 - 9	0	0	0	0	2	0	0	0
10 - 12	0	1	1	0	0	1	0	0
>12	0	0	0	0	6	0	16	0
Non-science Courses								
None	15	0	28	4	26	4	12	1
6 - 9	1	0	0	0	2	0	1	0
10 - 12	0	0	0	0	1	1	6	1
>12	0	0	0	0	13	0	29	0

The part-time / full-time heading in the above Table refers to part-time or full-time faculty. The S is defined as successful student and the NS is defined as non-successful student. The Frequencies heading defines the actual number of students, from the random sample, corresponding to the appropriate category for each Table displayed in Appendix G.

Table G3

Raw Data of Full-time / Part-time Faculty Taught Courses and Student Success by Student Age 30 to 35 Years Old

Reading Score Grade Level	Frequencies: Male Students Part-time S	Male Students Part-time NS	Male Students Full-time S	Male Students Full-time NS	Female Students Part-time S	Female Students Part-time NS	Female Students Full-time S	Female Students Full-time NS
Science Courses								
None	7	0	3	0	10	0	6	0
6 - 9	0	0	0	0	0	0	1	0
10 - 12	-	-	-	-	-	-	-	-
>12	5	0	7	1	15	0	9	0
Non-science Courses								
None	10	1	4	1	11	1	7	0
6 - 9	-	-	-	-	-	-	-	-
10 - 12	0	0	0	0	0	0	1	0
>12	8	0	4	0	3	0	5	0

The part-time / full-time heading in the above Table refers to part-time or full-time faculty. The S is defs successful student and the NS is defined as non-successful student. The Frequencies heading defines the actual number of students, from the random sample, corresponding to the appropriate category for each Table displayed in Appendix G.

Table G4

Raw Data of Full-time / Part-time Faculty Taught Courses and Student Success by Student Age 36 to 41 Years Old

Reading Score Grade Level	Frequencies: Male Students Part-time S	Male Students Part-time NS	Male Students Full-time S	Male Students Full-time NS	Female Students Part-time S	Female Students Part-time NS	Female Students Full-time S	Female Students Full-time NS
Science Courses								
None	5	0	3	1	2	2	2	1
6 - 9	-	-	-	-	-	-	-	-
10 - 12	4	0	0	0	0	0	0	0
>12	4	0	7	0	6	0	2	0
Non-science Courses								
None	3	0	2	0	14	2	4	0
6 - 9	-	-	-	-	-	-	-	-
10 - 12	-	-	-	-	-	-	-	-
>12	3	0	5	0	13	0	14	1

The part-time / full-time heading in the above Table refers to part-time or full-time faculty. The S is defined as successful student and the NS is defined as non-successful student. The Frequencies heading defines the actual number of students, from the random sample, corresponding to the appropriate category for each Table displayed in Appendix G.

Table G5

Raw Data of Full-time / Part-time Faculty Taught Courses and Student Success by Student Age 42 to 47 Years Old

Reading Score Grade Level	Frequencies: Male Students Part-time S	Male Students Part-time NS	Male Students Full-time S	Male Students Full-time NS	Female Students Part-time S	Female Students Part-time NS	Female Students Full-time S	Female Students Full-time NS
Science Courses								
None	0	0	2	0	1	0	3	0
6 - 9	-	-	-	-	-	-	-	-
10 - 12	-	-	-	-	-	-	-	-
>12	1	0	0	0	6	0	14	0
Non-science Courses								
None	6	0	2	0	5	0	11	0
6 - 9	-	-	-	-	-	-	-	-
10 - 12	0	0	0	0	1	1	0	3
>12	2	1	10	0	6	0	20	0

The part-time / full-time heading in the above Table refers to part-time or full-time faculty. The S is defined as successful student and the NS is defined as non-successful student. The Frequencies heading defines the actual number of students, from the random sample, corresponding to the appropriate category for each Table displayed in Appendix G.

Table G6

Raw Data of Full-time / Part-time Faculty Taught Courses and Student Success by Student Age 48 to 53 Years Old

Reading Score Grade Level	Frequencies: Male Students Part-time S	Male Students Part-time NS	Male Students Full-time S	Male Students Full-time NS	Female Students Part-time S	Female Students Part-time NS	Female Students Full-time S	Female Students Full-time NS
Science Courses								
None	0	0	0	0	1	0	0	0
6 - 9	-	-	-	-	-	-	-	-
10 - 12	-	-	-	-	-	-	-	-
>12	1	0	0	0	1	0	0	0
Non-science Courses								
None	6	0	6	1	3	0	4	0
6 - 9	-	-	-	-	-	-	-	-
10 - 12	-	-	-	-	-	-	-	-
>12	3	0	0	0	4	0	11	0

The part-time / full-time heading in the above Table refers to part-time or full-time faculty. The S is defined as successful student and the NS is defined as non-successful student. The Frequencies heading defines the actual number of students, from the random sample, corresponding to the appropriate category for each Table displayed in Appendix G.

Table G7

Raw Data of Full-time / Part-time Faculty Taught Courses and Student Success by Student Age > 54 Years Old

Reading Score Grade Level	Frequencies: Male Students Part-time S	Male Students Part-time NS	Male Students Full-time S	Male Students Full-time NS	Female Students Part-time S	Female Students Part-time NS	Female Students Full-time S	Female Students Full-time NS
Science Courses								
None	1	1	0	0	3	0	2	0
6 - 9	-	-	-	-	-	-	-	-
10 - 12	-	-	-	-	-	-	-	-
>12	1	0	0	0	0	0	0	0
Non-science Courses								
None	5	2	3	0	4	0	6	0
6 - 9	-	-	-	-	-	-	-	-
10 - 12	0	1	1	2	3	0	5	0
>12	2	1	10	0	6	0	20	0

The part-time / full-time heading in the above Table refers to part-time or full-time faculty. The S is defined as successful student and the NS is defined as non-successful student. The Frequencies heading defines the actual number of students, from the random sample, corresponding to the appropriate category for each Table displayed in Appendix G.

APPENDIX H

COMBINED TOTAL RESULTS OF CHI SQUARE ANALYSIS

Table H1

Chi Square Cells and Results of All Successful and Non-successful Male Students Taught by Full- / Part-time Faculty

	Student Outcome	
	Successful	Not Successful
Science Courses		
Full-time Faculty	39	3
Part-time Faculty	39	3
Chi square = 0 No Significant Difference (p = 0.05)		
Non - Science Courses		
Full-time Faculty	67	9
Part-time Faculty	66	6
Chi square = 0.45 No Significant Difference (p = 0.05)		

Table H2

Chi Square Cells and Results of All Successful and Non-successful Female Students Taught by Full- / Part-time Faculty

	Student Outcome	
	Successful	Not Successful
Science Courses		
Full-time Faculty	63	1
Part-time Faculty	73	4
Chi square = 1.35 No Significant Difference (p = 0.05)		
Non - Science Courses		
Full-time Faculty	147	6
Part-time Faculty	127	10
Chi square = 1.58 No Significant Difference (p = 0.05)		

Table H3

Chi Square Cells and Results of All Successful and Non-successful Students Taught by Full- / Part-time Faculty

	Student Outcome	
	Successful	Not Successful
Science Courses		
Full-time Faculty	102	4
Part-time Faculty	112	7
Chi square = 0.536 No Significant Difference (p = 0.05)		
Non - Science Courses		
Full-time Faculty	214	15
Part-time Faculty	193	16
Chi square = 0.203 No Significant Difference (p = 0.05)		

BIOGRAPHICAL SKETCH

David Guido Iadevaia was born in Providence, Rhode Island on 7 September 1949 into an extended, warm, Italian family. Italian was his first language. His formal education from elementary school through university was in the public institutions of the State of Rhode Island.

At an early age he had developed an interest in science, specifically Astronomy. During his youth David taught himself a great deal of observational astronomy. Finally, after completing his Master's Degree, he was offered and accepted a position with the University of Arizona, Multiple Mirror Telescope. At thirty four years old Iadevaia moved to Tucson, Arizona.

Before the move, he had been teaching for seven years in Rhode Island. He discovered that he had an ability to teach science very effectively. Coupled with his scientific and technical background this ability allowed him to succeed in both areas.

Iadevaia is currently Chair of the Astronomy/Physics Department at Pima College East Campus as well as the Director of the Arizona Astronomy Education Center. His astronomical research centers around CCD imaging and photometry, his educational research centers on science education delivery systems. Iadevaia is happy.