Writing to Learn in Anatomy and Physiology of the Speech and Hearing Mechanisms

Julie M. Liss, Ph.D.
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A research report submitted to the Center for Interdisciplinary Studies of Writing

"Technical Report Series"
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INTRODUCTION

The learning of human anatomy and physiology is comparable to the learning of a new language because of the vast amount of vocabulary that must be committed to memory. Once mastered, this terminology permits students a great degree of verbal precision with which to express novel concepts, and describe relationships among structures and systems.

All undergraduate students majoring Communication Disorders at the University of Minnesota, and other nationally accredited programs (American Speech Language and Hearing Association), are required to take a course devoted to the anatomy and physiology of the speech and hearing mechanisms. Graduate students entering without precious instruction in this area must also take such course work. The reasons for this requirement are two-fold. First, knowledge of the anatomy and physiology of the speech and hearing mechanisms serves as the foundation for learning in subsequent courses in Communication Disorders. Also, those students seeking certification in speech-language pathology or audiology after graduation training must demonstrate proficiency in this area on a national board examination. Therefore, it is essential that these students retain this knowledge in a usable and cohesive form. The second reason for this requirement is in the vein of professional training, and rarely is addressed directly in courses of this nature: Students must learn how to communicate effectively, often in the form of clinical reports, with other professionals in the medical community. This necessitates mastery of the general terminology, as well as mastery of more subtle elements that are not apparent

from gross definitions of the terms. For these reasons, this course is considered an essential component of the departmental core curriculum.

The traditional approach to the study of anatomy and physiology of the speech and hearing mechanisms is that of memorization of anatomical and physiological relationships. Test formats consistent with the memorization strategy include multiple-choice, true-false and diagram labeling. Several potential problems exist with this approach. Memorization of the terminology is not necessarily congruent with deeper understanding of the material. Memorization without sufficient understanding may result in rapid decay of the information or in its limited use in other settings or applications. Test formats that permit success through memorization typically do not encourage students to "own" the information in such a way that would allow them to discuss it extemporaneously. Thus, the more subtle aspects of the terminology and its uses are not procured. Herein lies the dilemma: How can students enrolled in this type of course learn and retain vast amounts of new information without undue reliance on rote memorization?

One possible solution to this dilemma is the implementation of writing and verbal exercises to promote information synthesis and retention. A version of this solution was attempted at the University of Minnesota in CDis-5302 (Anatomy and Physiology of the Speech and Hearing Mechanisms) in Fall 1990. Students were given short-answer/essay examinations rather than the traditional test formats. Students were informed that memorization would not be sufficient to obtain high scores on the tests. However, they were not given the types of written assignments outside of the examinations that might have prepared them for the short-answer/essay format. Perhaps not surprisingly, more

than 30% of the students received a "C" or lower on the first written examination. Grades improved, as a whole, on subsequent tests after students were provided with study strategies such as recopying notes, studying in groups, actively discussing the information, and writing summaries of the anatomical/physiological systems. Five undergraduate students who performed poorly on the first two examinations raised their grades by 10-30% on the third examination with direct instruction in the implementation of the study strategies. The retrospective analysis of the grade patterns in this class (CDis-5302, Fall 1990) supported the use of writing experiences to improve performance on the short-answer/essay examinations. The present study extends beyond this relationship to address whether written exercises influence learning, and attitudes about writing and learning.

The primary purpose of this study was to develop a series of writing exercises that would improve students' technical writing abilities, encourage "ownership" of the information, and enhance depth of understanding of the material. A second purpose was to identify attitudes about writing and its utility in learning through the use of pre- and post-course surveys. The final purpose of this study was to develop a database that eventually could be used to address whether writing exercises influence information retention in the area of anatomy and physiology.

METHOD AND PROCEDURES

The Course

CDis- 5302 (Fall 1991) was divided into three sections: 1) Neurology, 2) Hearing, and 3) Speech. This was predominantly a lecture course with one required text book. Prior to this study, writing-to-learn exercises had not been formally implemented in this course.

The Participants

Seventy-six students enrolled in this class during Fall 1991. Fifty-one were upper-level undergraduates, eleven were graduate students in the department of Communication Disorders, and six were adult special students. All students were required to complete the writing assignments and examinations, but full participation in the study (i.e., completing both of the surveys and submitting written consent) was optional. Forty undergraduate students completed the pre-course survey, but only 27 of these students participated fully in the study. Therefore, pre-course survey information presented in this paper is based on 40 responses, but all post-course survey and writing evaluation data are based on the 27 fully-completed response sets.

The Surveys

Two surveys were developed to obtain information about attitudes toward and experience with writing (Daly & Miller, 1975; McCarthy, Meier & Rinderer, 1985; Wolcott & Buhr, 1987). The rep-course survey (Appendix A) was distributed during the first class period. Students were told that the instructor was conducting a study to determine the best ways to teach anatomy and physiology. They were asked to read and sign the consent form attached to the survey. Students were not given information about

the specific questions to be addressed in the study, or any information that might influence their responses to the survey.

The post-course survey (Appendix B) was designed to tap changes in attitude that occurred over the quarter, and to obtain specific feedback about the utility of the written assignments as learning tools. This survey was distributed with the final written project and collected on the day of the final examination.

The Writing Exercises

Six written projects were assigned over the ten week session (Appendix C). These assignments were intended to provide an impetus for the students to synthesize seemingly disparate bits of anatomical and physiological information. The projects were also designed to demonstrate the practical application of the material in "real world" settings. Each assignment targeted conceptually-difficult topics that required integration of information from the text and lecture. Students were encouraged to discuss their projects in study groups. For the purposes of grading, all assignments were evaluated for **content** and **form** by a teaching assistant and/or the instructor.

The assignments varied along at least two situational continua, novelty and ambiguity (Daly & Hailey). All projects were designed to be moderately novel. That is, it was unlikely that the undergraduate students had completed similar types of assignments prior to taking this course. Second, the projects varied on the dimension of **ambiguity**. Projects I and III were the most ambiguous of the set, and Projects II and V were the least ambiguous. Although these variables were not systematically manipulated in this study, it was predicted that students would perceive the more ambiguous as more difficult.

The Examinations

All students completed a midterm and a non-cumulative final examination. Both exams consisted of primarily short-answer questions that covered information presented in lecture and in the readings. An effort was made to design some questions that sampled the information from the written exercises. Examinations were scored for the purposes of grading by a teaching assistant and the instructor.

Evaluation Procedures

Each written assignment was evaluated at least two times—once for assigning a grade, and once for the purposes of the present investigation. The latter evaluation was performed on photocopies of the writing samples, on which names and other identifying information had been replaced by an alphanumeric code to insure confidentiality.

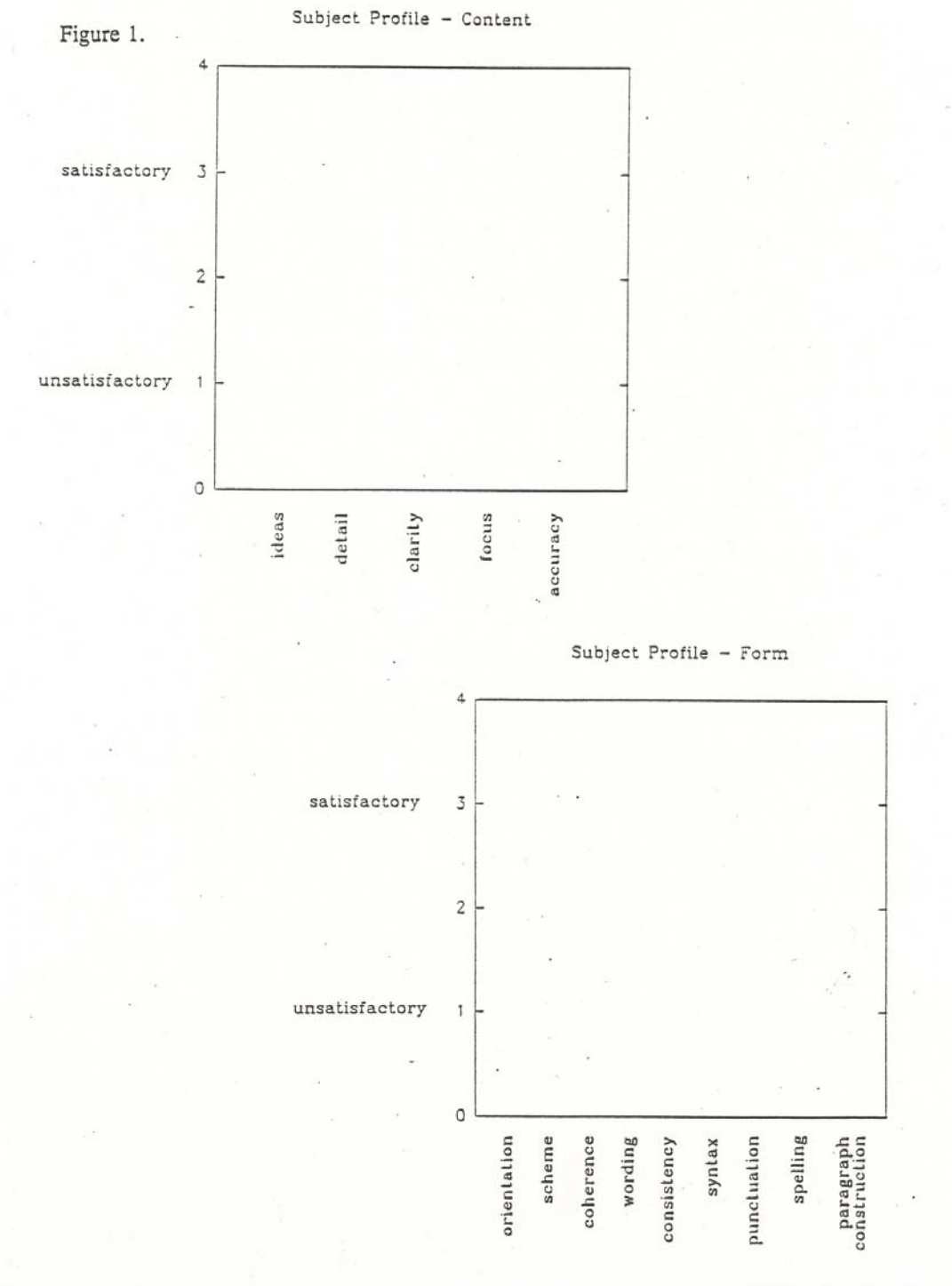
Grades were determined by the teaching assistant and/or instructor primarily on the basis of the accuracy of content information. That is, points were not systematically deducted for spelling or punctuation errors, or other minor form errors. Also, there was no attempt to scale grades in a way that would distinguish between a paper of "marginal accuracy" and one of "superior accuracy." Due to the size of the class (75 students total) and the number of written assignments (six), written feedback to students tended to be brief.

There is always some question as to how well any evaluation procedure captures the subjective impression about the quality of a written assignment (see Hout, 1990, for a review.) The evaluation procedure used for the purpose of this investigation was designed to catalog information about **content** (Appendix D) and **form** (Appendix E) (developed from evaluation procedures published by Cooper, 1975; Cooper, 1977;

Hunter-Carsch, 1990; Purves, Gorman & Takala, 1988). The **content** assessment evaluated the quality of ideas, detail, clarity, focus, and accuracy. The **form** assessment involved judgment of structure (orientation of task, organizational scheme, text coherence, wording and use of vocabulary, consistency of style, voice and tense), and mechanics (syntax, punctuation, spelling, and paragraph construction). Operational definitions for these categories were established that accommodated each of the formats and purposes of the different assignments (Appendix F). For example, the appropriate "voice" for Assignment V, in which students were to explain a theory to a classmate, was less formal than the "voice" expected for Assignment IV which was a clinical report. These operational definitions permitted comparisons both across and within assignments, and within subjects.

In order to obtain an overview of performance for each paper, summary information from the form and content evaluations was plotted. Specifically, subject profile plots were constructed to represent areas of strength and weakness in content and form for each written sample. An example of these plots is shown in Figure 1, where the categories under evaluation are located along the abscissa, and quality is denoted along the ordinate. A category was marked as "unsatisfactory" if the evaluation revealed one or more problems in that area. The subject profile plots were used to identify performance patterns across subjects and across assignments. Examinations were not subjected to the same content and form evaluation as the written assignments. Instead, the grades were recorded and used for subsequent comparisons.

Figure 1.


Subject Profile – Content
4
satisfactory
3
2
unsatisfactory
1
0
ideas
detail
clarity
focus
accuracy
Subject Profile – Form
4
satisfactory
3
2
unsatisfactory
1
0
orientation
scheme
coherence
wording
consistency
syntax
punctuation
spelling
paragraph construction

Reliability

A subset of fifteen writing assignments (three assignments from projects I, II, IV, V, and VI) were randomly selected and reevaluated by the original judge for form and content. Reliability was calculated by identifying the number of discrepancies between the first and second rating on a given evaluation form, subtracting that value from the total possible responses on the form, and then dividing by the number of possible responses. The mean intra-examiner reliability value for content was 96% (range 78-100%), and 97% for form (range 89-100%). This level of reliability was deemed highly acceptable for the purposes of this investigation.

RESULTS

Pre-Course Survey (N=40 undergraduates; Appendix G)

General Writing Experience. Pre-course survey responses revealed that most of these undergraduate students (83%) typically write up to five papers per quarter, and that the majority of these assignments (65%) are 1-3 pages in length. A few students (18%) reported that they usually complete only 0-1 written assignments per quarter.

Although it would seem that these students get some writing experience in classes, nearly 55% of the respondents indicated that they "never" write stories or poetry for recreation. Sixty-five percent "rarely" or "never" keep a log or journal of daily events. However, there was an indication of preference for creative writing over technical writing (63% "sometimes" or "frequently" prefer creative writing and 38% "rarely" or "never" prefer it).

Many students (68%) stated that they are efficient note-takers in class when the instructor is organized, and 60% "sometimes" or "frequently" rewrite their notes after class. Similarly, most students reported that they "sometimes" or "frequently" prepare an outline before beginning a writing assignment (83%), and "sometimes" or "frequently" ask someone to read and comment on these papers before handing them in (83%).

In terms of feedback given on writing assignments, students indicated that the comments and feedback provided by professors are "sometimes" useful (68%). Furthermore, they reported the grades assigned to the writing projects are "frequently" fair and appropriate (58%). Interestingly, half of the students claimed that professors

"rarely" put more emphasis on the form of the paper than on the ideas, and the other half indicated that this was true "sometimes" or "frequently."

Attitudes about Writing in General. Most respondents (75%) indicated that they enjoy preparing short written assignments at least some of the time, but 65% reported that they "rarely" or "never" enjoy larger written assignments. Seventy-five percent claimed that they "frequently" receive A and B scores on writing assignments. They also indicated a preference (85%, "sometimes" or "frequently") for being allowed to choose a topic for a paper rather than having one assigned.

Though most students (68%) denied avoiding classes that required writing, 33% admitted to this practice "sometimes" or "frequently." Of particular note, is that 75% indicated that writing assignments "sometimes" or "frequently" make them anxious, but 55% reported confidence at least "sometimes" in their ability to express themselves through writing. Eighty percent of the students claimed that they "sometimes" or "frequently" take more time than their peers to complete written assignments.

This group of undergraduates asserted that they "sometimes" or "frequently" learn more from writing about a topic than from taking an exam in class (90%). Many (75%) also claimed to "sometimes" or "frequently" prefer short answer/essay examinations over true-false or fill-in-the-blank tests. Yet, 43% "rarely" or "never" use writing to help them study for examinations. All but three students reported that being a better writer would have an impact on their grades at least some of the time. Ninety-three percent recognized that professionals in the area of Communication Disorders "sometimes" or "frequently" do a great deal of writing.

Writing in Science Courses. About 70% of the respondents reported having taken between two and five college-level science courses. Although most students (87%) claimed they receive A's and B's in science courses at least some of the time, more than one-third (35%) reported that they earn C's and D's "sometimes" or "frequently." Half of the students indicated that they "frequently" spend more time studying for science courses than for other types of courses, and 78% "sometimes" or "frequently" use flash-cards or repetition to memorize science facts. Although few students consider themselves to be science-minded (10% "frequently"), many (83%) reported that they "sometimes" or "frequently" find it easy to take notes in science courses.

In contrast to general positive response to writing that was revealed in the first portion of the pre-course survey, students were less favorable about writing in science courses. Over 70% of the students reported completing an average of 0-2 written assignments per science course. Half of the students asserted that they "rarely" or "never" enjoy writing laboratory reports and technical papers. This may or may not be related to the finding that 55% of the students "rarely" or "never" receive ample feedback from science professors or teaching assistants on their written assignments.

Writing Performance – Content and Form (N=27)

Six written projects were assigned (see Appendix C). Only data from Assignments I, II, IV, V, and VI will be reported here. Many students were not able to complete Assignment III, which involved in-class group discussion, because of a snowstorm. Subject profile plots, which contained summary information about content and form, were used to identify patterns across and within subjects and across and within assignments.

Form Errors. The most predominant types of errors were those out of form. Eighty-nine percent of the students produced errors in syntax, punctuation and spelling. Additionally, most demonstrated errors in working and paragraph construction. Table 1 shows some examples of these types of errors.

Table. 1

Form Errors

SYNTAX:

"The source traveled through the vocal tract and was filtered, thus the output looks different from the glottal sound source because the output has different amplitudes for each frequency, due to the fact that some were resonated and others were not." (run-on)

"Therefore explaining the man's inability to carry out two-step commands." (fragment)

"The most pronounced structure that has been affected are the contralateral zygomatic bones." (noun-verb agreement error)

SPELLING:

"The patient shows **micrognatia** of the mandible as well as mandibular hypoplasia." (micrognathia)

"They have a fundamental frequency and other **fromant** frequencies which are **intergral** multiples of the fundamental **frquency**." (formant, integral, frequency)

"If Wernicke's area was damaged, then the message **recieved** would not be transmitted along the arcuate fasciculus." (received)

PUNCTUATION:

"After reading through the **patients** symptoms, I have come to the conclusion..."(apostrophe)

"**the** inner ear is next in place as the **Vestibular** system is linked onto the **Ossicular** chain." (capitalization)

"Following **surgery exercise** through thoracic fixation will strengthen the instrinsic musculature." (comma)

WORDING:

"Because of the **paralyzation**, force is necessary to produce sound." (neologism)

"There are many lost waves between the middle ear to inner ear." (wording compromises accuracy)

"Also he seems like a very **voicturous** child enjoying thing where he can scream." (neologism)

PHRASING:

"When I listened to the perceptual evaluation of the vocal quality, I again heard the breathiness caused from the paralysis of one of the vocal folds."

"This might result in the inability of the vocal folds to release or shape to air efficiently after the vocal folds were blown apart."

Somewhat less common, but perhaps more important from the standpoint of learning, were errors of content. Thirty-three percent of the students exhibited insufficient detail or lack of clarity in at least some of their writing. Some writing also showed problems with general concepts or ideas. Examples of these types of errors are provided in Table 2.

Table 2.

Content Errors

CONCEPTS/IDEAS:

"Tissue death in this region affects one's ability to use and understand spoken and written language, therefore earning the name Broca's Aphasia."

"I speculate this because his symptoms are related to Broca's area and Wernicke's area, which are in different lobes and regions of the brain."

"Since the vocal folds are vibrating at a different frequency it is possible to get two different tones happening at the same time during speech production. This is called harmony."

DETAIL:

"Nasendoscopic Evaluation: Shows vocal nodules on the right vocal fold.
Perceptual Evaluation: Voice is weak and raspy. Sound difficult.
Treatment: Plenty of rest. Stay away from the smoke-filled environment. Retire!" (no comparison between what is viewed during the nasendoscopic evaluation and the perceptual evaluation; no mention of voice therapy)

"The embolism most likely traveled from the cardiac muscle through the blood stream into the area of the brain known as Wernicke's area. The coronary bypass operation performed one month prior to the embolic CVA could have loosened a piece of the cardiac muscle, or some other piece of debris, which eventually released and got transported to the brain." (no mention of aorta, common or internal carotid arteries, Circle of Willis, or middle cerebral artery)

"Speech production is an intricate process. This process is even more difficult when craniofacial anomalies are present. This patient's articulators are abnormal, producing very abnormal speech." (vague, imprecise description)

CLARITY:

"Due to the fact that the vocal folds have nodules they are not able to vibrate in a normal fashion and medial compression is not being achieved because the nodules are in the way. Furthermore, the folds are heavier due to the nodules and this will decrease the pitch of the voice."

ACCURACY:

"The vagus nerve, which is the fifth cranial nerve, at the recurrent nerve which arises from a point on the vagus considerably below the larynx..." (tenth)

"She has a Class **three** malocclusion which is a prognathic mandible, in which the mandible extends beyond the maxillary." (two)

"It may be necessary to inject Teflon into the paralyzed fold in order to make it bigger which may allow adduction with the right fold." (teflon is not injected into the vocal fold in order to increase its size but rather to move the fold more toward midline)

It is somewhat misguided to assess progress or development in writing abilities from these exercises because the assignments varied in form and complexity. However, perusal of subject profile plots revealed that students tended to make similar types of errors in each of their assignments. This was particularly true of form errors such as spelling and punctuation. Examples of within-subject form-error consistency are provided in Table 3.

Table 3.

FORM-ERROR CONSISTENCY

Subject UFP24:
I. "If the embolism is stuck in the artery that leads to Broca's area where the organization and planning of movement for speech takes place." (sentence construction)
II. "The middle ear has three hypothesis for playing the role of an impedance transformer." (sentence construction)
IV. "Means that the left recurrent laryngeal nerve loops around the aortic arch it could be that it was nicked during J.D. surgery." (sentence construction)
V. "Air molecules displacement is greater for the low frequency sounds then for high frequency sounds, this causes low frequency to encounter a greater resistance by the air." (sentence construction)
VI. "Means that the mandible is pulled back the tongue is also farther back then normal." (sentence construction)

Subject UFA19:
I. "From there the emboli would travel through the brain's vessel system, branching off and changing directions until it reached a point where the blood **vessels** (vessel's) diameter is the same as **it's** (its) own and it becomes lodged." (punctuation)
II. "The ear acts as a transducer of energy in all three of **it's** (its) anatomical divisions." (punctuation)
IV. "Because of the nodules (,) the vibratory pattern of the cover will change (.) Nodules add mass to the folds, particularly the epitheleum, affecting vertical phase difference, and (,) in turn (,) lowering pitch." (punctuation)
V. "At this point (,) there is a transfer function which is basically when resonants vibrate in frequencies along the tract, untill it finds it's **(its)** formant frequency, than a maximum energy transfer occurs and amplitudes reach it's **(its)** highest point." (punctuation)
VI. "Along with this (,) there is probably a lack or deformity of jaw closer muscles." (punctuation)

Subject UFP66:
I. "Another speculation that could in turn be true would be the embolism might have damaged **Wernick's** (Wernicke's) area affecting his comprehension." (spelling)
II. "The **absorbtion** (absorption) of energy is lead through, across and beyond, then emitted in the same form or in another form." (spelling)
IV. "I will have a **seperate** (separate) conference with parent to ensure they are willing to reinforce therapy techniques at home." (spelling)
V. "This explains why the **ampltude** (amplitude) decreases as the frequency increases." (spelling)
VI. "Malformation of external ear, often accompanied by the absence of external auditory canal or **refered** (referred) to as microtia." (spelling)

Perhaps the most revealing type of form error was the inappropriate combination or use of new terms. That is, students often used or combined words in ways that compromised accuracy of meaning – even when they chose the appropriate terminology. Often subtle, these errors are felt to reflect a more superficial understanding of the material. It is interesting to note that the **presence** of appropriate terminology was often enough to earn the student a respectable grade in the scoring procedures for the class. But among the papers that earned high grades, there were different levels of accuracy that were identified through the evaluation procedures for the study. In addition, these types of errors were further captured in the "content" analysis, typically under the heading of "clarity" or "detail." Examples of this are shown in Table 4.

Table. 4.

WORD COMBINATIONS

"The **supraglottis** area may also be irritated due to the allergies." (supraglottal or supraglottic)

"I would recommend that T.T. **sees a** otolaryngologist to see about the upper **respiration** infections." (see, an, respiratory)

"I suspected that the left recurrent laryngeal nerve, which is right under the **aorta** arch, had been cut somehow during the cardiac surgery." (aortic)

"Since he is unable to speak, **the** Broca's area must be damaged because this controls the movement for speech." (unconventional use)

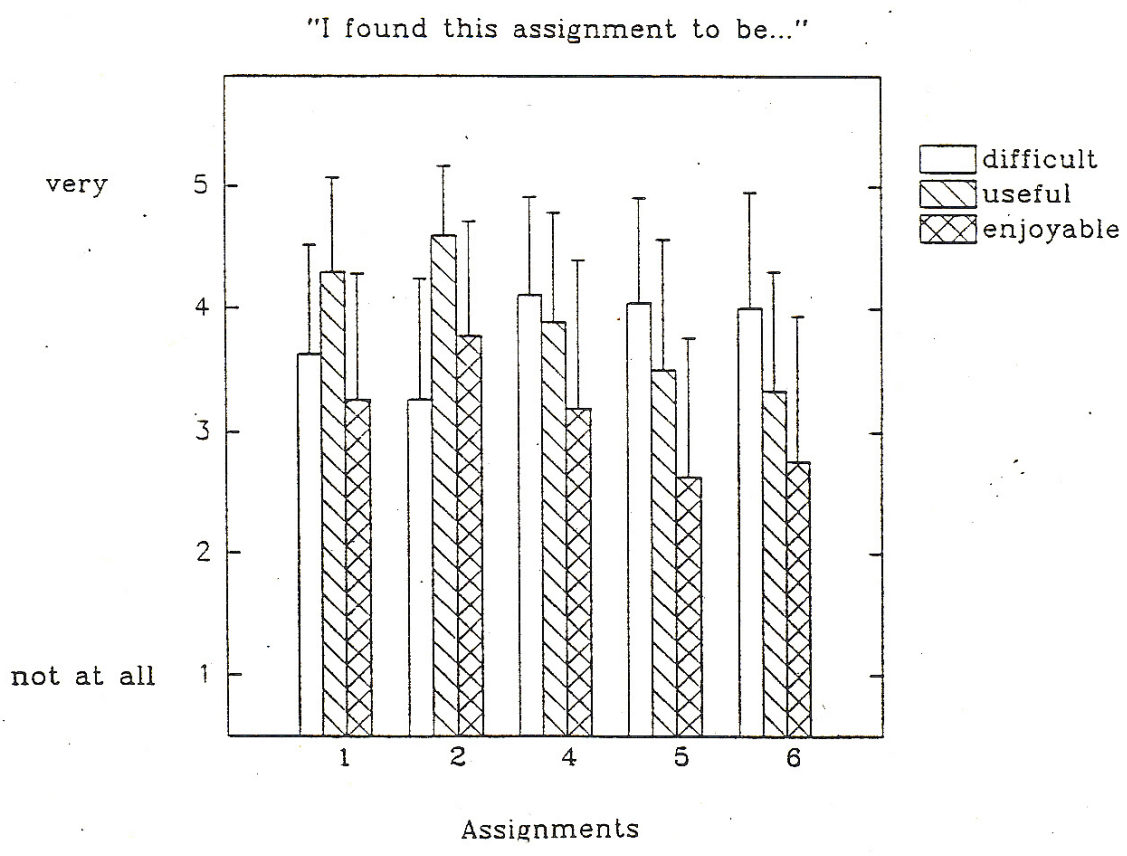
"...helpful in determining which hemisphere is speech **dominate.**" (dominant)

"There is a **cleft palate** in the hard palate that leads back into the soft palate." (cleft)

"Due to paralysis there will be no **vocalism** (neologism) because vocal folds never touch. This means there is no **transition phase for the right vocal fold** (incorrect). The covers won't medially compress and therefore the vocal folds lose their characteristic of being **mucoviseroelastic**-aerodynamic (spelling)." (though this description generally contains the appropriate terms, the student combines them in ways that reflect lack of thorough understanding)

Across-Subject by Assignment. According to the results of the post-course survey, students considered some assignments to be more difficult than others. Figure 2 shows the means and standard deviations (N=27) for responses to the statements, "I found this

assignment to be difficult," "…useful," and "…enjoyable." The scale ranged from 1 ("not at all") to 5 ("very"), and results for five assignments are reported. Assignments IV, V, and VI were deemed most difficult; Assignments I and II was considered the most enjoyable. Comments solicited on the post-course evaluation form supported the observation that Assignment II was a favorite among students. Of all the assignments, this was clearly the least ambiguous: Students were explicitly told what was expected of them in terms of content and form of the exercise. Although this assignment was perceived as being relatively "easy," it did require substantial knowledge of some fairly abstract physical and mathematical concepts.



The distribution of error types across assignments is provided in Table 5. Each cell contains the number of students (out of 27) who made errors in these categories.

Punctuation, spelling and syntax errors were the most common form errors across exercises. Wording problems were evident for Assignments I and VI. In terms of the content evaluation, inappropriate detail (usually an insufficient amount) was the most prominent problem noted in all assignments, but specifically in Assignments I and V.

Table 5

Types of Errors Across Subject Per Assignment -- # of students out of 27

Assignment #	I	II	IV	V	VI
FORM					
Wording	6	2	2	1	7
Syntax	11	12	11	8	13
Punctuation	17	15	16	14	19
Spelling	15	14	14	8	19
Paragraph Construction	4	2	3	2	1
CONTENT					
Detail	9	4	6	8	5
Clarity	4	3	2	4	2
Ideas	0	1	0	1	1

Writing Performance and Attitudes About Writing

Responses from the post-course survey were compared to actual writing performance to determine how well students' perceptions corresponded with the evaluation of their written work (see Appendix H for post-course survey responses.) This was accomplished by identifying comments (e.g.,: "I think it's gotten more clear and concise") and then examining the subject profiles to determine if, indeed, the writing showed some evidence to support the claim. Appendix I lists selected comments to the question, "Has the quality of your writing changed since participating in this class…" from the post-course survey. It also indicates relevant information from the evaluation procedure. Twenty-six percent of the students reported that their organization improved from participating in this class. Only 19% reported that their writing had become more

clear and concise. However, according to the evaluations, five of these same students were judged to have insufficient detail in their papers. Only three students (11%) indicated that they learned to write in a more technical or scientific manner. In general, it appears that the results of the evaluation mirrored the perceptions the students had about their own writing, though the evaluation was somewhat more critical and was unable to readily capture 'improvement.'

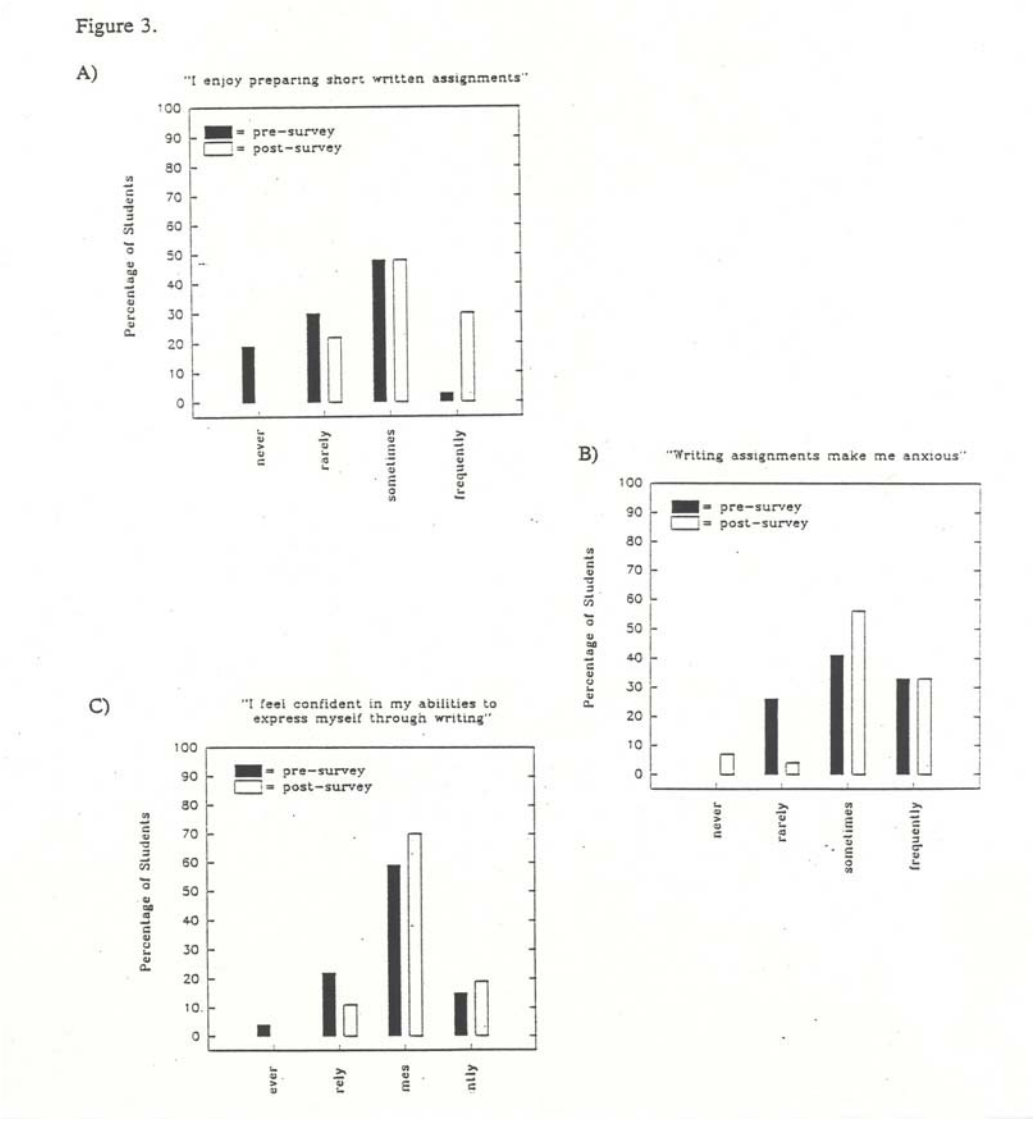
Correlation coefficients among content, and form ratings (from evaluation procedures), and perception of "difficulty," and perception of "amount learned" (from responses on the post-course evaluation) were calculated for each assignment. Interestingly, no strong patterns emerged that would suggest a predictable relationship between any two of these variables. That is to say, the correlations did not find, for example, that assignments perceived as more "difficult" had poorer content and form evaluations than those rated less "difficult." Similarly, there was no strong relationship between these performance measures and the amount students felt they learned from the assignments.

Changes in Attitudes about Writing (N=27)

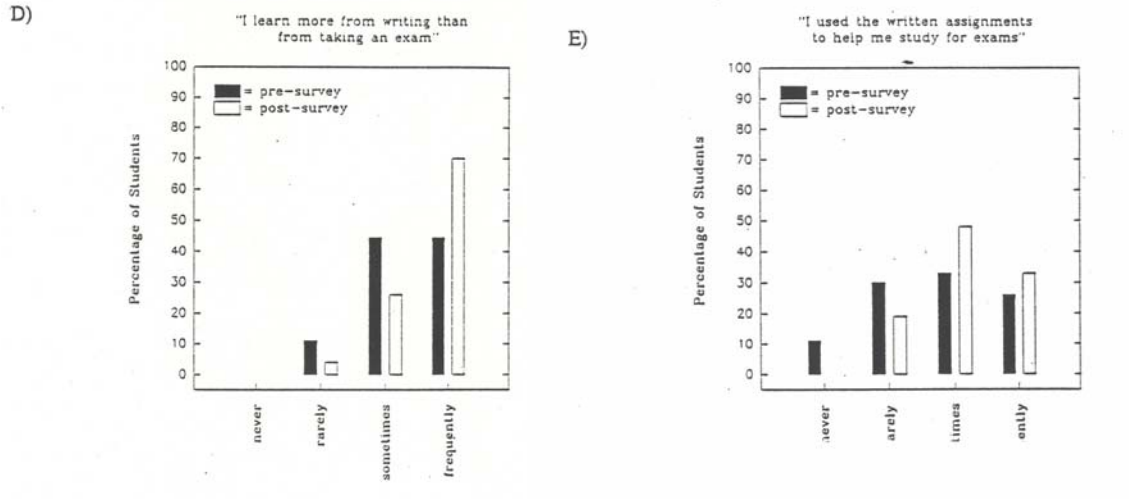
Pre- vs. Post-Course Survey Responses. The most notable changes in attitude from the first to final surveys are shown in Figure 3 (see Appendix J for the full set of pre- versus post-course survey responses). According to the first graph in Panel A on Figure 3, 30% of the respondents reported on the post-course survey that they "frequently" enjoy preparing short written assignments. Only 5% made this claim prior to taking the course. Responses to the statement, "writing assignments make me anxious," suggest a slight general increase in anxiety (Panel B). On the post-course

survey, about 58% of the students indicated that the assignments "sometimes" make them anxious. This figure is about 15% higher than that of the pre-course responses. Likewise, on the post-course survey, fewer students responded "rarely" to this statement. Despite the slight indication of heightened anxiety regarding writing, there was an increase in the percentage of students who reported they "sometimes" or "frequently" feel confident in their abilities to express themselves through writing (Panel C). Post-course responses also suggest that students view their writing experiences in this course as valuable learning tools (Panels D and E).

Figure 3.



(Figure 3.)



Direct Questions. The post-course survey contained direct, open-ended questions about changes in attitude. Answers to the question, "Has your attitude towards writing changed since participating in this class…" are listed in Appendix K. Six of the students remarked that knowing how to write is helpful and important, though several students indicated that frustration and anxiety are still associated with their writing experiences.

Responses to the question, "Did the written assignments influence your learning of the course material…" are listed in Appendix L. Clearly, the consensus is that the assignments enhanced their learning of the material. As predicted, students' comments indicated that the writing assignments required a deeper understanding, a broader view, and a more integrative approach than simply studying for an exam. It is of special interest that responses about the writing experiences were positive across the entire range of class grade averages (left column of Appendix L).

Writing Exercises and Exam Performance

The obvious goal of writing-to-learn is to develop writing activities that influence information acquisition and retention. Though this study was not designed to address a casual relationship between these two variables, it is possible to examine the relationship between quality of writing and exam performance. Correlation coefficients between mean examination scores and content and form scores per assignment did not reveal any strong or significant relationships. These values are shown in Table 6.

Table 6.

Correlation coefficients (r) for the relationship between examination averages and content and form scores.

Assignment	Exam Average v. Content	Exam Average v. Form
I	.506	.416
II	.309	.388
IV	.184	-.044
V	.311	-.182
VI	.435	.272

DISCUSSION

The results of this investigation indicate that writing exercises can be used successfully as a learning tool in a course whose traditional emphasis is rote-memorization. In addition, this study demonstrates that the benefits of the writing exercises were not lost on the students: Although many students indicated throughout the quarter that they found the writing assignments challenging, time-consuming and anxiety-provoking, their final responses were overwhelmingly positive.

Glynn, Yeany and Britton (1991) have described a trend in the teaching of science in which there has been an evolution from rote strategies, to "hands-on" strategies, to "minds-on" strategies. Writing assignments that require students to master the complex relationships among structures and systems is the consummate experience in constructive, "minds-on" learning (see, for example, Ambron, 1987; Madigan, 1987). However, the great value of writing is offset by the additional burden placed on the instructor in terms of grading, and by the weight of the longstanding tradition of rote-memorization associated with courses of this nature. This may explain why the implementation of writing in science courses has been slow to take root (Mitman, Mergendoller, Marchman & Packer, 1987; Squitieri, 1988). Perhaps additional accounts of success will convince teachers of science that the benefits far outweigh the costs, and moreover, that the costs can be kept reasonable by creative planning.

Although the results of the present study provide unequivocal support for writing-to-learn exercises in anatomy and physiology, the study also cast doubt on the assumption that any writing experience is better than no writing experience. Several observations lead to this conclusion. First, based on student comments, their written products, and

evidence from the examinations, it is clear that the six writing exercises in this study were not equally useful as learning tools. Recall that some assignments were more ambiguous than others, requiring that students call on their knowledge and insight to organize their written responses. The results of this study suggest that some level of ambiguity regarding precisely what is expected promotes creativity among most students. However, too much ambiguity promotes floundering, and too little stifles imagination and may diminish the learning "pay-off." Another factor that was systematically varied, and that is felt to be a critical component in the success of a writing experience, is specification of the audience (see, also, Herrington, 1985). In this study, different types of audiences were specifically manipulated to ensure that students understood information at appropriate levels of detail. It encouraged them to anticipate the types of questions a certain audience may have, and to recognize the depth and accuracy of their own understanding.

The second observation is that not all students benefited equally from the types of writing experiences implemented in this course. Specifically, they may have been of limited value for those students who could not master the most basic of concepts. Of the nine undergraduate students who dropped the course or earned an "Incomplete," three received at least one score below 70% on a writing assignment – the other six dropped the course prior to turning in their first assignment. It is not clear whether the writing played a role in their failure to complete the course, but such a possibility must not be overlooked.

A final, but related, observation is that writing acts as a reinforcer that has the capacity to reinforce misinformation as readily as correct information. This was noted

informally one day prior to class when several students were arguing vehemently about the vibratory pattern of the vocal folds – the topic of a paper they had just completed. Though one of the students was incorrect in her description, she had constructed an involved explanation that evidently made sense to her. In what appeared to be an attempt to validate her explanation, she removed her paper from her folder and read it, verbatim, to the others in the group.

Taken as a whole, these caveats reinforce the notion that writing assignments must be thoughtfully and critically developed. Allowing students to play a part in this development will likely lead to the most useful experiences for the student as well as the instructor. Writing assignments can serve as a metric by which to measure that critical interface between teaching and learning. As one student stated, "I will not forget what I wrote – I will forget what I studied for exams."

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APPENDIX A

Consent Form
Writing to Learn in Anatomy and Physiology of the Speech and Hearing Mechanisms

Julie M. Liss, Ph.D.
Department of Communication Disorders

You, as a student enrolled in CDis-5302, are being asked to participate in a research study that I am conducting. I ask that you read this form and ask any questions you may have before filling out the attached survey.

The purpose of this study is to identify the best ways to teach anatomy and physiology to students taking course work in the Department of Communication Disorders. If you agree to participate in this study, you will be asked to fill out a brief survey at the beginning and the end of this course during class time. These surveys will in no way influence your grade in CDis-5302. In addition, copies of your examinations and assignments will be retained for further analysis. Your names and any other identifying information will be removed from these copies and replaced with a code to assure confidentiality.

Your participation in this investigation will lead to a better understanding of how students learn anatomy and physiology.

The records of this study will be kept private. In any sort of report I might publish, I will not include any information that will make it possible to identify a subject. Research records will be kept in a locked file; only my research assistant and I will have access to the records.

Your decision whether or not to participate will not affect your current or future relations with the University and will in no way influence your grade in CDis-5302. If you decide to participate, you are free to withdraw at any time without affecting those relationships.

Please ask me any questions you may have at this time. If you have questions later, you may contact me, Julie Liss, at 115 Shevlin Hall, 624-3322.

You will be given a copy of this form for your records.

I have read the above information. I have asked questions and have received answers. I consent to participate in the study.

Signature _____ Date_____

Investigator_____ Date_____

SURVEY

BACKGROUND INFORMATION:
Year in school:
Current major:
Degree sought:
Years in current program:
Native Language:
Second language:
Gender:
Age:

GENERAL WRITING EXPERIENCE:

The following questions are designed to gain information about your general writing experience at the college level up to this point. In answering these questions, please think about your writing experiences as a whole.

Circle the item that most accurately finishes the statement.

1. Average number of written assignments per quarter (e.g., papers and reports at least one page in length. Do not include math or fill-in-the-blank assignments):
   a. 0-1 written assignments per quarter
   b. 2-3
   c. 4-5
   d. 6-7
   e. more than 7

2. Most of my written assignments have been:
   a. 1-3 page papers on assigned topics or topics of my choice
   b. 4-6 page papers .
   c. 7-10 page papers
   d. 11-20 page papers
   e. other (describe):

3.With regard to note-taking in class, I consider myself to be:
   a. inefficient--it is difficult for me to know what to write and how to organize the information in my notes .
   b. excessive--I usually write more than I need and this causes me to lose sight of the "big picture.
   c. efficient-but only when the instructor is well-organized and speaks from some sort of outline
   d. efficient--my notes are usually concise and accurate
   e. moderate--I don't take many notes but I find the information I do record useful
   f. insufficient--I don't write down enough and later I regret it

4. Professors and TA's have described my writing as (circle all that apply):

creative	full of errors	disorganized	significant
unified	grammatically acceptable	rough	confusing
polished	clear	wordy	awkward
concise	vigorous	boring	other:

5. I describe my writing as (circle all that apply):

creative	full of errors	disorganized	significant
unified	grammatically acceptable	rough	confusing
polished	clear	wordy	awkward
concise	vigorous	boring	other:

6. I believe that the following aspects of my writing need improvement (circle all that apply):

organization	ideas	wording
preparation	style	spelling
punctuation	grammar	other:

Please read the following statements and circle the word that best describes how often you have had each experience in college.

1. I enjoy preparing short written assignments (between 1-5 pages):
never rarely sometimes frequently

2. I enjoy preparing larger writing projects of more than 5 pages:
never rarely sometimes frequently

3. I like short answer/essay examinations better than true-false and fill-in-the-blank types:
never rarely sometimes frequently

4. I get A and B scores on my writing assignments:
never rarely sometimes frequently

5. Writing assignments make me anxious:
never rarely sometimes frequently

6. I take more time than my peers to complete written assignments:
never rarely sometimes frequently

7. I keep a log or journal of my daily events:
never rarely sometimes frequently

8. I write stories or poetry for recreation:
never rarely sometimes frequently

9. I get C and D scores on my writing assignments:
never rarely sometimes frequently

10. My professors give useful comments and feedback on my written assignments:
never rarely sometimes frequently

11. I use writing to help me study for examinations:
never rarely sometimes frequently

12. I rewrite my notes after class:
never rarely sometimes frequently

13. I am confident in my abilities to express myself through writing:
never rarely sometimes frequently

14. Professionals in my field do a great deal of writing:
never rarely sometimes frequently

15. I avoid taking classes that require me to write papers:
never rarely sometimes frequently

16. I prepare an outline before beginning a writing assignment:
never rarely sometimes frequently

17. I feel the grades assigned to my writing projects are fair:
never rarely sometimes frequently

18. I prefer writing **creative** papers over **technical or research** papers:
never rarely sometimes frequently

19. I prefer being allowed to choose a topic for a paper rather than having a topic assigned to me:
never rarely sometimes frequently

20. My professors put more emphasis on the **form** of my papers (e.g., grammar, punctuation, spelling) than on the **ideas**:
never rarely sometimes frequently

21. I ask someone else to read and comment on my papers before I hand them in:
never rarely sometimes frequently

22. I feel I learn more from writing about a topic than from taking an exam in class:
never rarely sometimes frequently

23. I feel being a better writer would have an impact on my grades:
never rarely sometimes frequently

WRITING IN SCIENCE COURSES:

The following questions refer specifically to your writing experience in **SCIENCE COURSES** (for example, these could include Biology, Chemistry, Physics, Astronomy, Geology, Zoology):

1. How many science courses have you taken at the college level?
    a. 0-1
    b. 2-3
    c. 4-5
    d. more than 5
    e. other (describe):

2. On average, how many reports and papers have you written for each of these courses?
    a. 0-2
    b. 3-5
    c. 6-8
    d. more than 8
    e. other (describe):

3. I get A's and B's in science courses:
never rarely sometimes frequently

4. I consider myself to be "science minded:"
never rarely sometimes frequently

5. I enjoy writing laboratory reports and technical papers:
never rarely sometimes frequently

6. I get lots of feedback from science professors/TAs on my written assignments:
never rarely sometimes frequently

7. I get C's and D's in science courses:
never rarely sometimes frequently

8. I find it easy to take notes in science courses:
never rarely sometimes frequently

9. I use flash cards or repetition to memorize facts:
never rarely sometimes frequently

10. I spend more time studying for science courses than for other types of courses:
never rarely sometimes frequently

APPENDIX B

SURVEY

ANATOMY & PHYSIOLOGY WRITING EXPERIENCE:

The following questions are designed to gain information about your writing experience **in the Anatomy & Physiology course this fall.**

Circle the item that most accurately finishes this statement.

1. With regard to note-taking in this class, I consider myself:
   a. **inefficient** – it is difficult for me to know what to write and how to organize the information in my notes.
   b. **excessive** – I usually write more than I need and this causes me to lose sight of the "big picture"
   c. **efficient – but only** when the instructor is well organized and speaks from some sort of outline
   d. **efficient** – my notes are usually concise and accurate
   e. **moderate** – I don't take many notes but I find the information I do record useful
   f. **insufficient** – I don't write down enough and later I regret it

2. The **professor and/or TA** for this class described my writing as (circle all that apply):

creative	full of errors	disorganized	significant
unified	grammatically acceptable	rough	confusing
polished	clear	wordy	awkward
concise	vigorous	boring	other:

3. Based on written assignments for this course, I describe my writing as (circle all that apply):

creative	full of errors	disorganized	significant
unified	grammatically acceptable	rough	confusing
polished	clear	wordy	awkward
concise	vigorous	boring	other:

4. Based on the written assignments for this course, I believe that the following aspects of my writing need improvement (circle all that apply):

organization	ideas	wording
preparation	style	spelling
punctuation	grammar	other:_____

Please read the following statements and circle one word that best describes how often you have had each experience in this course:

1. I enjoyed preparing the written assignments:
never rarely sometimes frequently

2. I consulted with other students in the class about the written assignments:
never rarely sometimes frequently

3. I found the written assignments useful:
never rarely sometimes frequently

4. I consulted with the professor about the written assignments before turning them in to be graded:
never rarely sometimes frequently

5. I was able to express myself adequately on the short-answer questions on the examinations:
never rarely sometimes frequently

6. I got A and B scores on my written assignments:
never rarely sometimes frequently

7. The written assignments for this class made me anxious:
never rarely sometimes frequently

8. I took more time than my peers to complete some of my assignments.
never rarely sometimes frequently

9. I got C and D scores on my written assignments:
never rarely sometimes frequently

10. The professor/TA gave useful comments and feedback on my written assignments:
never rarely sometimes frequently

11. I used the written assignments to help me study for exams:
never rarely sometimes frequently

12. I rewrote my notes after class:
never rarely sometimes frequently

13. I felt confident in my abilities to express myself through writing:
never rarely sometimes frequently

14. I prepared an outline before beginning a written assignment:
never rarely sometimes frequently

15. I felt the grades assigned to my writing projects were fair:
never rarely sometimes frequently

16. I preferred writing the less structured **creative** papers over the more **technical** ones:
never rarely sometimes frequently

17. I did not understand what information the professor expected me to include in my written assignments:
never rarely sometimes frequently

18. The professor/TA put more emphasis on the **form** of my paper (e.g., grammar, punctuation, spelling) than on the **ideas**:
never rarely sometimes frequently

19. I asked someone to else to read and comment on my papers before handing them in:
never rarely sometimes frequently

20. I felt I learned more from writing about a topic than from taking the exams in class:
never rarely sometimes frequently

21. I found the textbook (Zemlin) useful in completing the written assignments:
never rarely sometimes frequently

22. Professionals in my field do a great deal of writing:
never rarely sometimes frequently

23. I found lecture material and my notes useful in completing the written assignments:
never rarely sometimes frequently

24. The written assignments helped me integrate information from the course:
never rarely sometimes frequently

25. I believe the written assignments influenced my performance on the examination:
never rarely sometimes frequently

26. I believe multiple-choice or true/false questions would have reflected my knowledge of the course better than essay exams:
never rarely sometimes frequently

27. I believe I spent too much time on the written assignments:
never rarely sometimes frequently

28. I sought out additional references when completing the written assignments:
never rarely sometimes frequently

29. How did you study for the exams (check any and all that apply):
    a.____studied notes
    b.____studied with a friend or with a group
    c.____wrote flashcards to memorize facts
    d.____read/studied the textbook
    e.____reviewed pertinent written assignments
    f.____other
    g.____I did little studying for the exams

30. What was most helpful in studying for the exams?

The following questions pertain to each written assignment:

1. Assignment #1: NEUROLOGY: Description of the path an embolism from the heart might take to produce aphasic symptoms in an elderly man.

	Not At All				Very
a) How difficult was this assignment?	1	2	3	4	5
b) How useful was this assignment?	1	2	3	4	5
c) How much did you enjoy writing it?	1	2	3	4	5
d) Grade received:	A	B	C	D	F
e) Comments:					

2. Assignment #2: HEARING: "The Ear: An Amazing Transducer" Handout for medical students.

	Not At All				Very
a) How difficult was this assignment?	1	2	3	4	5
b) How useful was this assignment?	1	2	3	4	5
c) How much did you enjoy writing it?	1	2	3	4	5
d) Grade received:	A	B	C	D	F
e) Comments:					

3. Assignment #3: RESPIRATION: Group activities designed to stimulate question-answer session (following "Halloween Megastorm")

	Not At All				Very
a) How difficult was this assignment?	1	2	3	4	5
b) How useful was this assignment?	1	2	3	4	5
c) How much did you enjoy writing it?	1	2	3	4	5
d) Grade received:	A	B	C	D	F
e) Comments:					

4. Assignment #4: PHONATION: Clinical reports of three voice patients.

	Not At All				Very
a) How difficult was this assignment?	1	2	3	4	5
b) How useful was this assignment?	1	2	3	4	5
c) How much did you enjoy writing it?	1	2	3	4	5
d) Grade received:	A	B	C	D	F
e) Comments:					

5. Assignment #5: UPPER ARTICULATIONS: Description of Source-Filter Theory and consonant-vowel table.

	Not At All				Very
a) How difficult was this assignment?	1	2	3	4	5
b) How useful was this assignment?	1	2	3	4	5
c) How much did you enjoy writing it?	1	2	3	4	5
d) Grade received:	A	B	C	D	F
e) Comments:					

6. Assignment #6: FINAL PROJECT: Speech Mechanism Examination

	Not At All				Very
a) How difficult was this assignment?	1	2	3	4	5
b) How useful was this assignment?	1	2	3	4	5
c) How much did you enjoy writing it?	1	2	3	4	5
d) Grade received:	A	B	C	D	F
e) Comments:					

11. Has your attitude towards writing changed since participating in this class? If so, how?

12. Has the quality of your writing changed since participating in this class? If so, how?

13. Did the written assignments influence your learning of course material? If so, how?

NOTE

**********You will be given the opportunity to anonymously evaluate the **instructor, course content, and the text** on the last day of class. Please reserve your **comments on these topics for that forum**********

APPENDIX C

PROJECT I: NEUROLOGY

You are the staff speech-language pathologist at a hospital. You arrive Monday morning to find the following referral on your desk.

Patient 1: A 77 year-old male was brought by ambulance to the emergency room on Saturday 9/28/91. The examining neurologist reported that the patient was unable to speak and could not perform two-step commands presented verbally. The patient's history included a coronary bypass operation just one month prior to the onset of his present symptoms, giving rise the possibility that the patient may have suffered an embolic CVA.

In no more than two double-spaced, type-written pages:

a) describe the path a coronary embolism may have traveled,
b) speculate about where the embolism may have lodged in the brain,
c) and describe the location(s) of the brain that likely suffered tissue death and explain why you chose these locations.

Feel free to discuss this project in your study groups, but **all writing must be accomplished independently**. This assignment does not require outside readings but you may incorporate information from other sources. Grading of these assignments will be based on content as well as on form.

PROJECT II: HEARING

You are an audiologist working at the Department of Otolaryngology at a large University Hospital. As part of your job description, you are required to lecture to third-year medical students about hearing physiology. This year you have decided to make a hand-out entitled, "The Ear: An Amazing Transducer," to accompany this lecture. Recognizing how corny this title is, you want to do an impressive job on the hand-out to redeem your credibility.

It should include the following:

a) major anatomical divisions of the ear and their locations (your audience is already familiar with all of the anatomical structures)—be brief and concise and only mention structures that bear directly on divisions.
b) Definition of "transduction"
c) A description of the type of transduction that occurs at each division of the ear and how the transduction is accomplished (including the relevant anatomy)
d) A description of the role of the MIDDLE EAR as an IMPEDANCE TRANSFORMER.

The hand-out must not exceed **two typed, double-spaced pages of text** in length. You may use pictures or diagrams to enhance the hand-out, but the points listed above must be addressed in writing. Feel free to work in groups to discuss the project, but all writing must be accomplished independently. This assignment does not require outside readings but you may incorporate information from other sources. Grading of this assignment will be based on **content and form**.

PROJECT IV: PHONATION

The study and treatment of voice has become a specialty area over the years. There are many clinics devoted exclusively to voice disorders and these clinics employ only speech-language pathologists with this expertise. Some of these clinics cater to the professional voice user, such as singers, entertainers, news casters and teachers. Others specialize in vocal pathologies associated with tumors and cancers and neurologic diseases affecting phonation.

The first step, when confronted with a voice patient, is to obtain a history of the vocal problem and to perform diagnostic testing. Often times, the diagnosis will be accomplished by a combination of listening to the voice, and by visualizing the vocal folds through direct or indirect techniques. Treatment decisions are based on this information.

Correct diagnosis and treatment of a voice problem depend on understanding the form and function of the vocal folds. Using your knowledge, construct (i.e., make up) a brief clinical report for each of the following vocal pathology cases. Each description should include:

1. a brief case history (what is the problem, what are the symptoms, how long have they been present, what might have caused the problem)
2. what do you see on an imaginary nasendoscopic evaluation
3. what do you hear on an imaginary perceptual evaluation of vocal quality
4. what is a potential course of treatment (include justification)
5. based on your knowledge of body-cover theory, provide a couple of summary sentences about how the pathology influences the vibratory pattern and how this might relate to the perceptual findings.

PATIENT 1 (M.J.):
47 year-old male, presents with chronic hoarseness. Has worked as the lead singer of a famous rock and roll band for approximately 25 years. Evidence of decadent lifestyle.

PATIENT 2 (J.D.):
65 year-old female, presents with exceedingly breathy voice following recent cardiac surgery. No history of voice problems prior to this incident.

PATIENT 3 (T.T.):
8 year-old male, presents with intermittent hoarseness spanning approximately 2 years. Evidence of frequent upper respiratory infections. Hobbies include attending professional wrestling events with his mother and terrorizing classmates on the playground.

This project may not exceed one double-spaced typed page per patient report (no more than 3 pages total). Your text will be a useful resource. You may work in groups, but all writing must be accomplished independently. Grading of this assignment will be based on content and form. Pay special attention to question #5 because it will be weighted most heavily.

PROJECT V

In this course, we've considered the speech system in its component parts: respiration, phonation, and articulation. Now is the time for us to discover how these components interact to produce the speech signal. Pages 290-310 in your text (Zemlin) provide a review of the process of speech production. Read these pages carefully and perform the following: A classmate in your study group has indicated that he/she does not understand the Source-Filter Theory. In no more than one double-spaced typed page, explain figure 4-120 to your classmate. Your response will be graded on content and form (with particular emphasis on ACCURACY of your explanation.)

PROJECT VI

A speech mechanism examination (also called "oral mechanism exam" and "oral motor exam") serves at least three critical functions: 1. to obtain a baseline of information on relevant speech mechanism structures and function, 2. to collect evidence to support or refute initial diagnostic hypotheses about the nature of the problem, 3. to obtain information about usefulness of potential treatment strategies. In the "real world," speech-language pathologists perform an examination that focuses on those subsystems that appear deficient in any given patient.

Complete the mock speech-mechanism form for the following patient. Indicate the appearance of relevant landmarks for each heading. Be sure to **address speech and non-speech function** for all items marked with an asterisk. Include explanations for structural and functional deviations when possible.

PATIENT (see Figure 4-8(B) page 202.): Patient is a nine year-old girl diagnosed as having Treacher-Collins Syndrome. She is being seen in Craniofacial Clinic for a routine annual follow-up. Complete cephalometry will be performed next year. The purpose of today's speech-language pathology visit is to perform an examination of craniofacial structures and functioning, and to assess speech performance. The results of a focused craniofacial evaluation follow:

A. Head
   1. Ears:

B. Face
   1. Eyes:
   2. Nose:
   3. Midface:
   4. Mandible:
   5. Occlusion:
   6. Lips:

C. Oral Cavity
   1. Teeth:
   2. Tongue:
   3. Hard palate:
   4. Velum:

D. General Articulator Functioning for Speech

(Briefly describe how craniofacial structures and functioning impact connected speech production.)

Complete this task in no more than two double-spaced typed pages. Your answers should be complete but relevant (that is, avoid reporting extraneous and inconsequential information). You may consult additional references but none are needed to complete this assignment.

APPENDIX D
CONTENT

EVALUATION OF CONTENT
Assignment:_____ Subject Code:_____ Scorer:_____ Grade:_____

		YES	NO
IDEAS		___	___ -main points are sufficiently developed
		___	___ -ideas are thoughtful and creative
If not:	a. ___		___ -ideas lack clarity
	b. ___		___ -ideas are not supported
	c. ___		___ -other:
DETAIL		___	___ -there is enough detail to develop central ideas
		___	___ -details are appropriately concrete & specific
		___	___ -other
If not:	a. ___		___ -there is not enough detail to support ideas
	b. ___		___ -excessive detail compromises accuracy
	c. ___		___ -detail is not relevant to the topic being discussed
	d. ___		___ -other
CLARITY		___	___-paper illustrates knowledge of content areas
		___	___-student has thought about the topic and discusses an issue long enough to show clear understanding
If not:	a. ___		-paper illustrates lack of knowledge of some content areas
	b. ___		-paper lacks justification for assertions
	c. ___		-student does not support his point of view clearly
FOCUS		___	___ -paper effectively answers the questions posed
If not:	a. ___		___ -paper wanders off topic
	b. ___		___ -paper skirts around topic
	c. ___		___ -other:
ACCURACY			
		___	___-ideas are factually accurate
		___	___-ideas are conceptually accurate
If not:	a. ___		___-misunderstanding of facts
	b.___		___-misunderstanding of global concepts
	c. ___		___-both of the above

APPENDIX E
FORM

EVALUATION OF FORM – STRUCTURE AND MECHANICS

Assignment:_____ Subject Code:_____ Scorer:_____ Grade:_____

STRUCTURE

	YES	NO	
Orientation	___	___	appropriate orientation to the task
If not: a.___		___	inappropriately formal writing style
b.___		___	inappropriately informal writing style
Organizational Scheme	___	___	organization is appropriate for task
If not: a. ___		___	lacks statement of purpose/no clear "lead in" (if applicable)
b. ___		___	no summary statement (if applicable)
c. ___		___	does not follow logical sequence of development
d. ___		___	excludes information asked for
e. ___		___	lacks justification for assertions
Coherence	___	___	combines relational and content information (integrated)
If not: a. ___		___	lists unrelated chunks of information (i.e., "chunk-style")
b. ___		___	attempts to relate information without a coherent framework (chaotic)
c. ___		___	other
Wording/Vocabulary	___	___	uses correct terminology
	___	___	uses accurate word combinations/phrasing
If not: a. ___		___	word choice is limited
b. ___		___	word choice is non-scientific
c. ___		___	word choice is awkward
d. ___		___	word combos interfere with accuracy
Consistency	___	___	uses same style/voice throughout
If not: a. ___		___	switches style (e.g., informal/ formal)
b. ___		___	switches voice (e.g., third/ first person)
c. ___		___	switches tense (e.g., present/ past)

MECHANICS

Syntax

___ ___ good sentence construction
___ ___ reads smoothly from sent, to sent., no run-ons

If not: a. ___ ___ run-ons
b. ___ ___ sentence fragments
c. ___ ___ noun-verb agreement errors
d. ___ ___ poor sentence construction

Punctuation

___ ___ correct punctuation

If not: a. ___ ___ incorrect use of commas
b. ___ ___ incorrect use of semi-colon
c. ___ ___ incorrect capitalization
d. ___ ___ incorrect use of dashes
e. ___ ___ incorrect use of quotes
f. ___ ___ other

Spelling

___ ___ no spelling errors

If not: a. ___ ___ errors in anatomy/physiology terms
b. ___ ___ errors in other words

Paragraph Construction

___ ___ correct organization

If not: a. ___ ___ disorganized
b. ___ ___ links unrelated sentences
c. ___ ___ no topic sentence
d. ___ ___ not sufficiently developed

APPENDIX F

Operational Definitions

DEFINITIONS

Organization

High - There is a thesis which is adequately developed.
The paper follows a logical sequence of development - (e.g., uses markers such as "first/finally" to denote steps).

Mid - The thesis is not clearly defined.
It is difficult to follow the developmental sequence.

Low - There is no central thesis.
The paper is not developed in a logical sequence.

Coherence

High - Combines relational and content info. (INTEGRATED)

Mid - Lists unrelated chunks of information (CHUNK-STYLE)

Low- Attempts to relate info without a coherent framework (CHAOTIC)

Wording and Vocabulary

High – Words are used in unique and interesting easy.
Uses correct terminology/scientific terms.

Mid - Some ordinary, over-worked expressions. Sometimes misuses scientific terms. Awkward phrasing.

Low - Word choice is limited.
Does not use scientific terminology.
Sometimes words are used incorrectly - the wrong word is used.

Consistency

High - Uses same style (i.e., formal vs. informal) throughout the paper. Uses same voice (i.e., first or third person) throughout the paper. Same wealth of detail throughout the paper.

Mid - Inconsistent use of style/voice.
Sometimes switches verb tense (e.g, from past to present). Inconsistent levels of detail.

Low – Awkward style/voice.
Frequently switches verb tense.
Very inconsistent levels of detail (i.e., very sparse info sometimes and lots of info at other times.)

Accuracy

High – Ideas are factually correct.

Mid – Some ideas are not factually correct.
Some ideas are not conceptually correct.

Low – Facts and/or concepts are frequently incorrect.

Shape

High – There is a definite beginning, middle, and ending.
Uses markers to denote boundaries (e.g., "first, second, and finally")

Mid – The beginning, middle, and end are unclear.

Low - There is no clear introduction.
There is no closure to the paper (i.e., it ends abruptly).

Syntax

High – Sentences are varied in length and structure.
Confident control of sentence structure.
Paper reads smoothly from sentence to sentence.
No run-ons or sentence fragments.
No noun-verb agreement errors.
Correct use of verb tense.

Mid – Some control of sentence structure.
Occasional awkward or puzzling sentences.
Almost no run-ons and fragments.
Few noun-verb agreement errors.
Some errors in verb tense.

Low – Many problems with sentence structure.
Sentences are short and simply in structure; somewhat repetitious in their patterns.
Many run-ons and fragments.
Many noun-verb agreement errors.
Many errors in verb tense.

Punctuation

High – Consistently uses appropriate punctuation.

Mid – Mostly correct punctuation.

Low – Many punctuation errors.

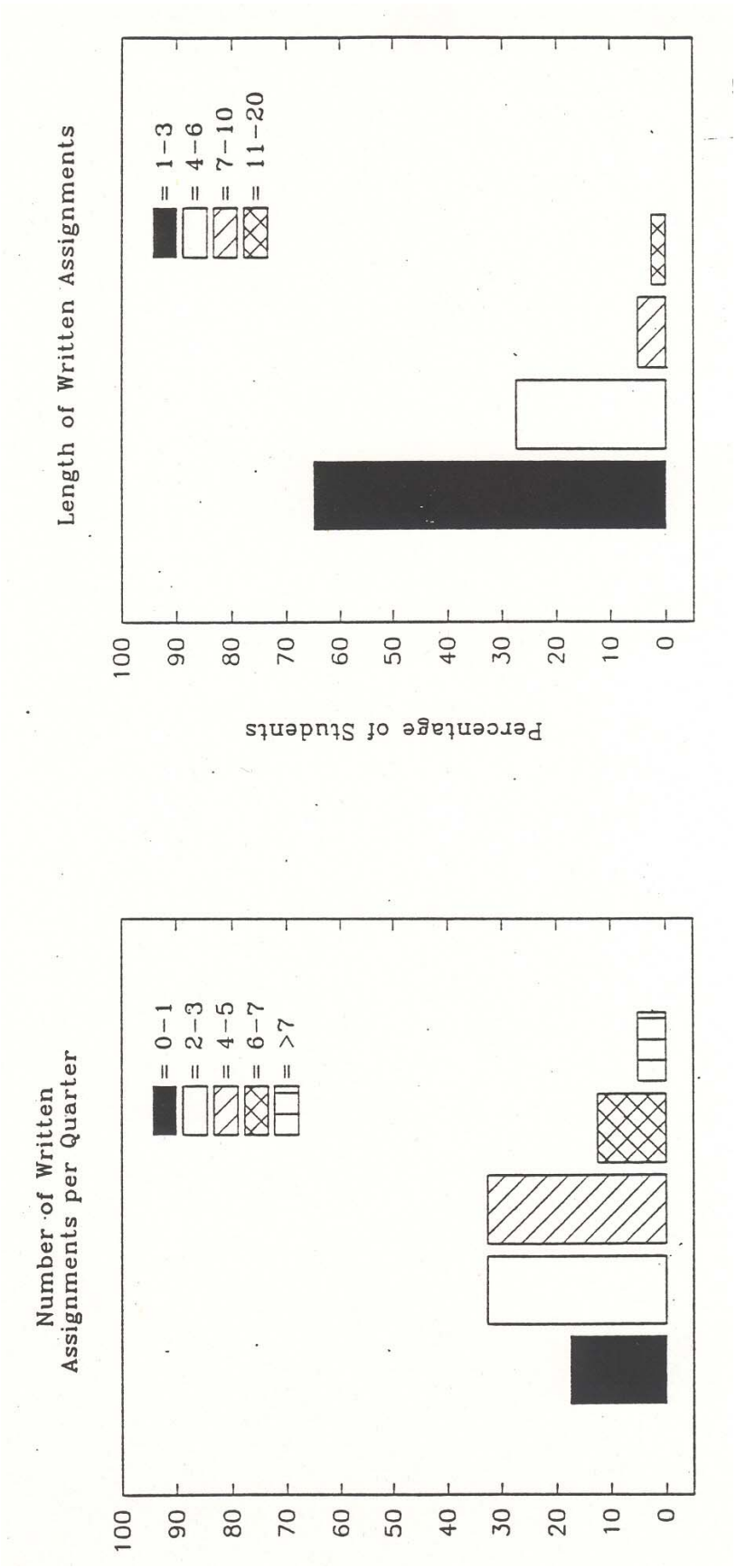
Spelling

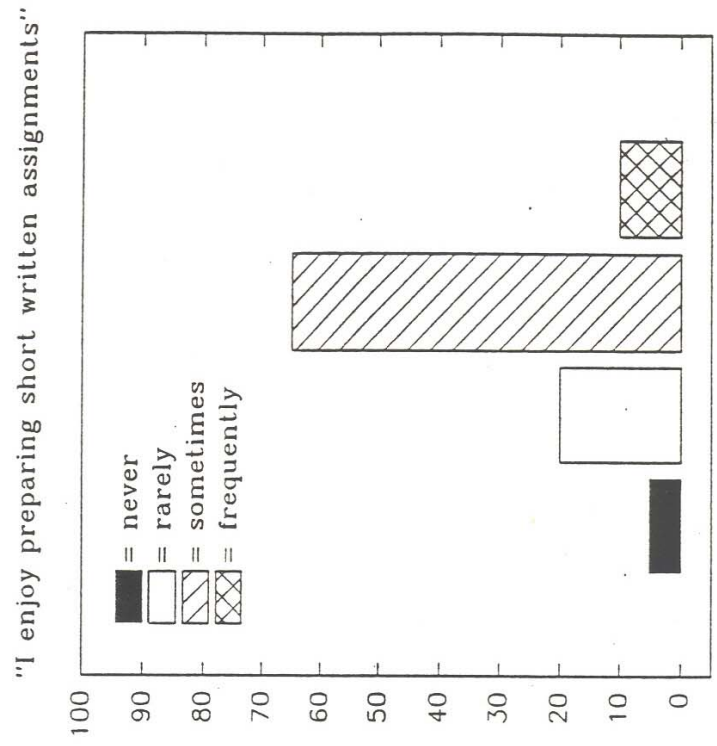
High – All words are spelled correctly.

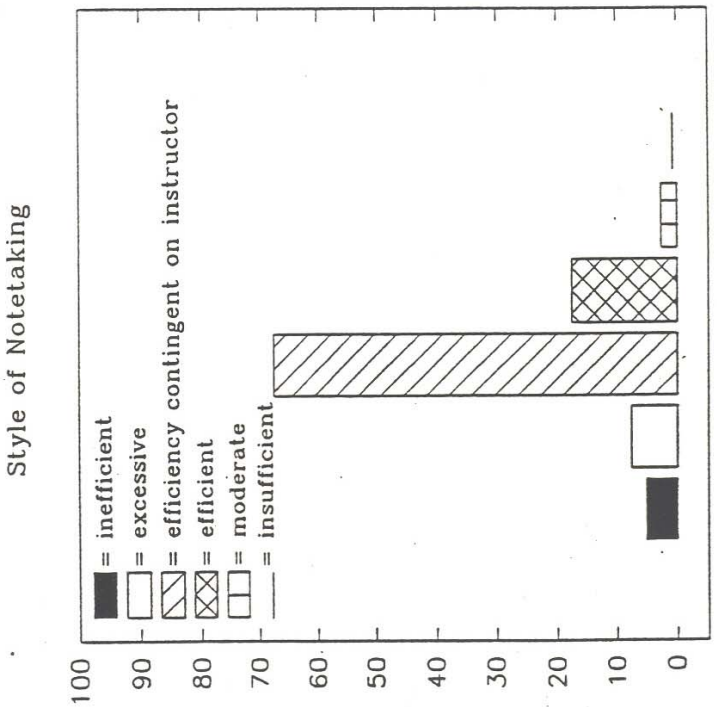
Mid – Few words are misspelled.
Errors occur mainly with new scientific terminology.

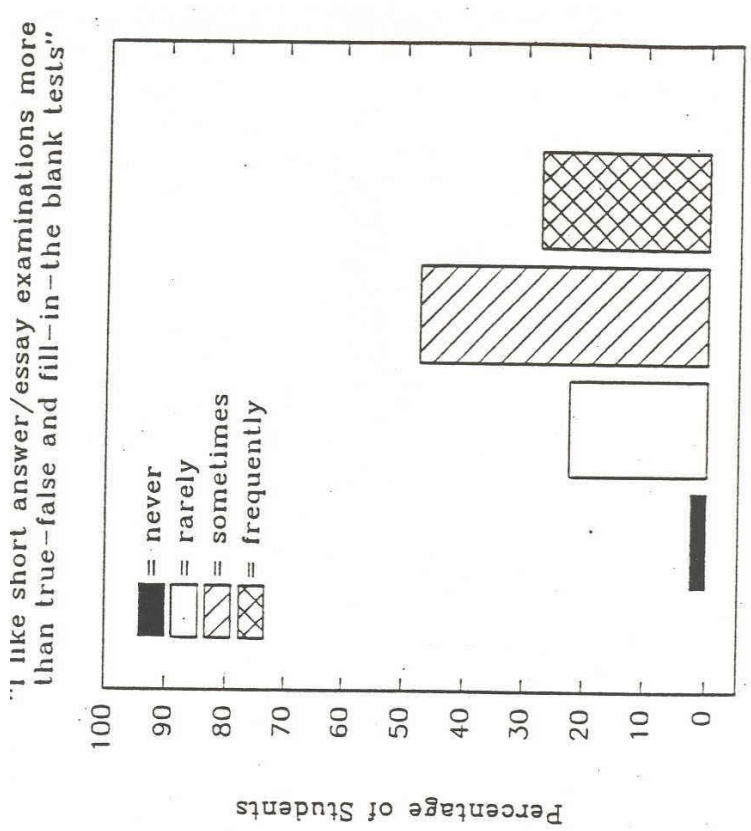
Low – Many words are misspelled.

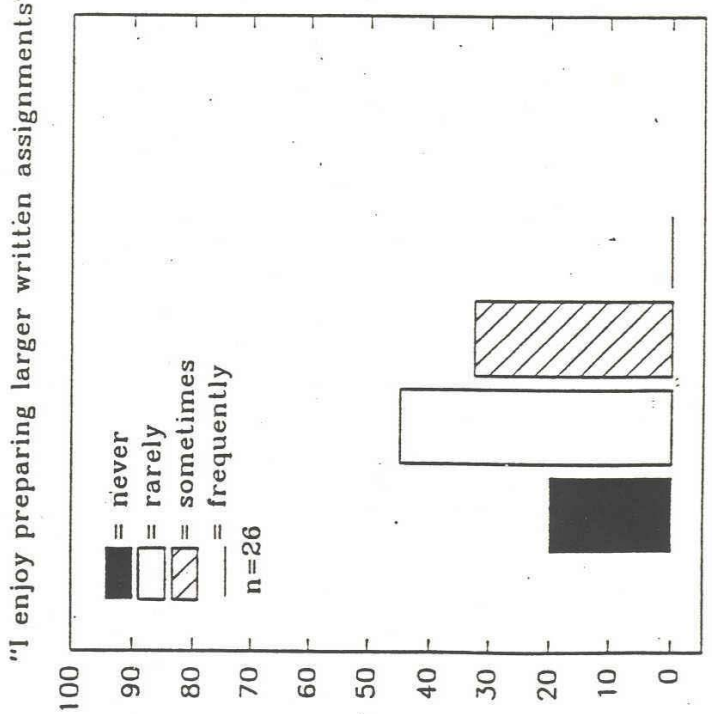
APPENDIX G
Pre-Course Survey Responses

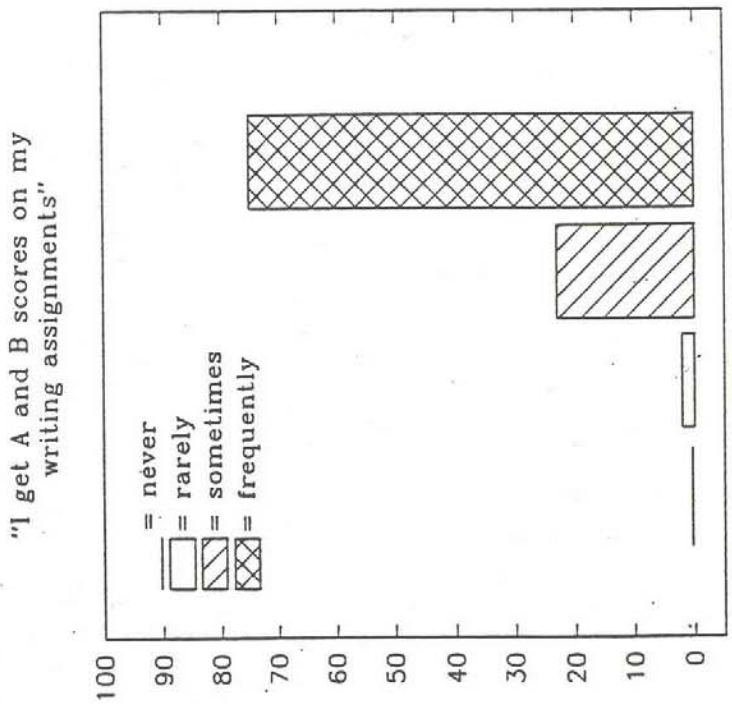

Length of Written Assignments
= 1-3
= 4-6
= 7-10
= 11-20
Percentage of Students
100
90
80
70
60
50
40
30
20
10
0
Number of Written Assignments per Quarter
= 0-1
= 2-3
= 4-5
= 6-7
= >7
100
90
80
70
60
50
40
30
20
10
0

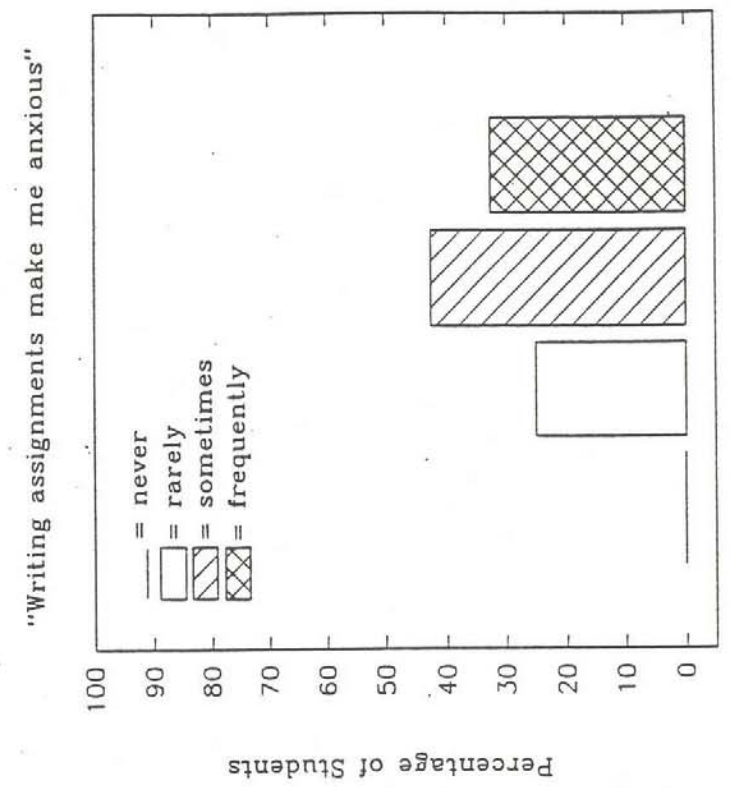

"I enjoy preparing short written assignments"
Percentage of Students
100
90
80
70
60
50
40
30
20
10
0
= never
= rarely
= sometimes
= frequently

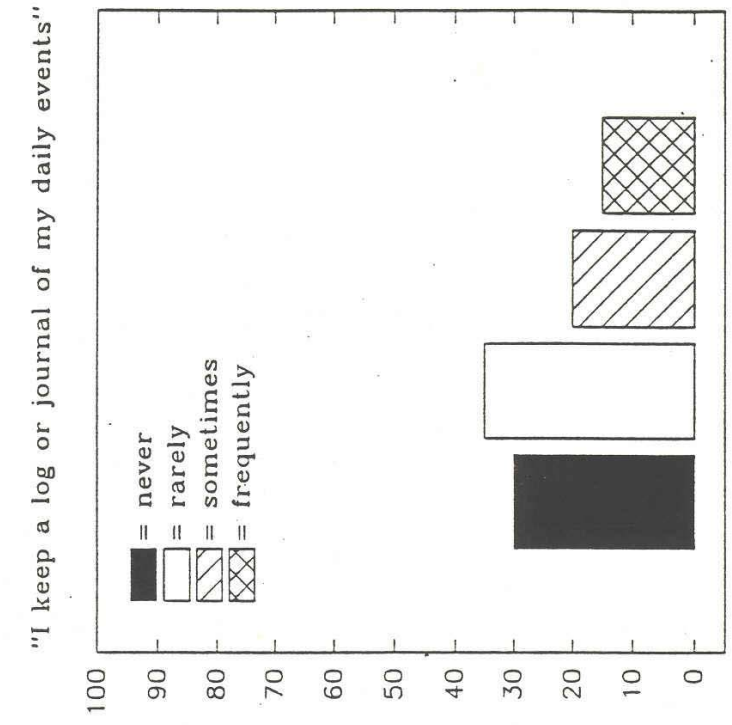

Style of Notetaking
100
90
80
70
60
50
40
30
20
10
0
= inefficient
= excessive
= efficiency contingent on instructor
= efficient
= moderate
= insufficient

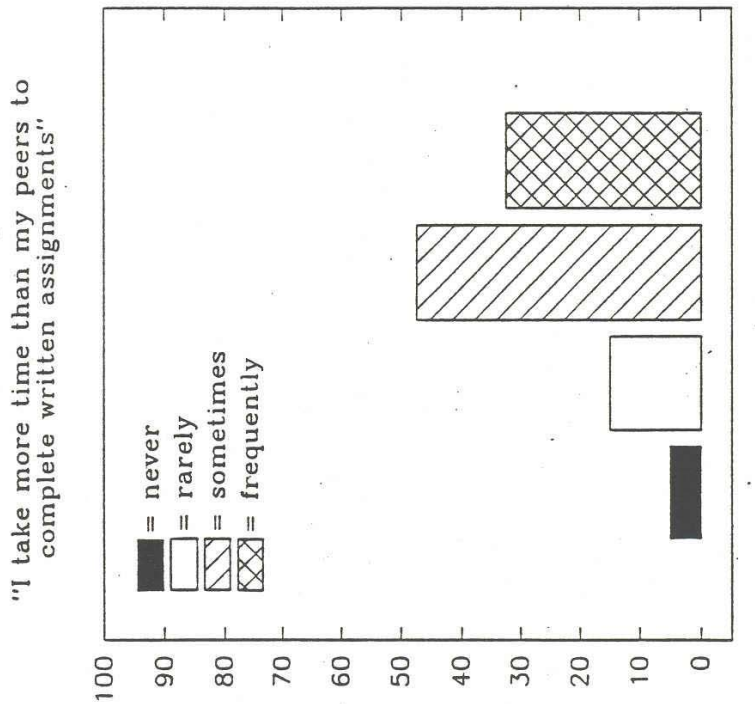

"I like short answer/essay examinations more than true-false and fill-in-the blank tests"
Percentage of Students
100
90
80
70
60
50
40
30
20
10
0
= never
= rarely
= sometimes
= frequently

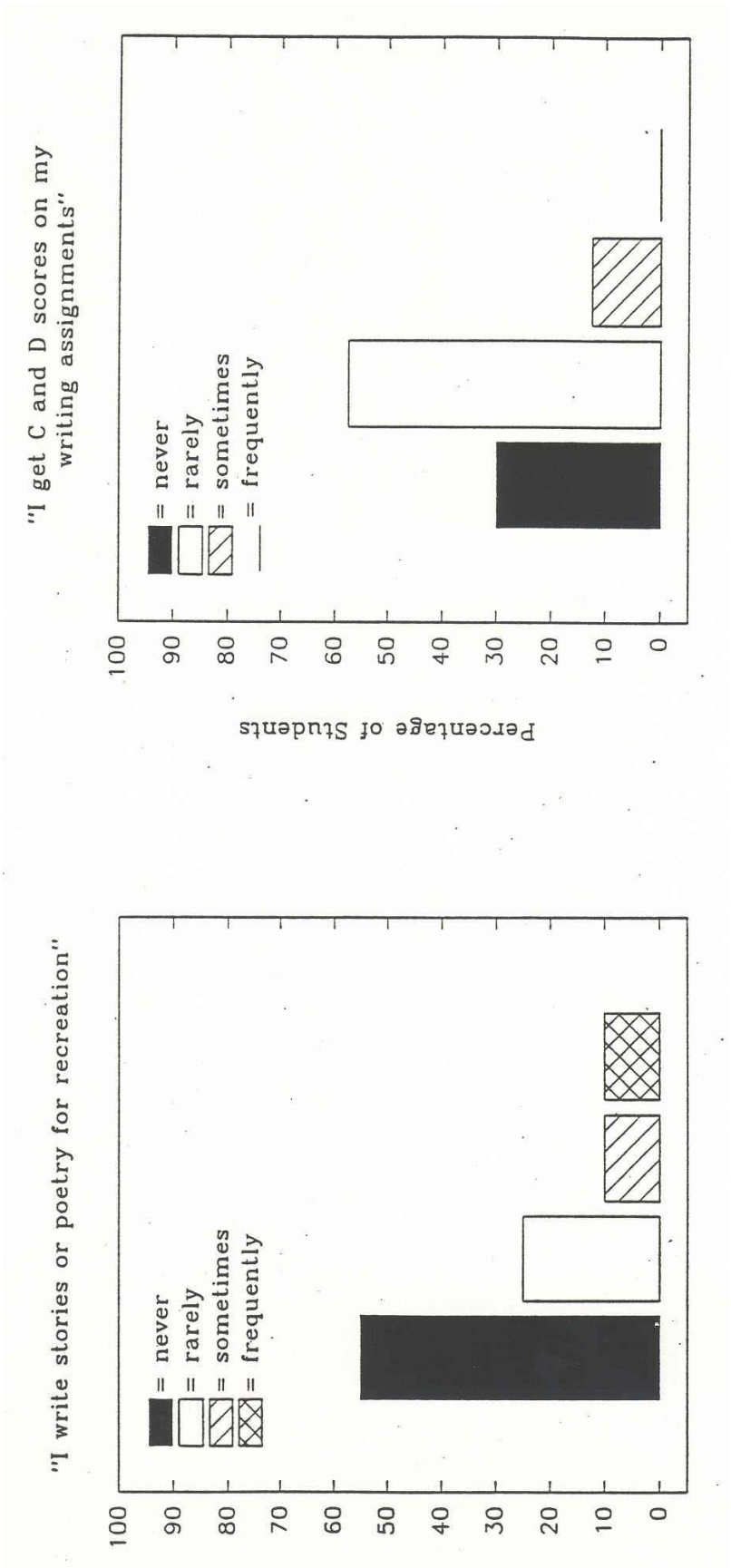

"I enjoy preparing larger written assignments"
100
90
80
70
60
50
40
30
20
10
0
= never
= rarely
= sometimes
= frequently
n=26

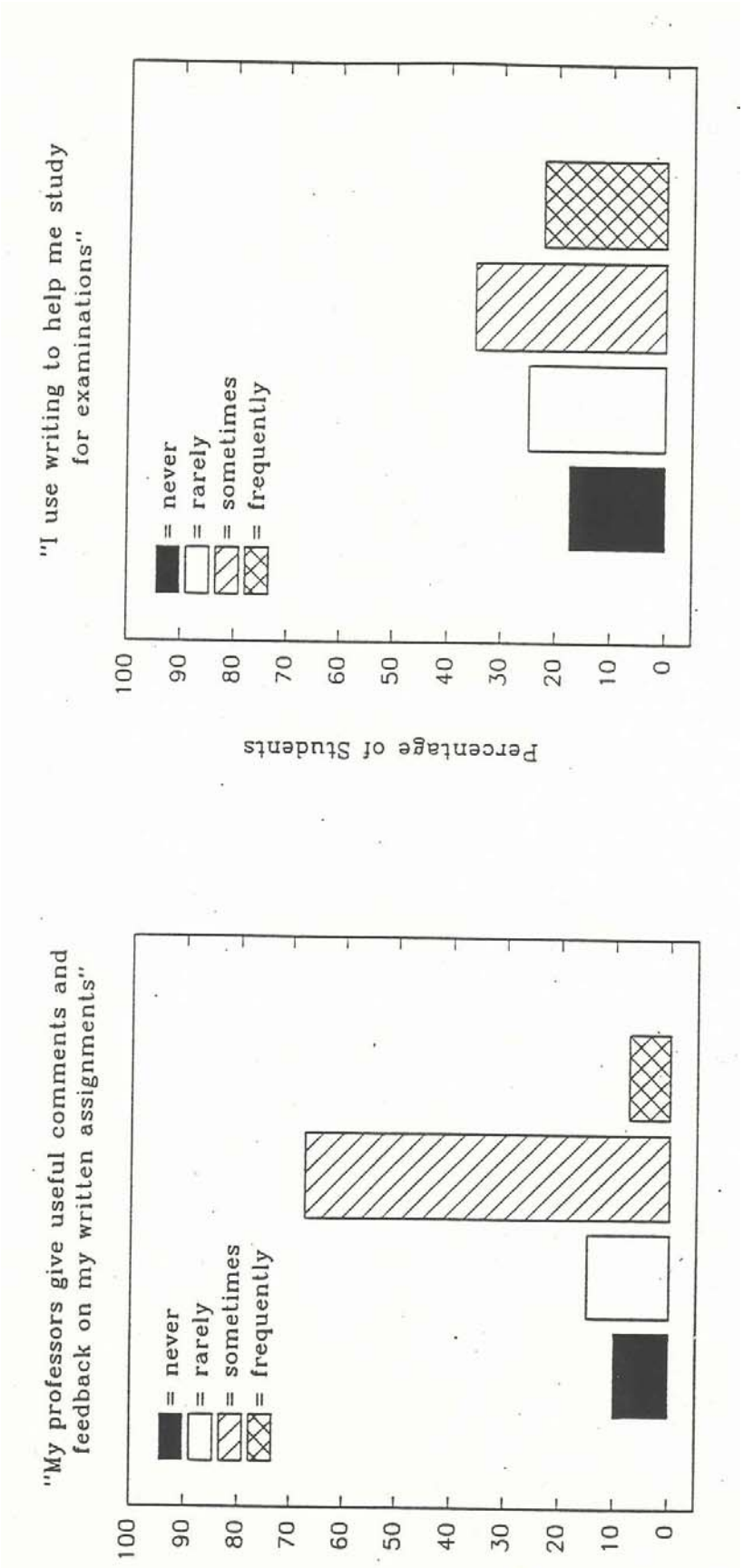

"I get A and B scores on my writing assignments"
= never
= rarely
= sometimes
= frequently
100
90
80
70
60
50
40
30
20
10
0

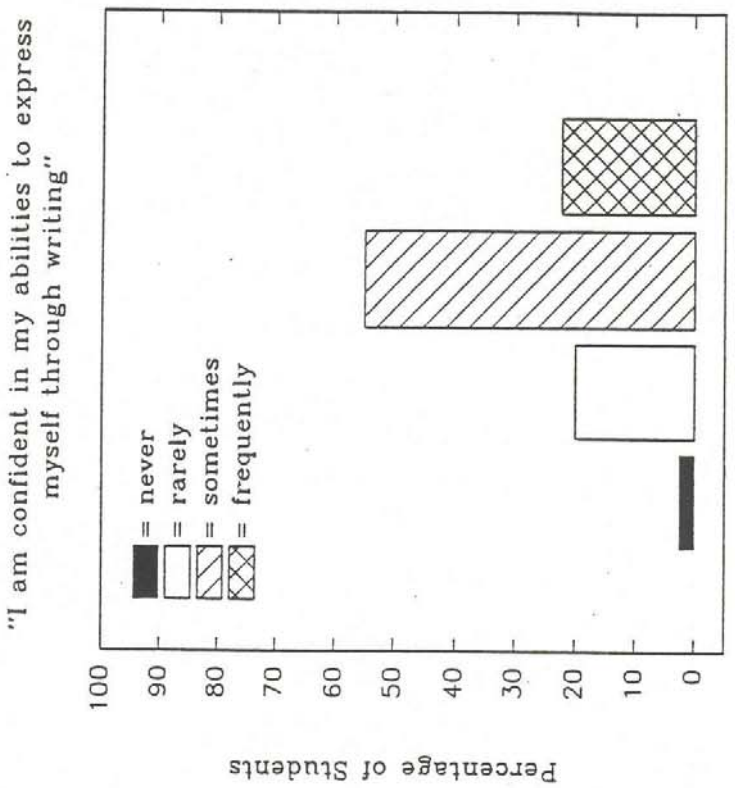

"Writing assignments make me anxious"
= never
= rarely
= sometimes
= frequently
Percentage of Students
100
90
80
70
60
50
40
30
20
10
0

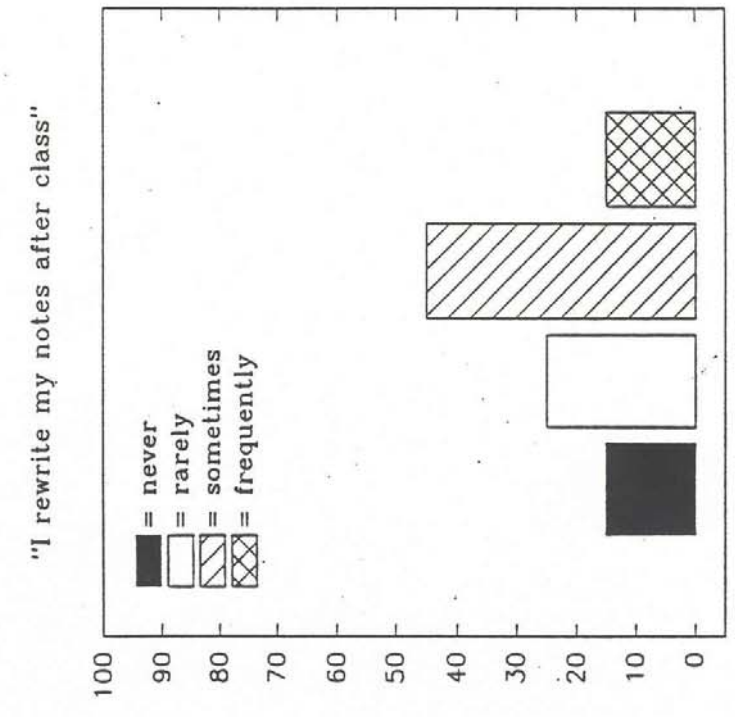

"I keep a log or journal of my daily events"
= never
= rarely
= sometimes
= frequently
Percentage of Students
100
90
80
70
60
50
40
30
20
10
0

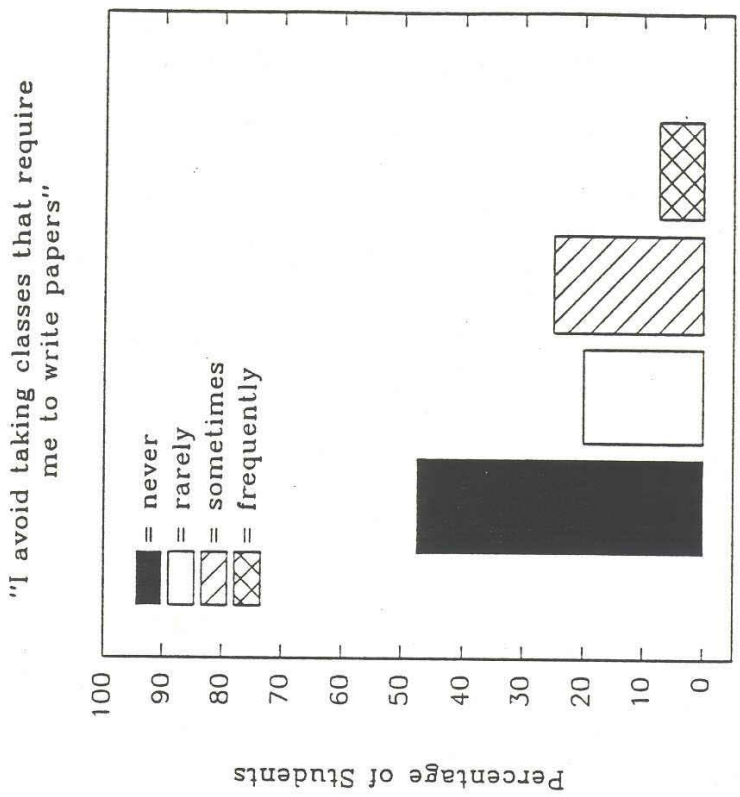

"I take more time than my peers to complete written assignments"
= never
= rarely
= sometimes
= frequently
100
90
80
70
60
50
40
30
20
10
0

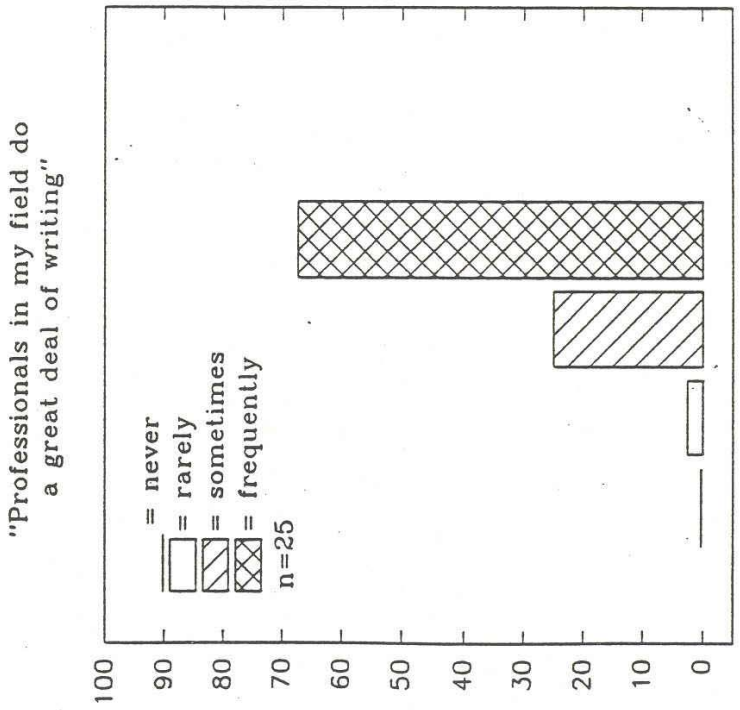

"I write stories or poetry for recreation"
= never
= rarely
= sometimes
= frequently
100
90
80
70
60
50
40
30
20
10
0
"I get C and D scores on my writing assignments"
Percentage of Students

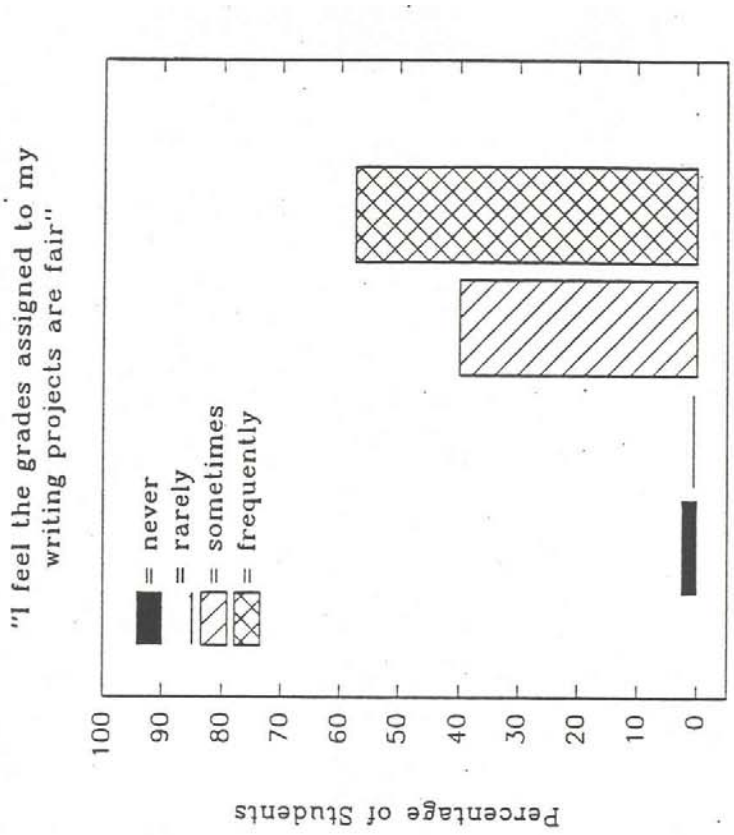

"I use writing to help me study for examinations"
Percentage of Students
100
90
80
70
60
50
40
30
20
10
0
= never
= rarely
= sometimes
= frequently
"My professors give useful comments and feedback on my written assignments"
100
90
80
70
60
50
40
30
20
10
0
= never
= rarely
= sometimes
= frequently

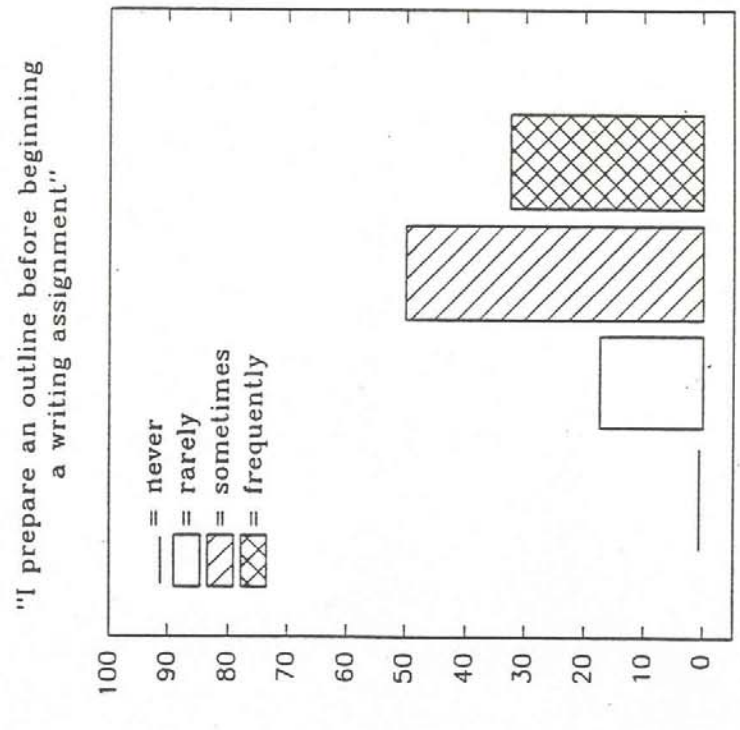

"I am confident in my abilities to express myself through writing"
= never
= rarely
= sometimes
= frequently
Percentage of Students
100
90
80
70
60
50
40
30
20
10
0

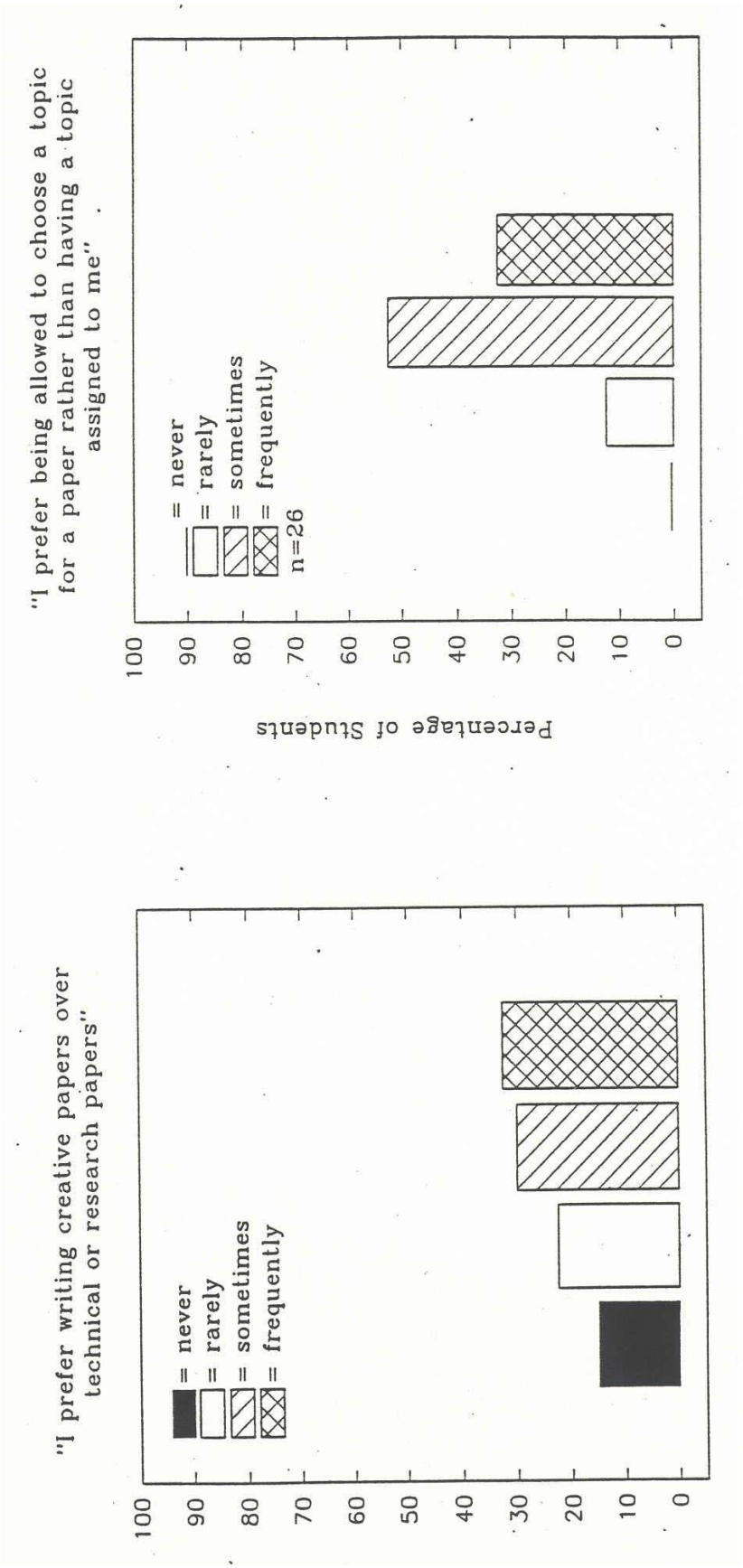

"I rewrite my notes after class"
= never
= rarely
= sometimes
= frequently
100
90
80
70
60
50
40
30
20
10
0

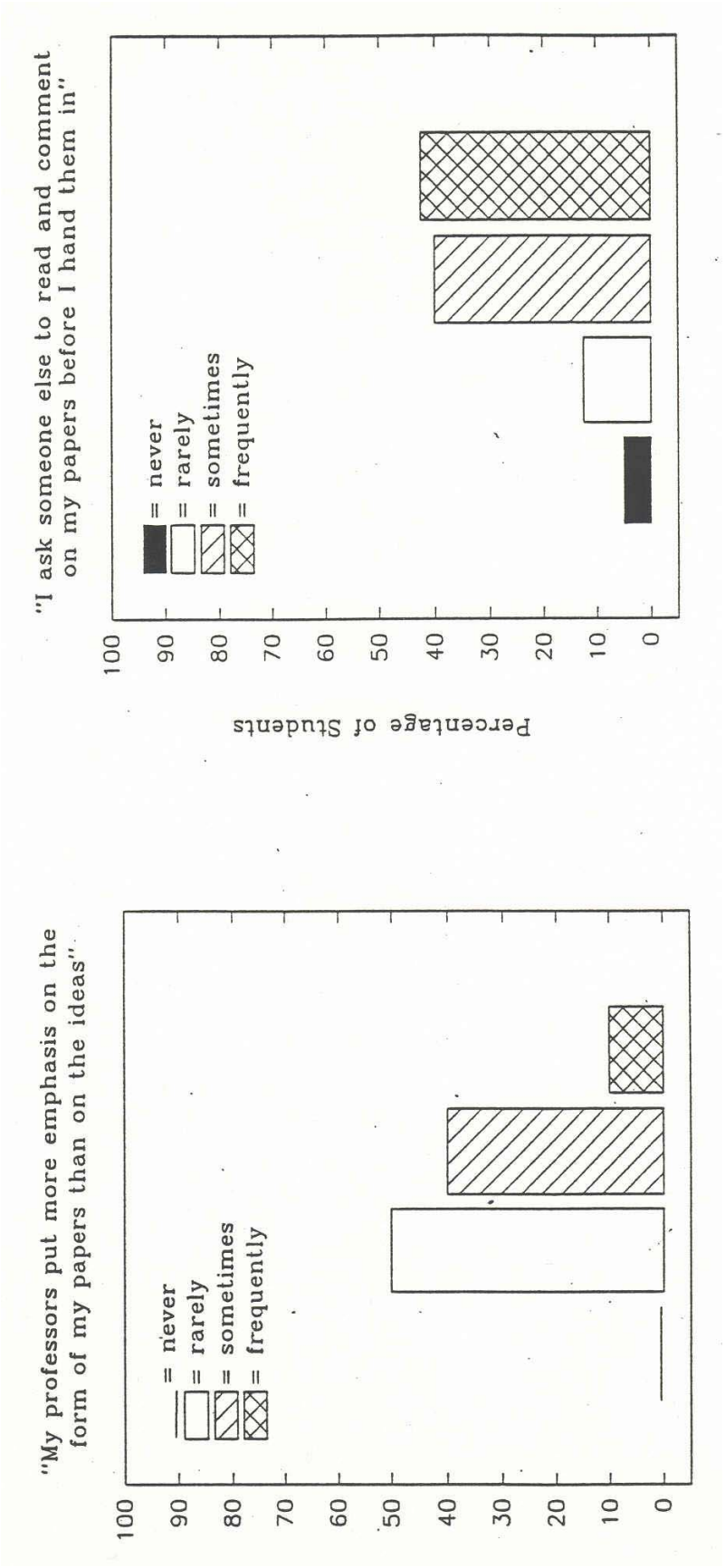

"I avoid taking classes that require me to write papers"
= never
= rarely
= sometimes
= frequently
Percentage of Students
100
90
80
70
60
50
40
30
20
10
0

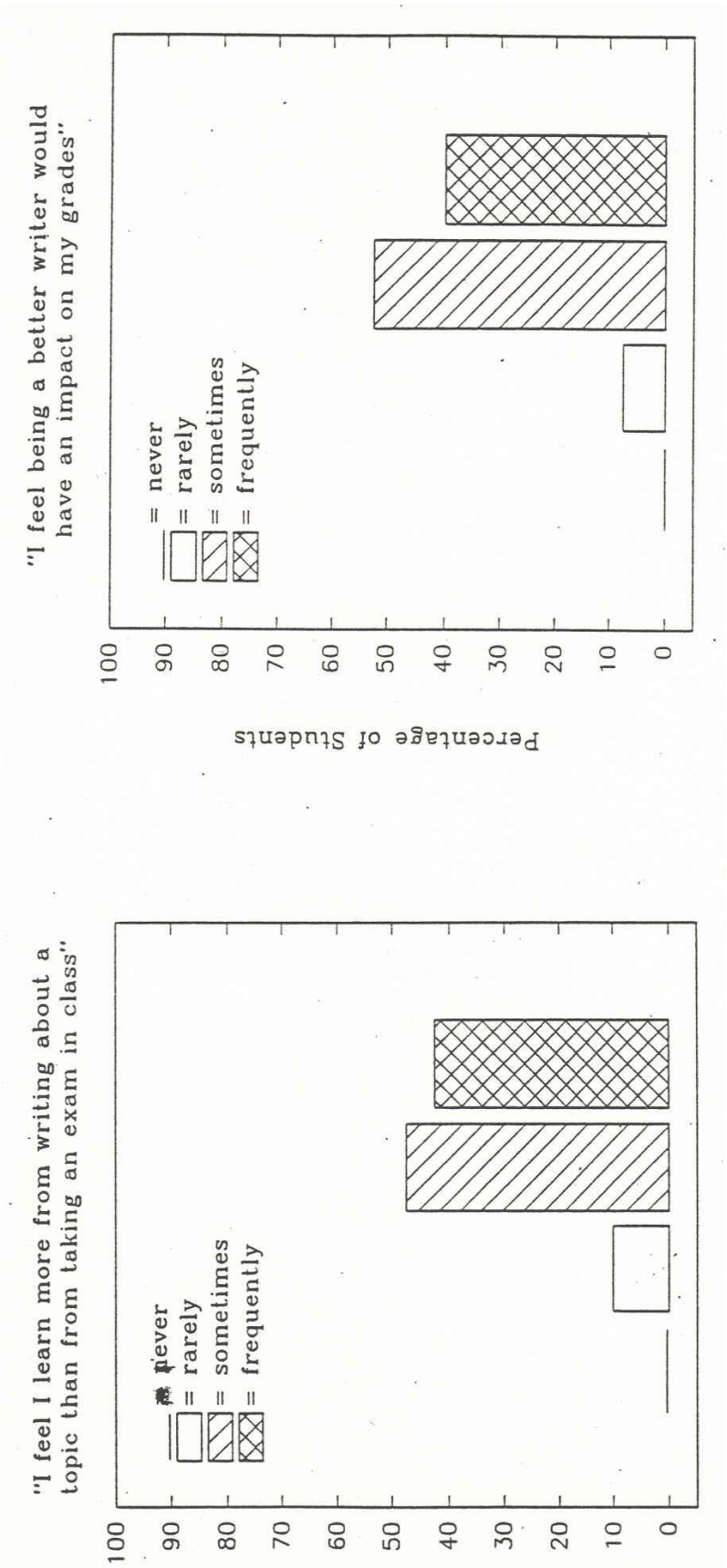

"Professionals in my field do a great deal of writing"
= never
= rarely
= sometimes
= frequently
n=25
100
90
80
70
60
50
40
30
20
10
0

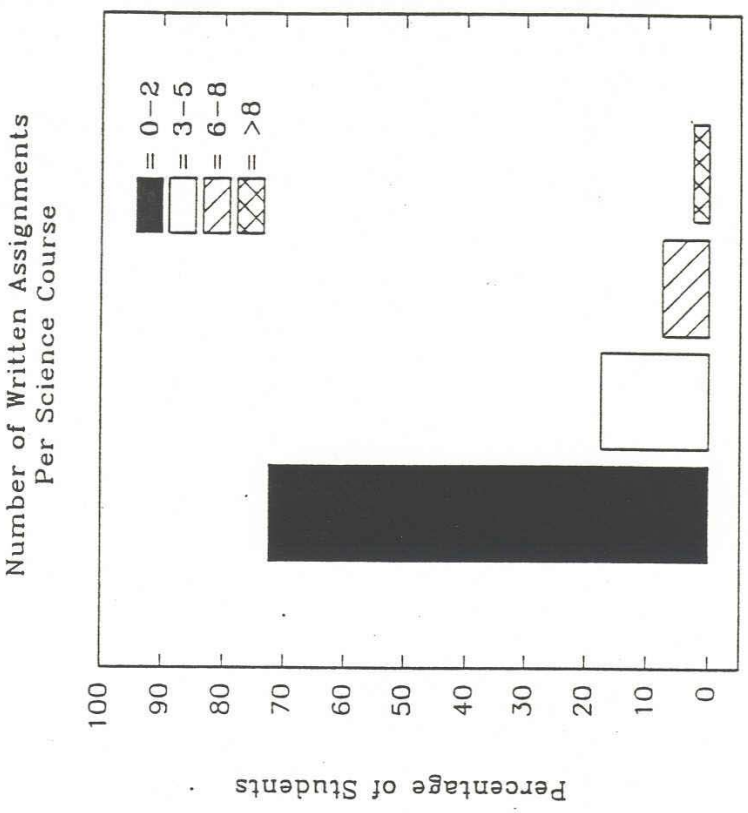

"I feel the grades assigned to my writing projects are fair"
= never
= rarely
= sometimes
= frequently
Percentage of Students
100
90
80
70
60
50
40
30
20
10
0

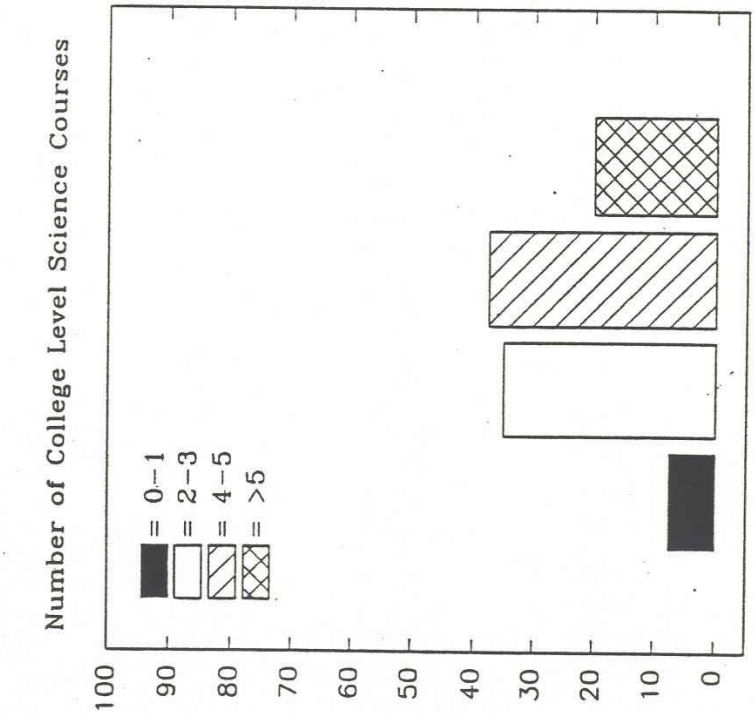

"I prepare an outline before beginning a writing assignment"
= never
= rarely
= sometimes
= frequently
100
90
80
70
60
50
40
30
20
10
0

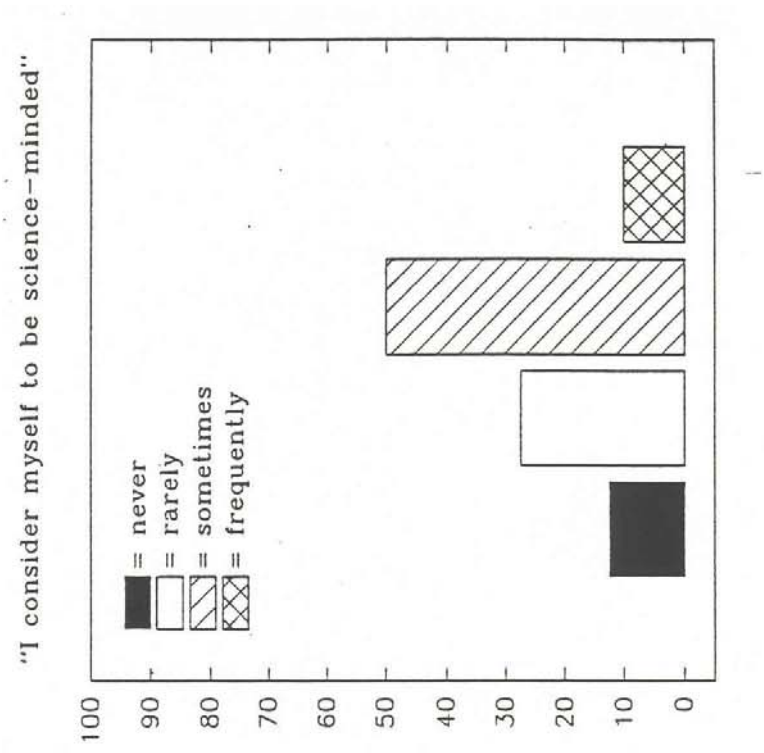

"I prefer being allowed to choose a topic for a paper rather than having a topic assigned to me".
= never
= rarely
= sometimes
= frequently
n=26
Percentage of Students
100
90
80
70
60
50
40
30
20
10
0
"I prefer writing creative papers over technical or research papers"
= never
= rarely
= sometimes
= frequently
100
90
80
70
60
50
40
30
20
10
0

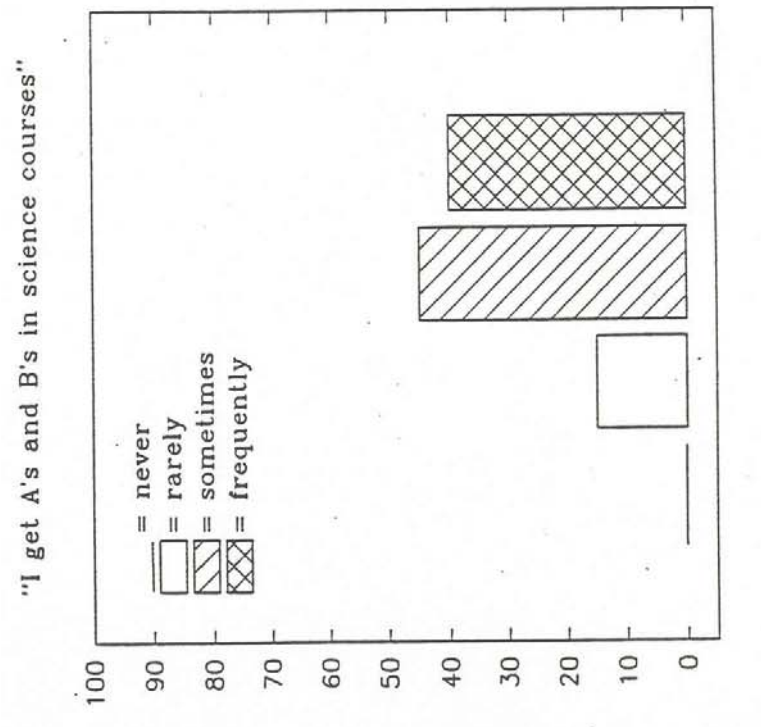

"I ask someone else to read and comment on my papers before I hand them in"
Percentage of Students
100
90
80
70
60
50
40
30
20
10
0
= never
= rarely
= sometimes
= frequently
"My professors put more emphasis on the form of my papers than on the ideas"
100
90
80
70
60
50
40
30
20
10
0
= never
= rarely
= sometimes
= frequently

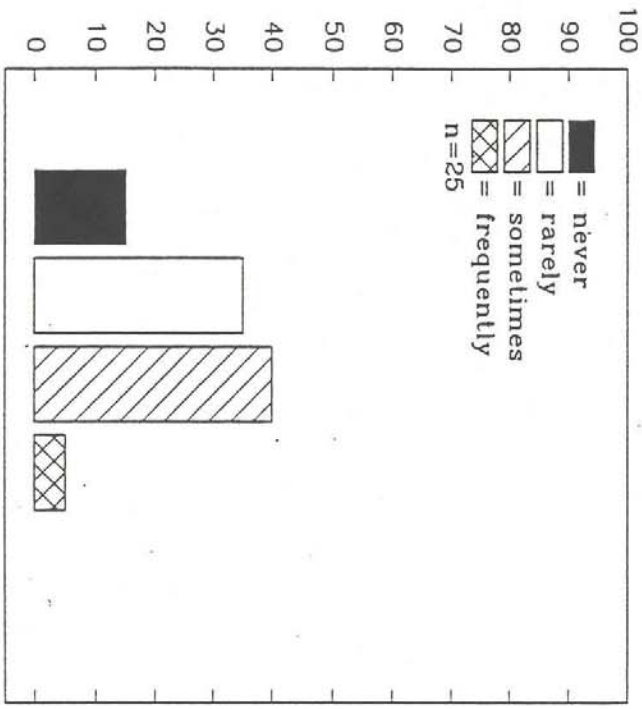

"I feel being a better writer would have an impact on my grades"
Percentage of Students
100
90
80
70
60
50
40
30
20
10
0
= never
= rarely
= sometimes
= frequently
"I feel I learn more from writing about a topic than from taking an exam in class"
100
90
80
70
60
50
40
30
20
10
0
= never
= rarely
= sometimes
= frequently

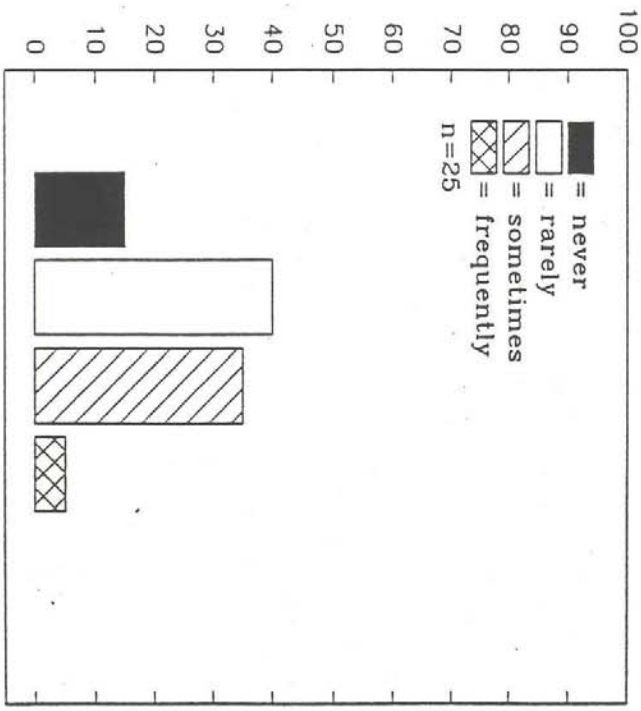

Number of Written Assignments
Per Science Course
= 0–2
= 3–5
= 6–8
= >8
Percentage of Students
100
90
80
70
60
50
40
30
20
10
0


Number of College Level Science Courses
= 0–1
= 2–3
= 4–5
= >5
100
90
80
70
60
50
40
30
20
10
0

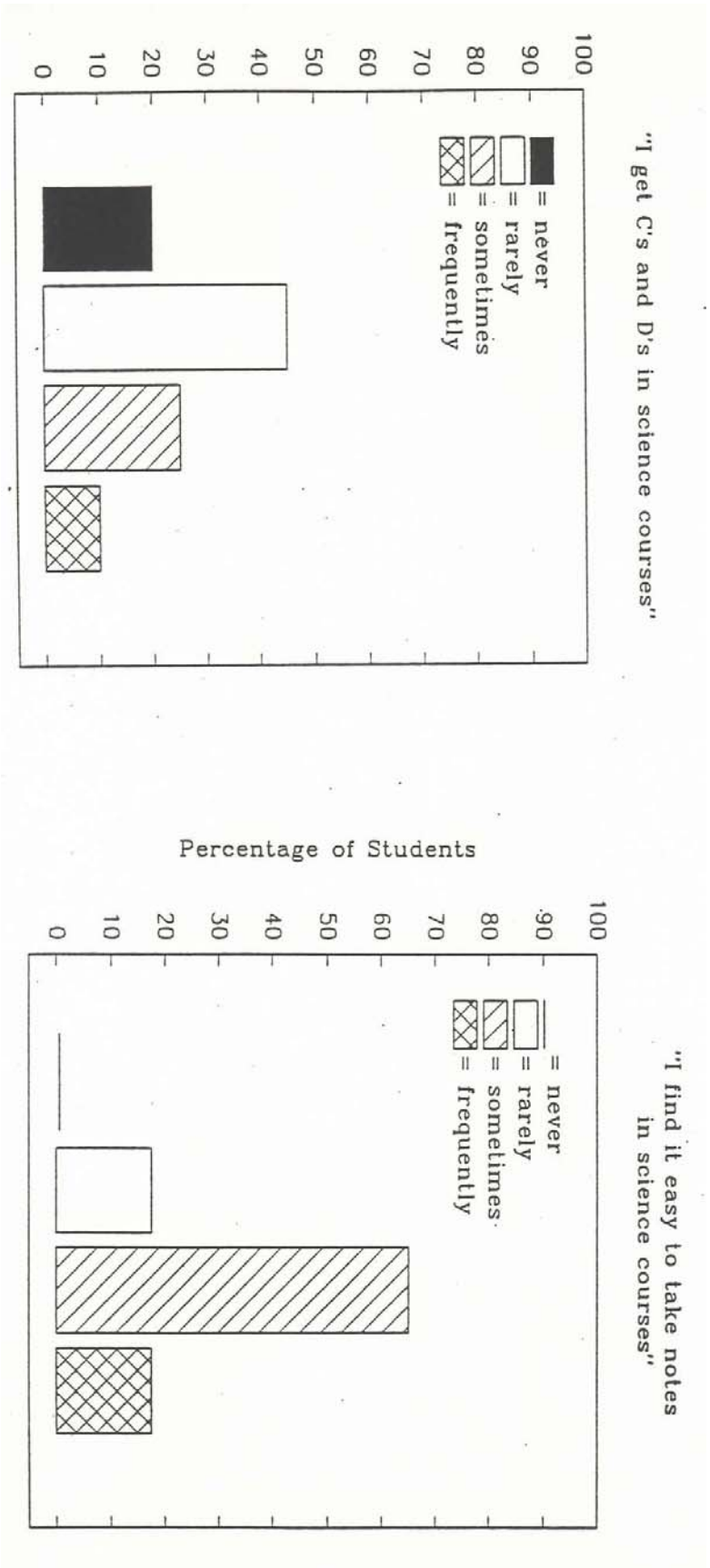

"I consider myself to be science-minded"
= never
= rarely
= sometimes
= frequently
Percentage of Students
100
90
80
70
60
50
40
30
20
10
0

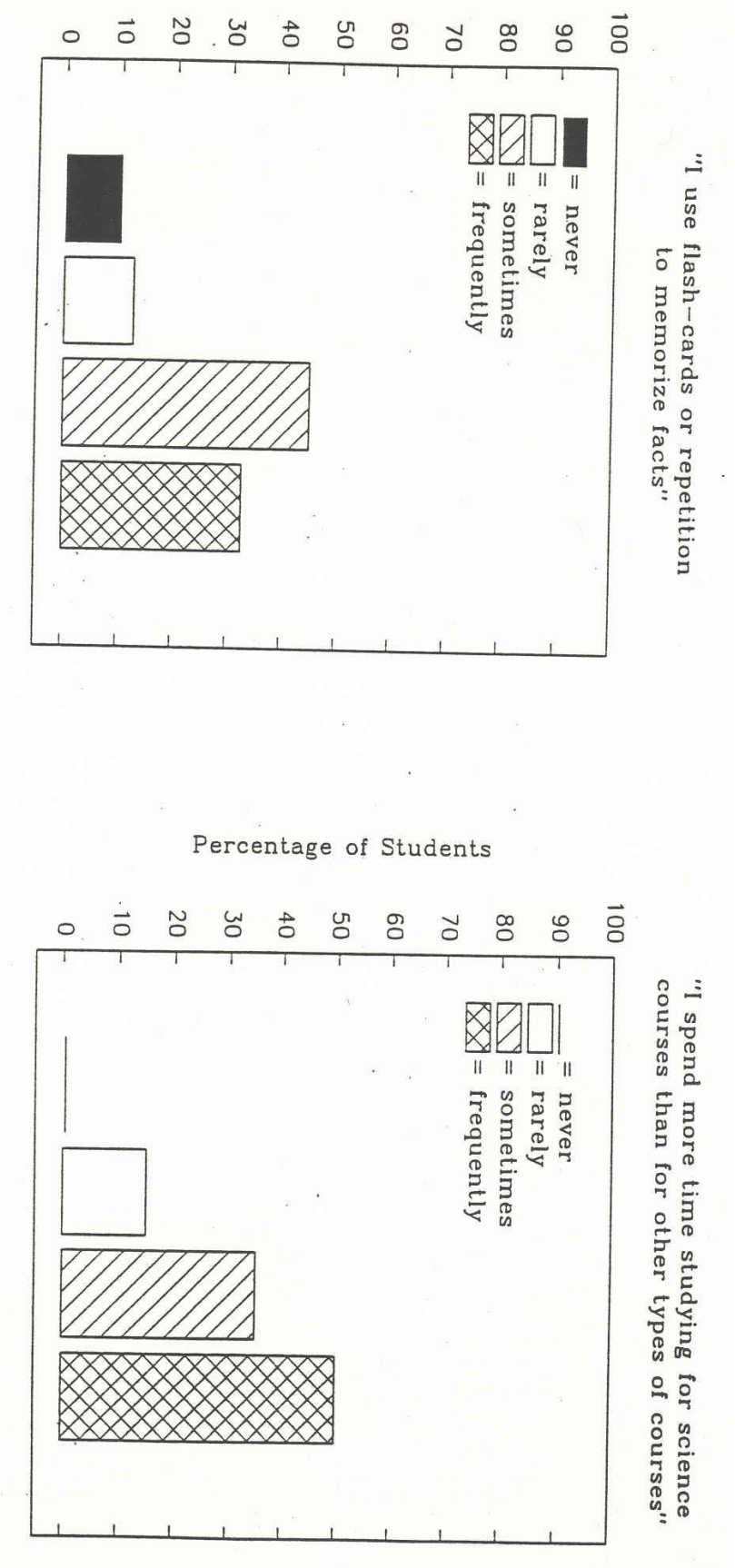

"I get A's and B's in science courses"
= never
= rarely
= sometimes
= frequently
100
90
80
70
60
50
40
30
20
10
0



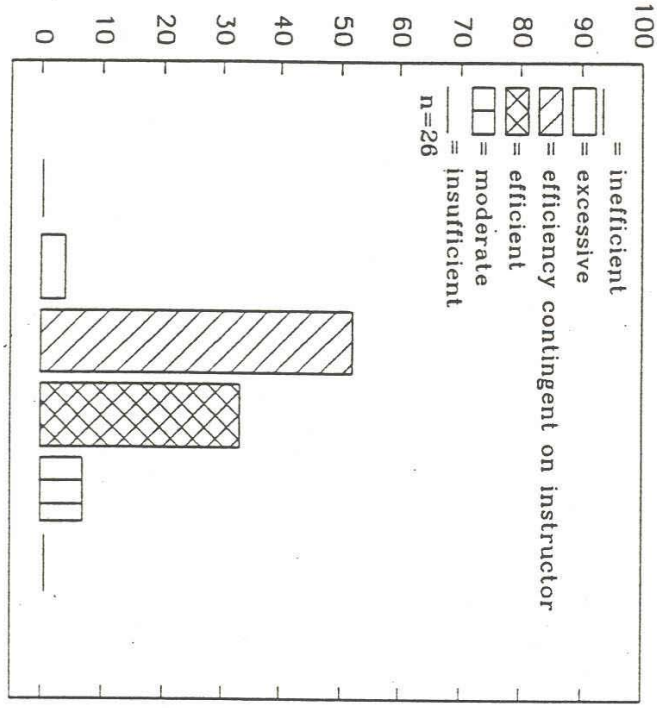


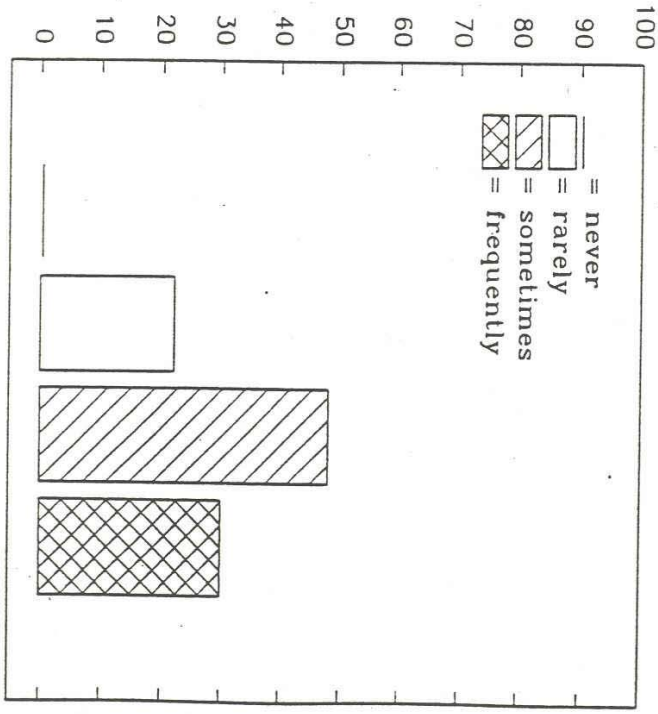
Percentage of Students

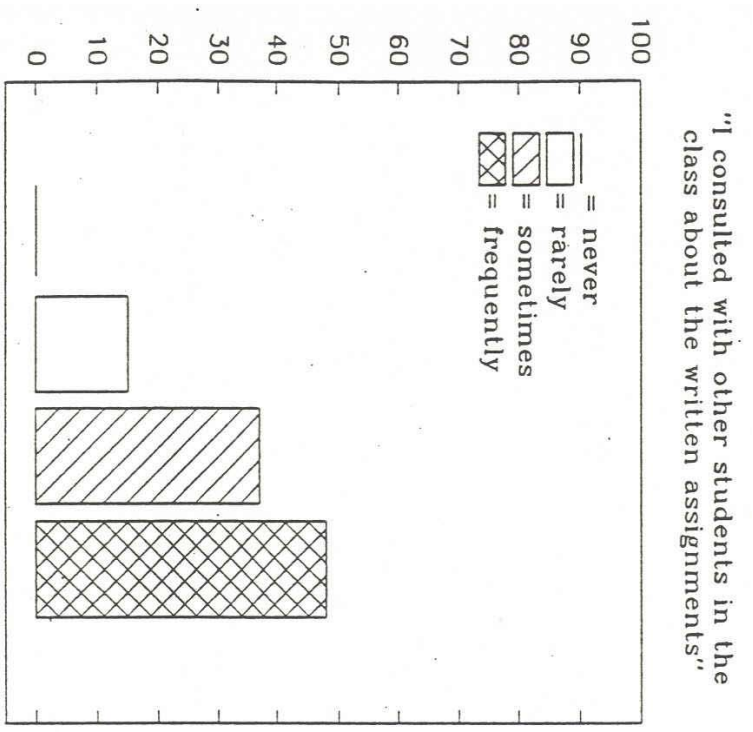

"I get C's and D's in science courses"
= never
= rarely
= sometimes
= frequently
0
10
20
30
40
50
60
70
80
90
100
Percentage of Students
"I find it easy to take notes in science courses"
= never
= rarely
= sometimes
= frequently
0
10
20
30
40
50
60
70
80
90
100


"I use flash-cards or repetition to memorize facts"
= never
= rarely
= sometimes
= frequently
100
90
80
70
60
50
40
30
20
10
0
Percentage of Students
"I spend more time studying for science courses than for other types of courses"
= never
= rarely
= sometimes
= frequently
100
90
80
70
60
50
40
30
20
10
0

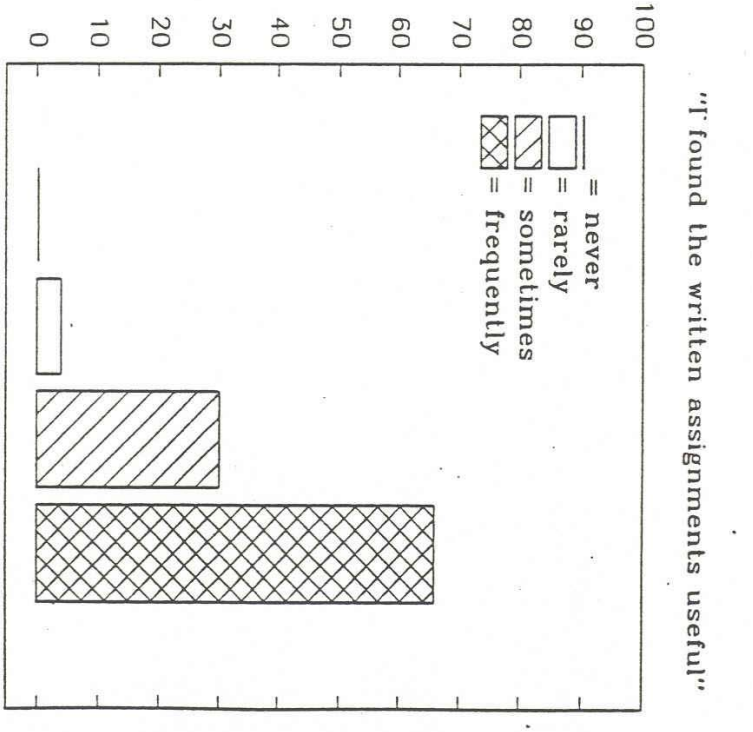
APPENDIX H
Post-Course Survey Response


Style of Notetaking
= inefficient
= excessive
= efficiency contingent on instructor
= efficient
= moderate
= insufficient
n=26
100
90
80
70
60
50
40
30
20
10
0

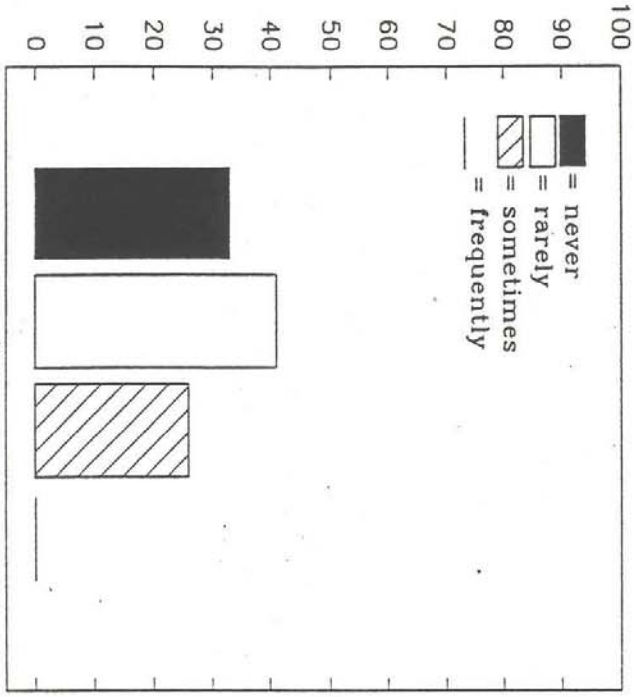

"I enjoyed preparing the written assignments"
Percentage of Students
= never
= rarely
= sometimes
= frequently
100
90
80
70
60
50
40
30
20
10
0



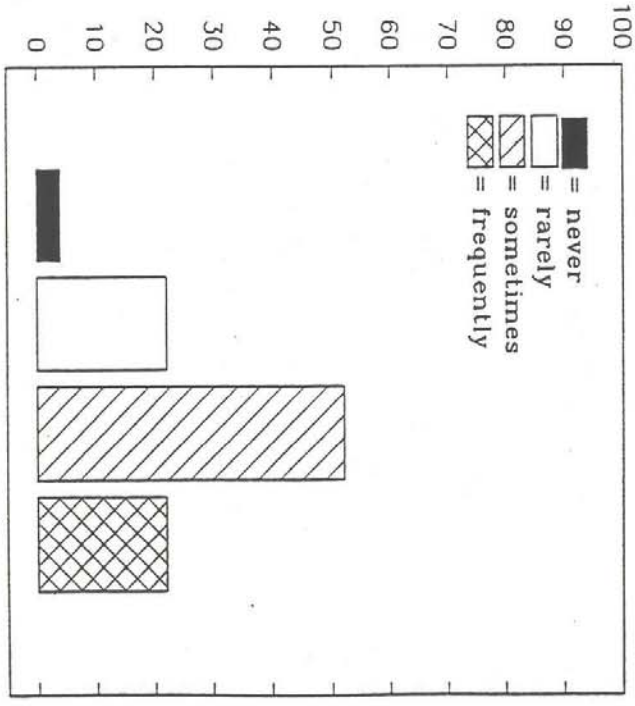
Percentage of Students

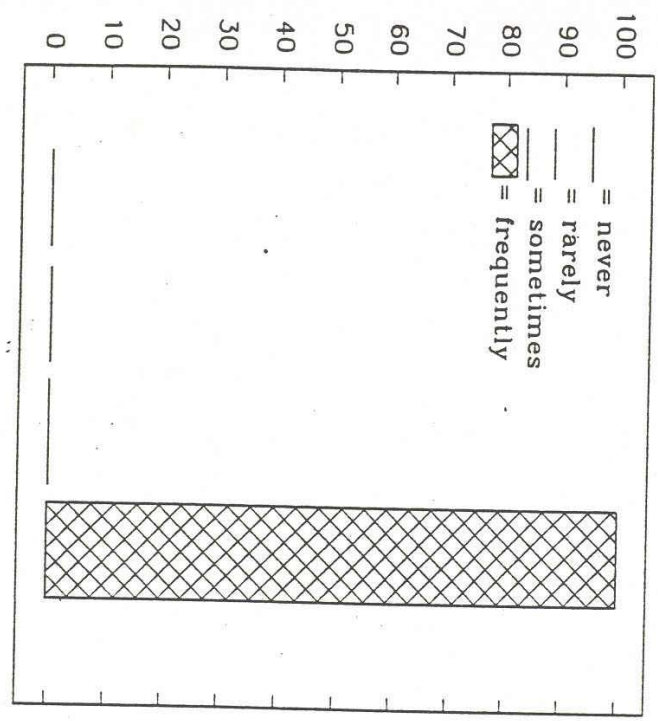


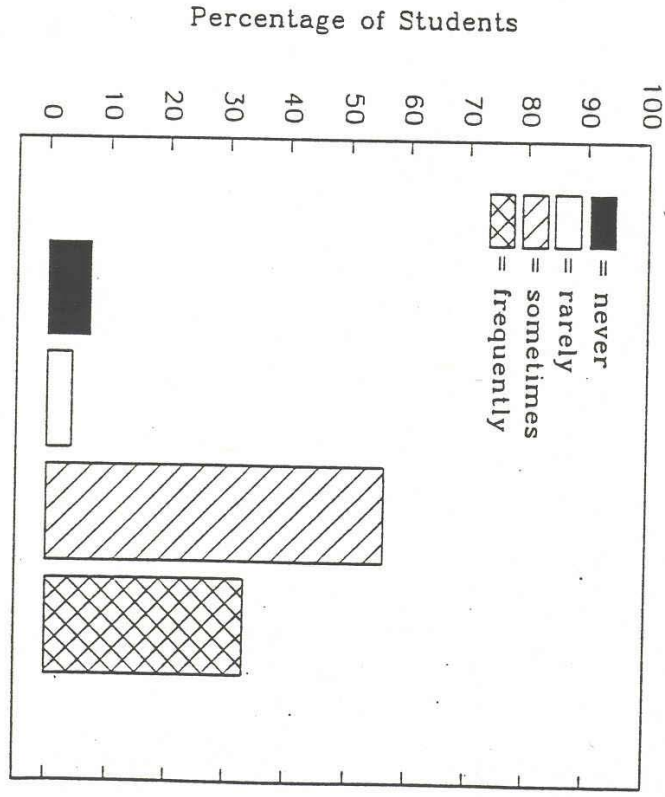
"I consulted with the professor about the written assignments before turning them in to be graded"

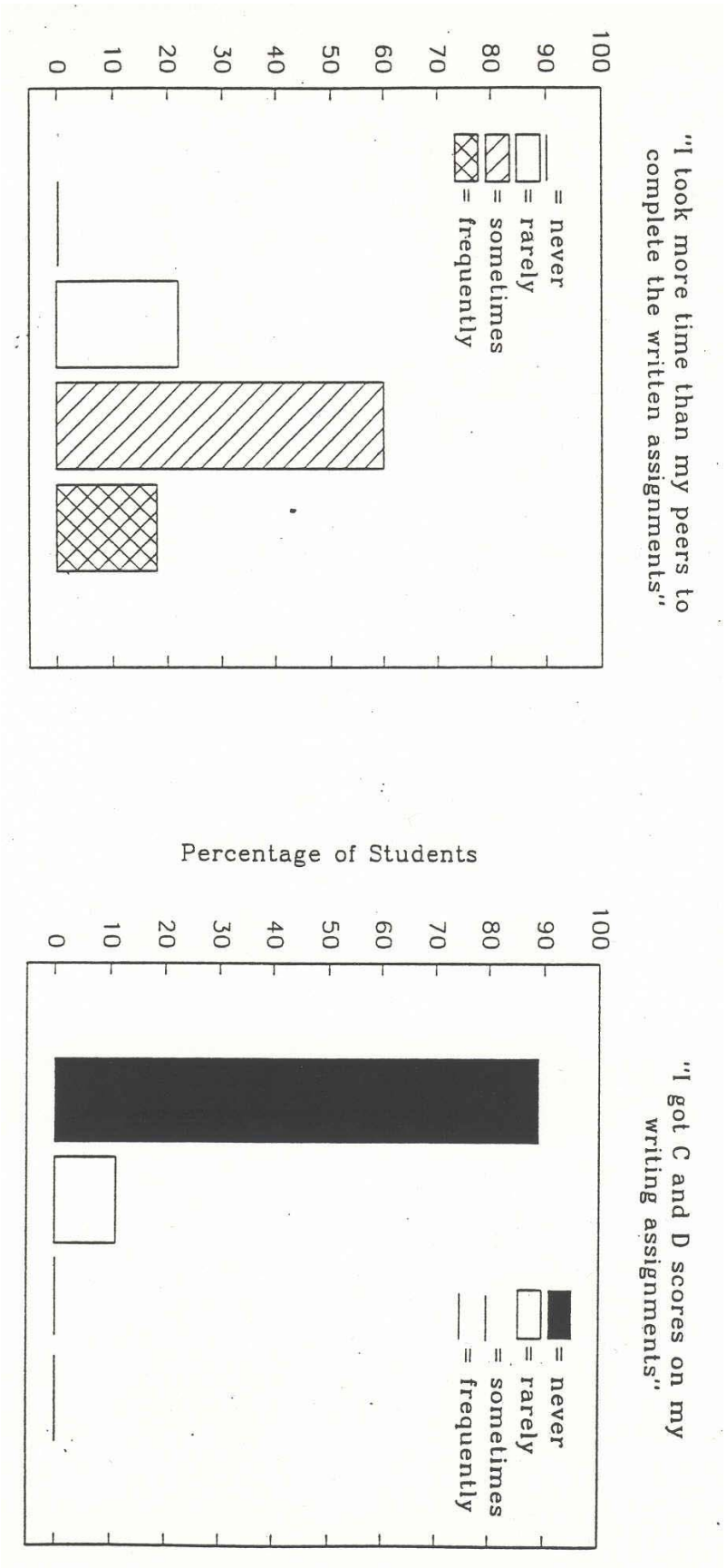


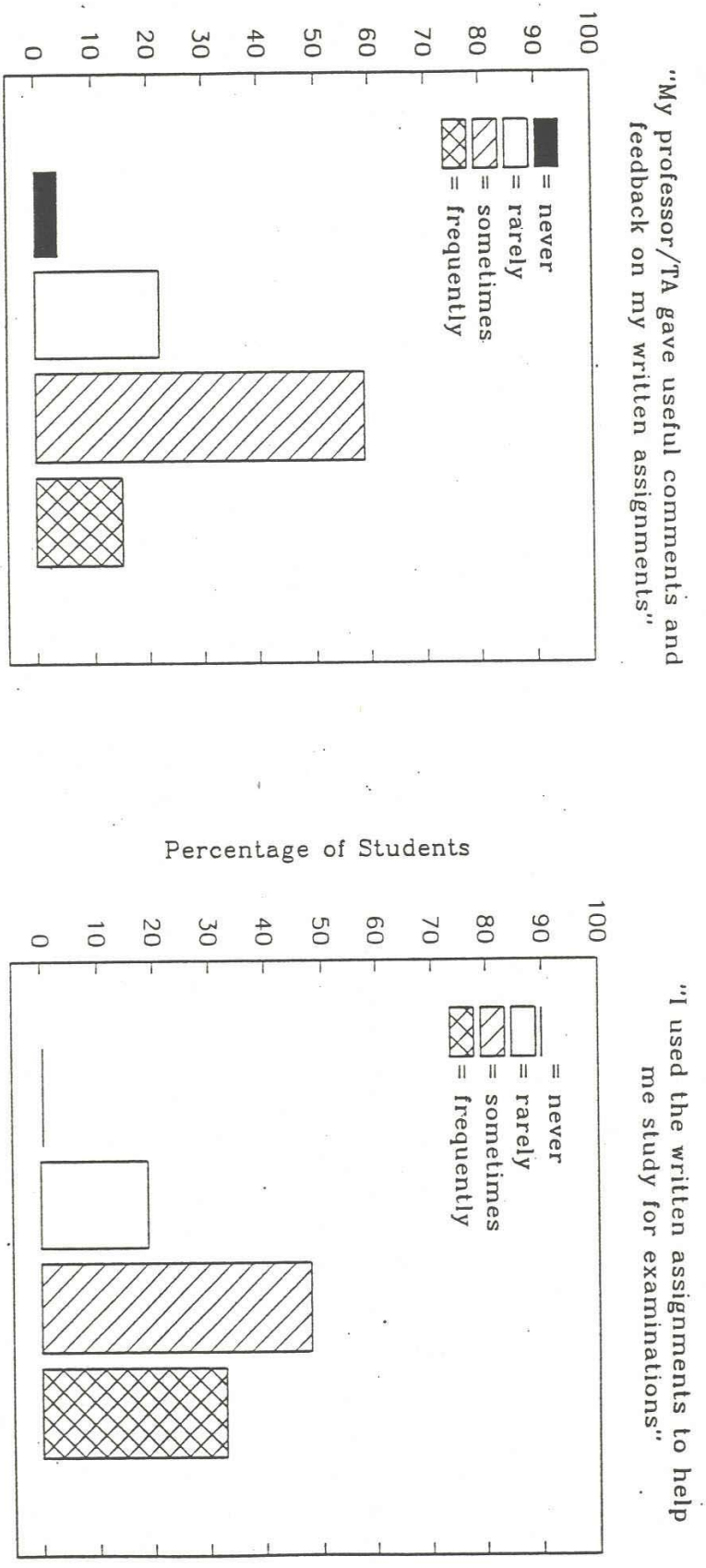
"I was able to express myself adequately on the short-answer questions on the examinations"

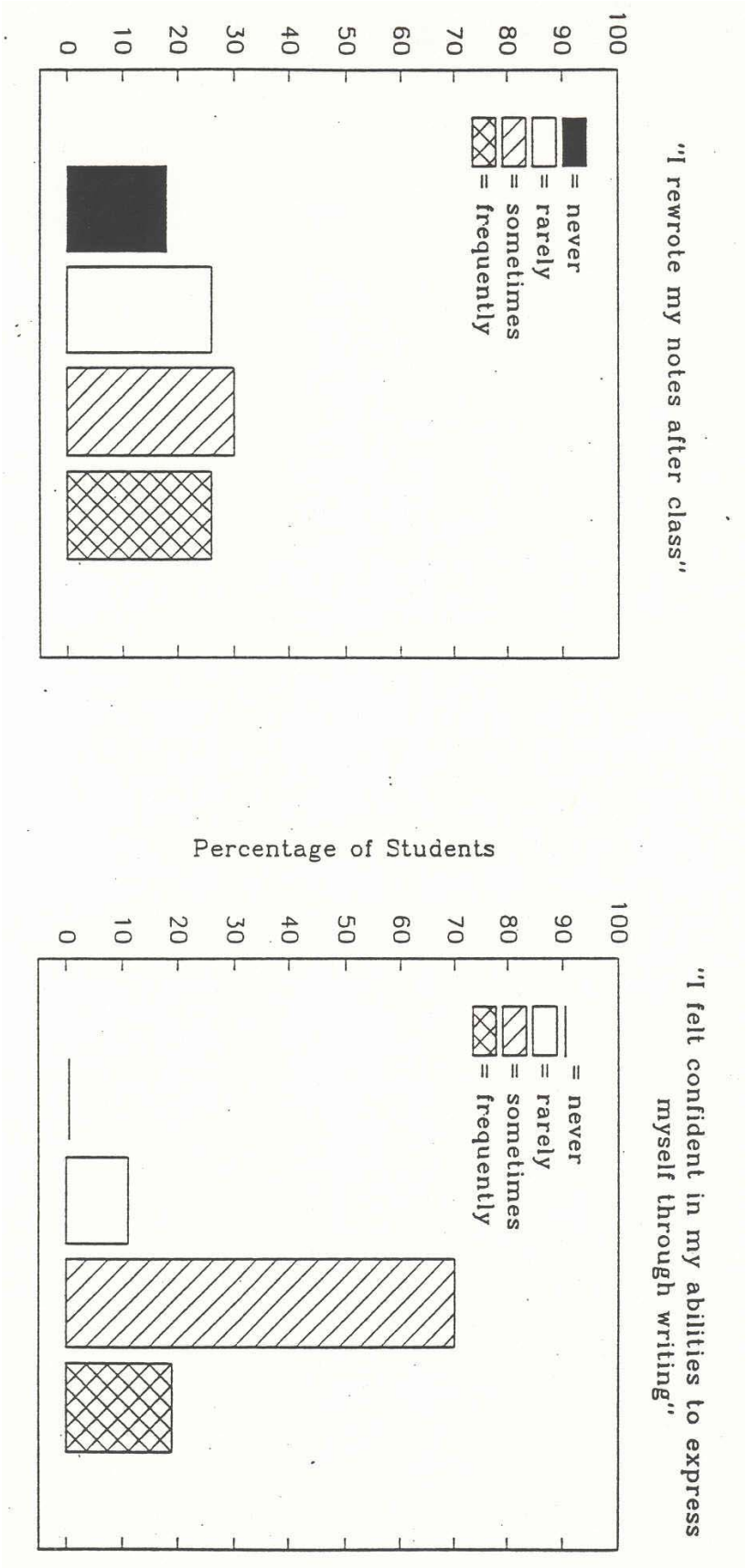


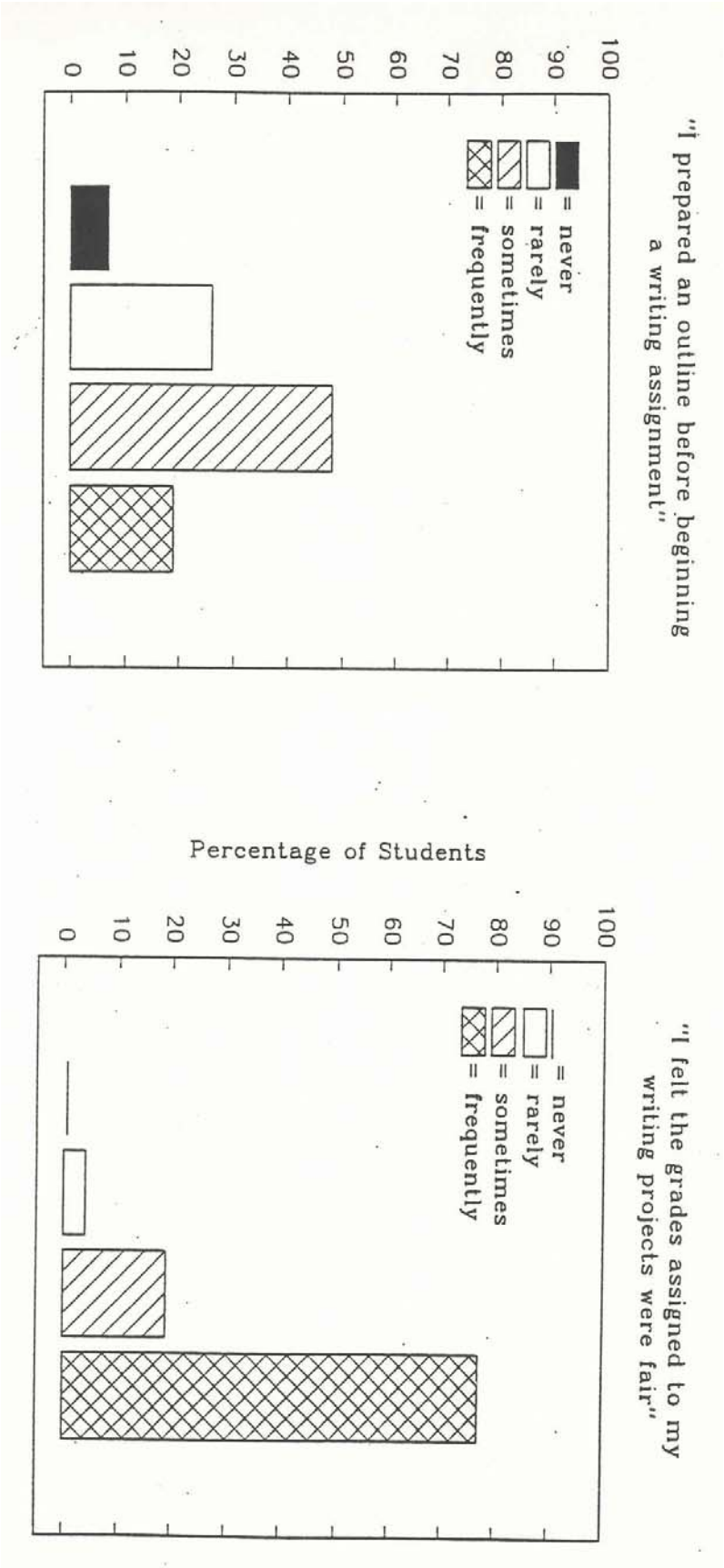

"I got A and B scores on my writing assignments"
100
90
80
70
60
50
40
30
20
10
0
= never
= rarely
= sometimes
= frequently

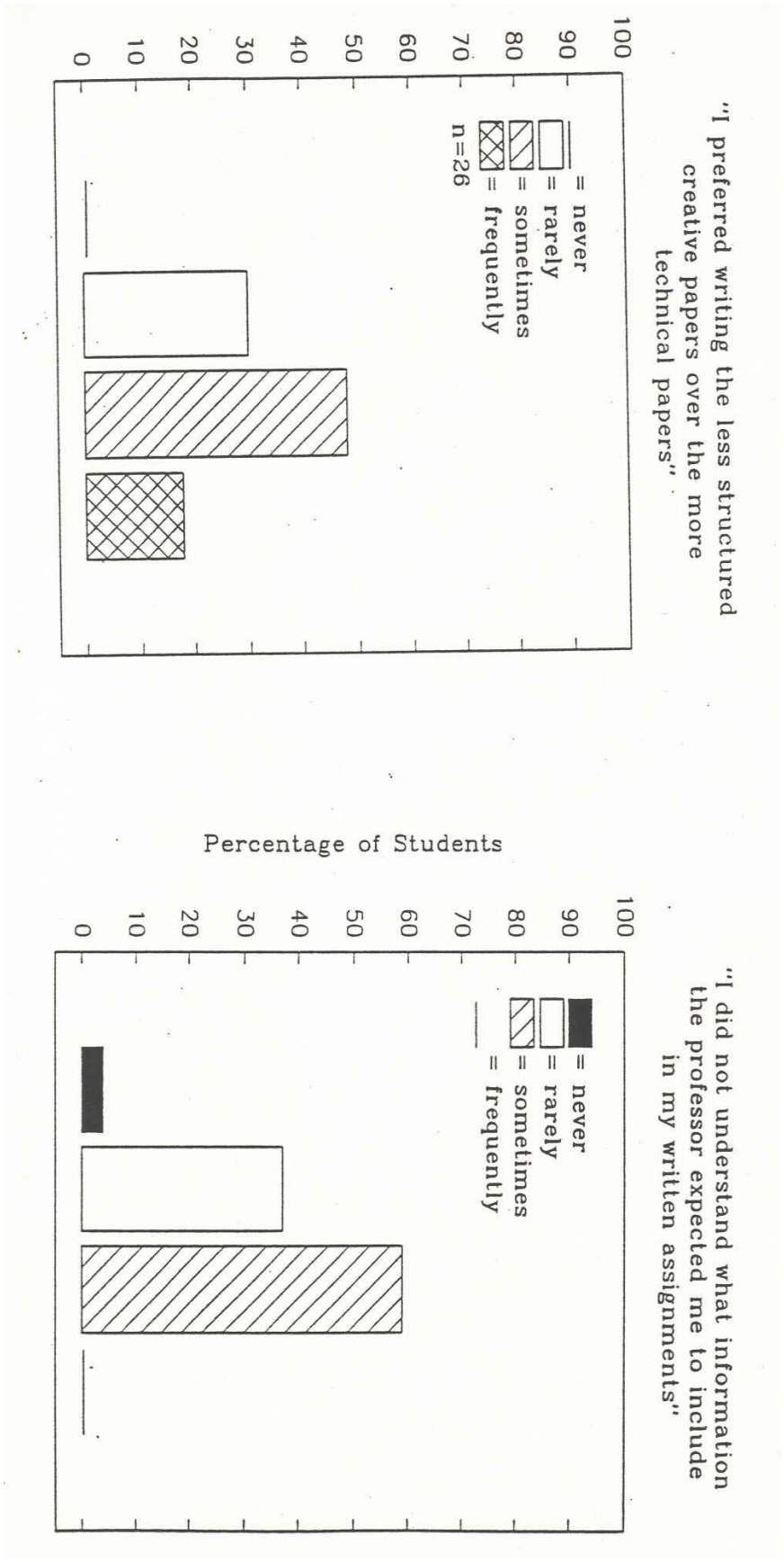

Percentage of Students
"The writing assignments for this class made me anxious"
100
90
80
70
60
50
40
30
20
10
0
= never
= rarely
= sometimes
= frequently

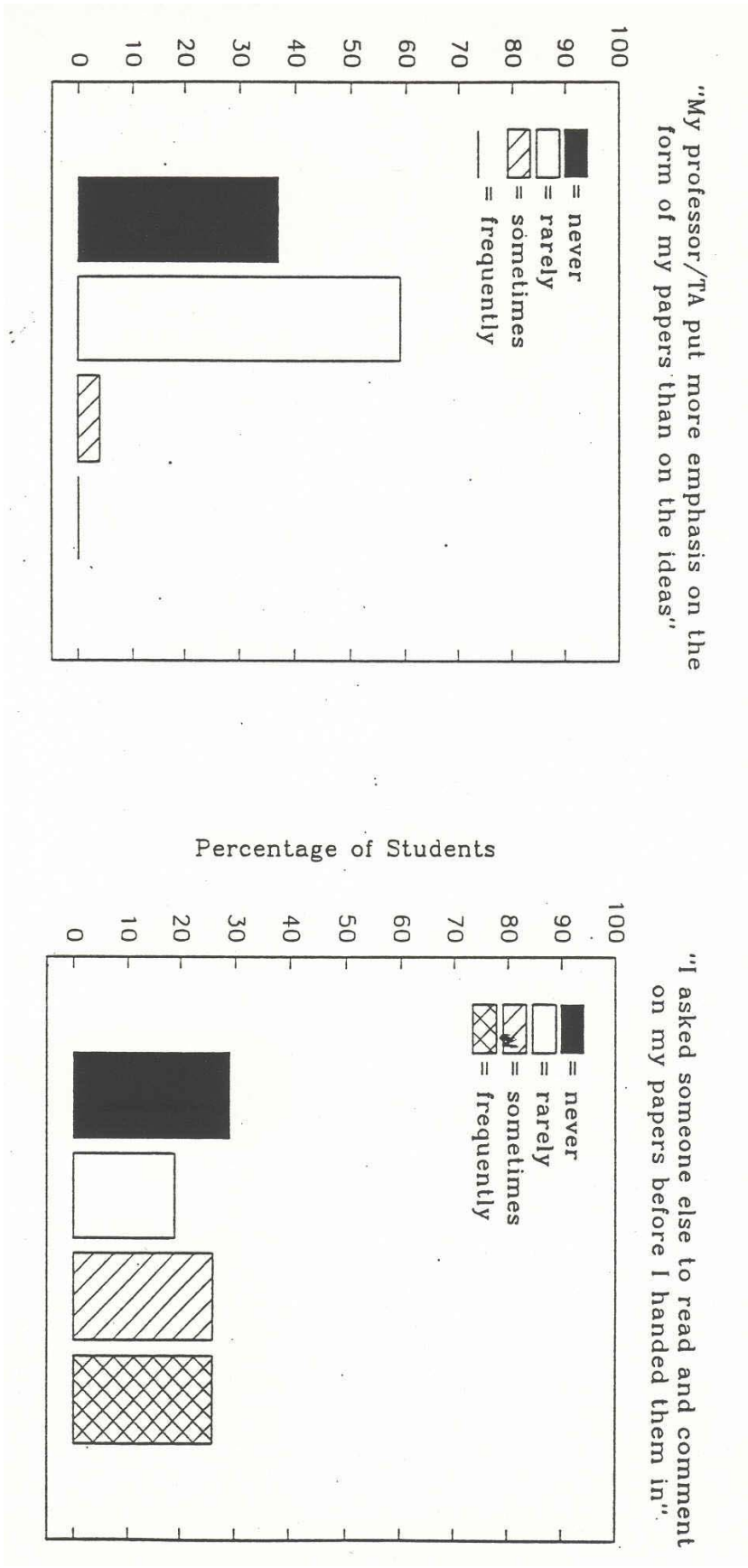

"I look more time than my peers to complete the written assignments"
"I got C and D scores on my writing assignments"
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100
= never
= rarely
= sometimes
= frequently

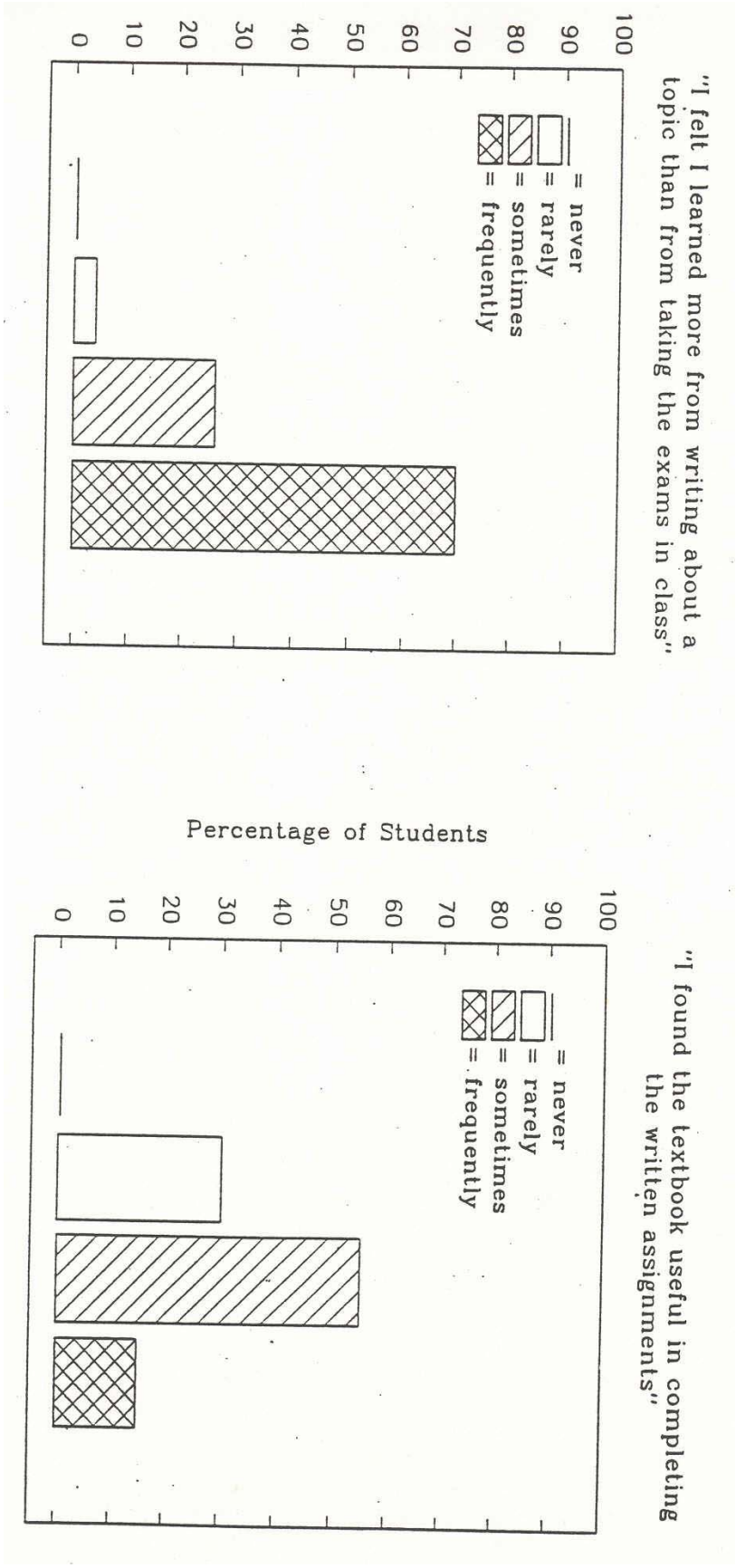

"My professor/TA gave useful comments and feedback on my written assignments"
= never
= rarely
= sometimes
= frequently
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100
"I used the written assignments to help me study for examinations"
= never
= rarely
= sometimes
= frequently
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100

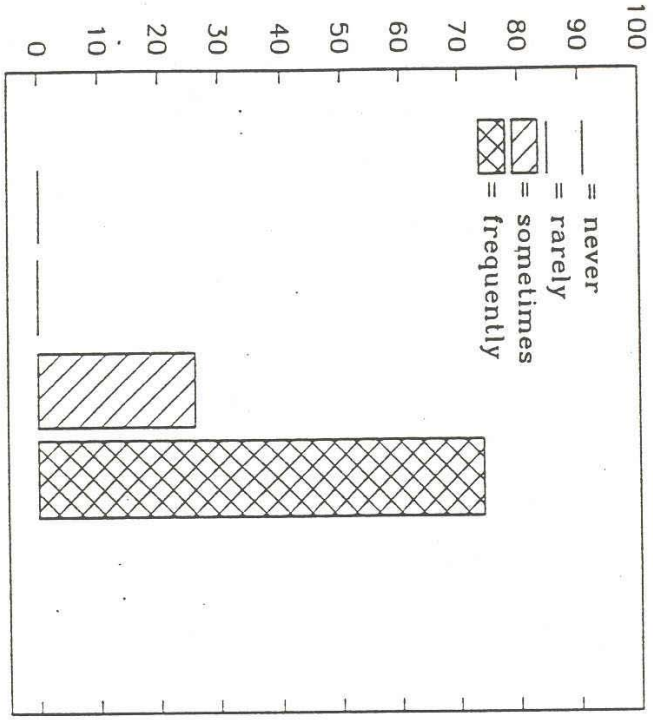

"I rewrote my notes after class"
"I felt confident in my abilities to express myself through writing"
= never
= rarely
= sometimes
= frequently
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100


"I prepared an outline before beginning a writing assignment"
= never
= rarely
= sometimes
= frequently
100
90
80
70
60
50
40
30
20
10
0
Percentage of Students
"I felt the grades assigned to my writing projects were fair"
= never
= rarely
= sometimes
= frequently
100
90
80
70
60
50
40
30
20
10
0

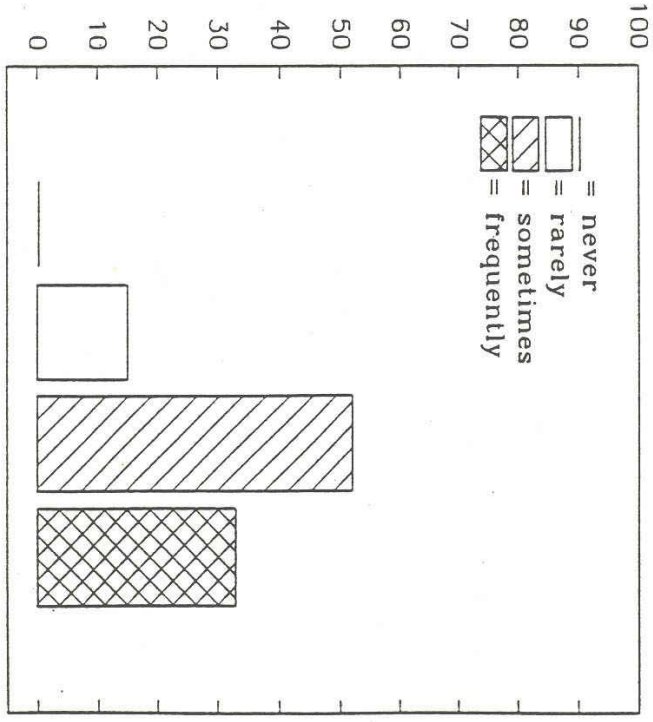

"I preferred writing the less structured creative papers over the more technical papers"
= never
= rarely
= sometimes
= frequently
n=26
"I did not understand what information the professor expected me to include in my written assignments"
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100

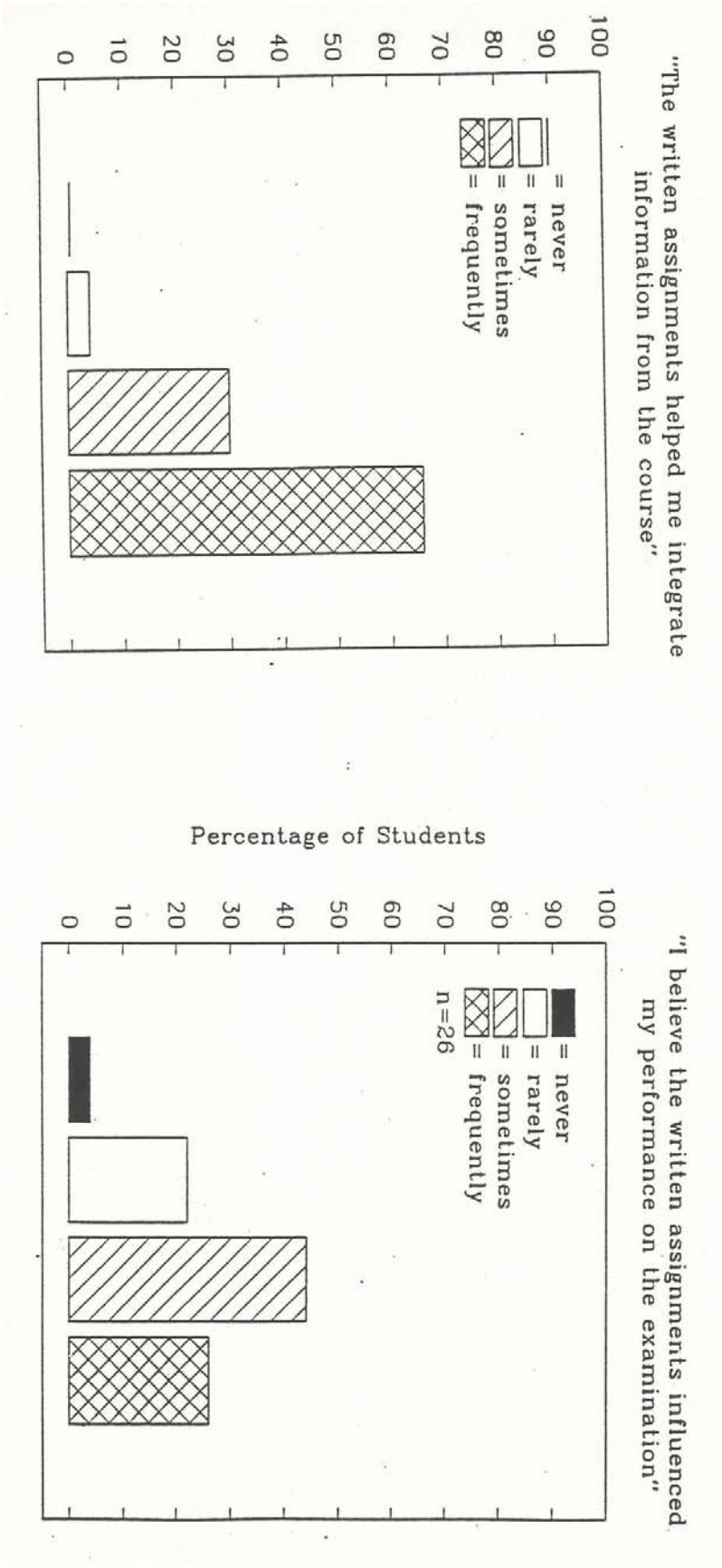

"My professor/TA put more emphasis on the form of my papers than on the ideas"
= never
= rarely
= sometimes
= frequently
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100
"I asked someone else to read and comment on my papers before I handed them in".
= never
= rarely
= sometimes
= frequently

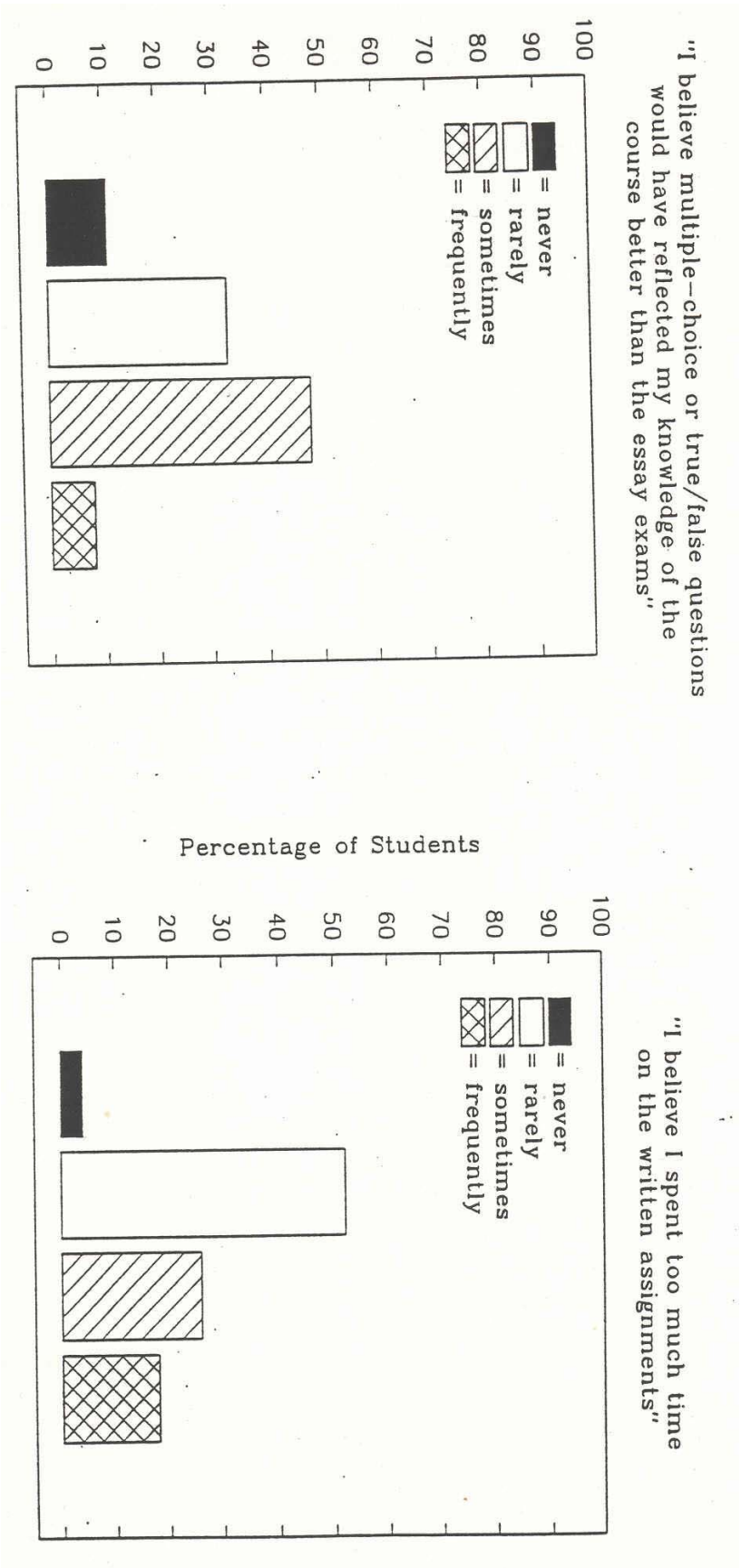

"I felt I learned more from writing about a topic than from taking the exams in class."
"I found the textbook useful in completing the written assignments."
= never
= rarely
= sometimes
= frequently
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100

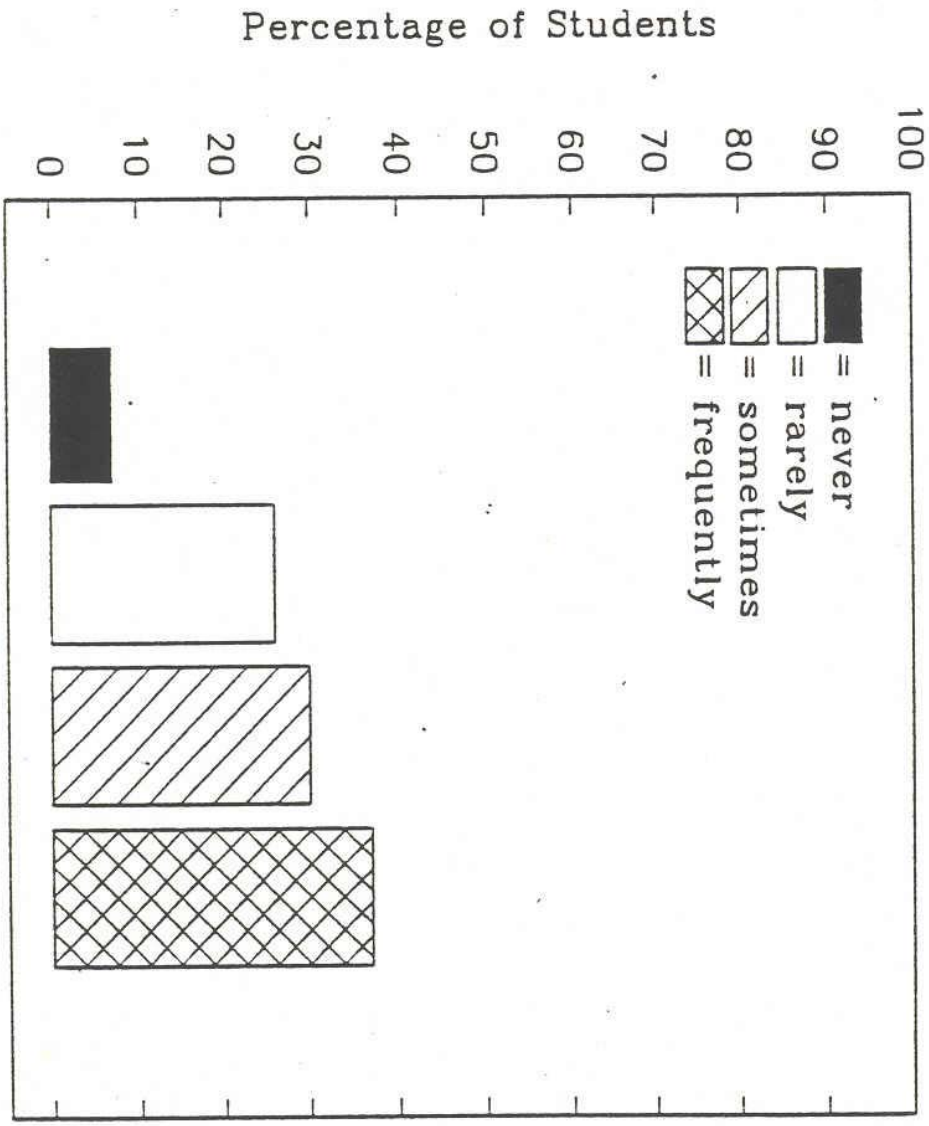


Percentage of Students




"The written assignments helped me integrate information from the course"
100
90
80
70
60
50
40
30
20
10
0
= never
= rarely
= sometimes
= frequently
Percentage of Students
"I believe the written assignments influenced my performance on the examination"
n=26


"I believe multiple-choice or true/false questions would have reflected my knowledge of the course better than the essay exams"
= never
= rarely
= sometimes
= frequently
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100
"I believe I spent too much time on the written assignments"
= never
= rarely
= sometimes
= frequently
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100



"I sought out additional references when completing the written assignments."

APPENDIX I

Has the quality of your writing changed since participating in this class? If so, how?

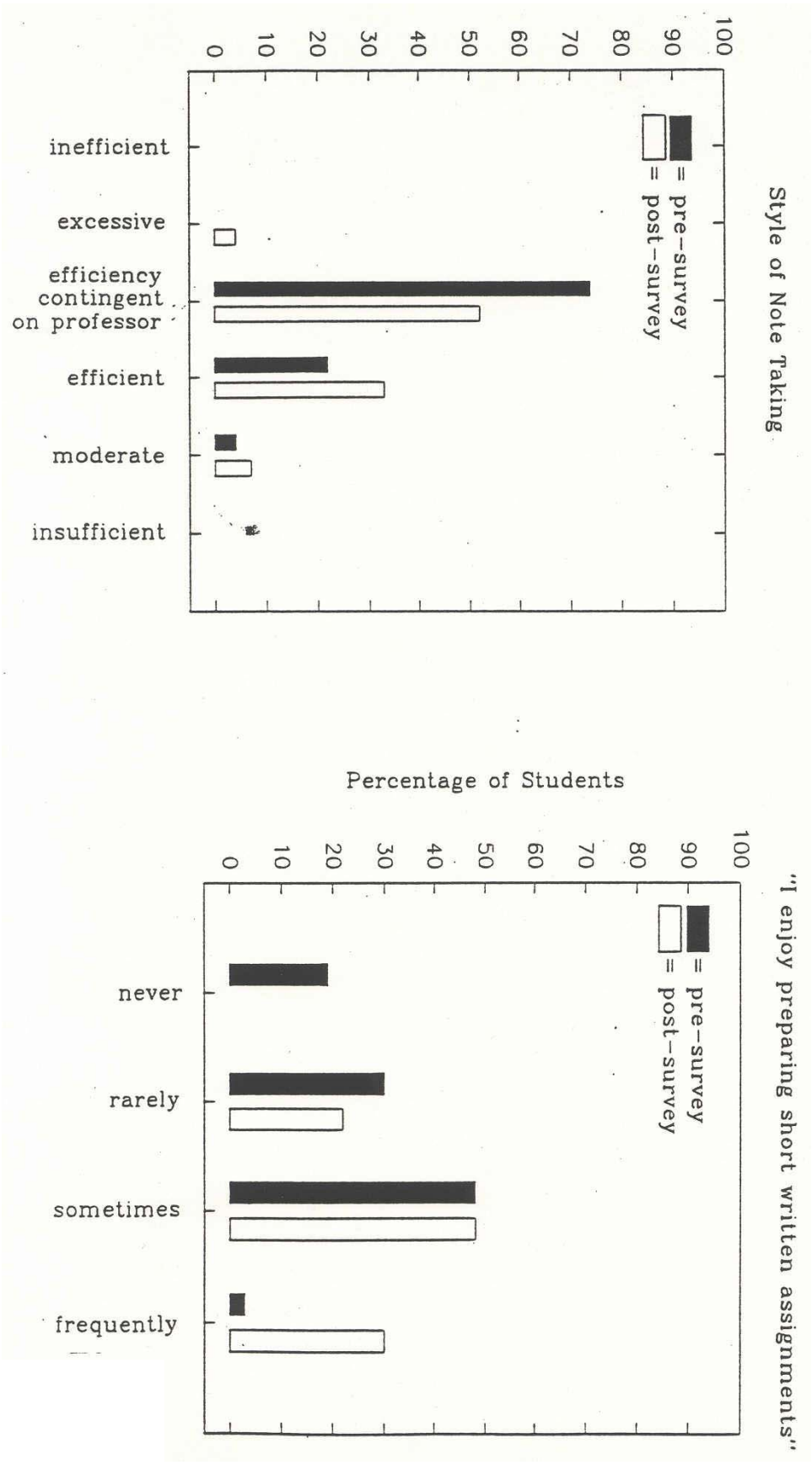
Subject Code	Course Average	Survey Response	Evaluation Comments
UFJ35	90.6	I think it's gotten more clear and concise.	Clarity was rated as being satisfactory. Accuracy was judged to be unsatisfactory on assignments 1 and 6.
UFM30	86.4	My prep has improved a lot and I think my organization has too. I also can get to the point a lot faster because of the two page limit.	Organization was rated satisfactory on all assignments.
UFO14	88.2	Possibly, in terms of sufficient information, content and descriptions. But as far as form, this class didn't require a certain format for the assignments (all were very different) so I'd say my form quality hasn't changed.	Accuracy and wording were rated satisfactory on assignment 1. Detail was not satisfactory on assignment 6. Punctuation was judged to be unsatisfactory on all the assignments. Spelling was unsatisfactory on assignments 2,4,5, and 6.
UFL18	96.5	Maybe a little more organized.	Organization was rated satisfactory on all five of the assignments.
UFN06	95.4	I believe so. I think I have become better at being more concise and not over-elaborating.	Detail was judged to be unsatisfactory on assignments 1 and 6.

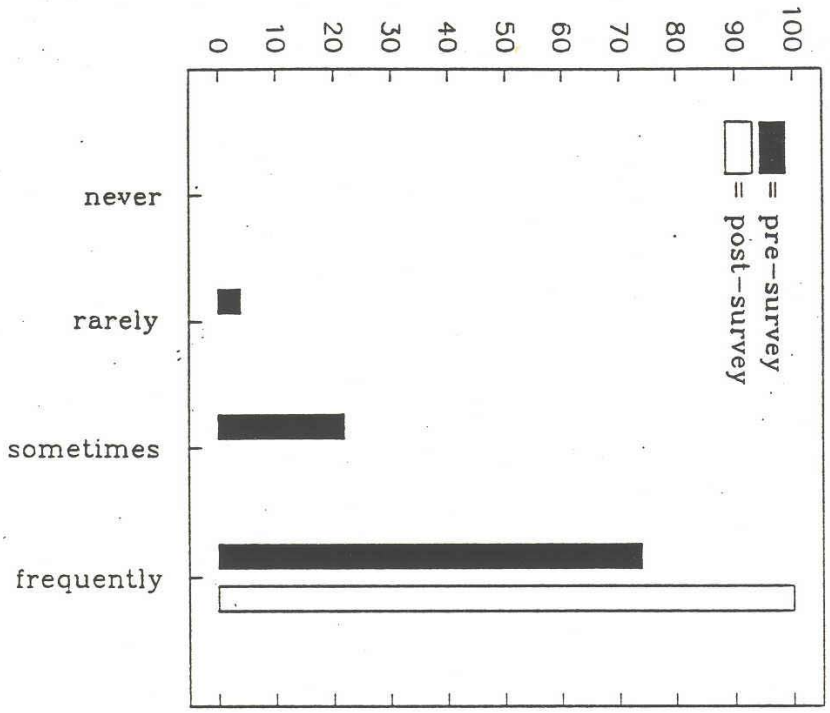
UFM39	81.5	No.	
UMB03	90.1	I think this class and these assignments have helped me focus on being concise and yet convey enough information to be understood.	Assignment 4 was rated as lacking sufficient detail.
UFB13	94.6	Yes, I think I'm able to be more analytical. I feel more confident in writing reviews of patients.	
UFK07	79.4	Yes, I think my writing has improved from the papers because we had to write in a scientific manner, something I have never done and actually enjoy.	Assignments 1 and 2 were rated as having non-scientific wording and limited vocabulary. Assignments 1, 5, and 6 lacked detail.
UFW58	86.0	Yes, I'm more concise in meaning. And my ability to relay information so it is understandable to others outside this field has also improved.	Assignments 1, 4, and 5 were rated as having insufficient detail. Clarity was unsatisfactory on assignments 1 and 5.
UFH41	75.3	No.	
UFS29	85.4	I don't think so, it might be more technical – although I'm not sure how accurate it is.	Accuracy was satisfactory on all assignments. Assignments 1, 5, and 6 lacked detail. Problems with wording were apparent on assignments 1 and 6.
UFW01	72.2	Yes, it's more organized.	Organization was rated satisfactory on all five assignments.

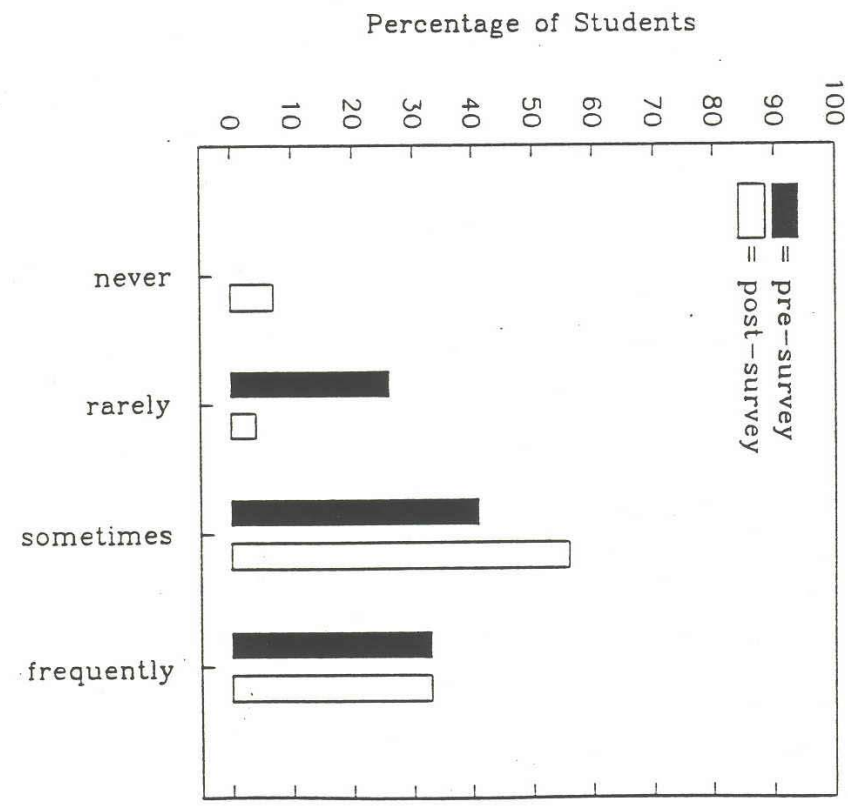
UFS17	96.8	No.	
UFR09	91.6	Yes, it has made me more organized.	Organization was satisfactory on all assignments.
UFH25	80.8	No.	
UFH16	86.0	Yes, like I said, I had to be less wordy. I felt I was more organized than usual. I knew I had to get to the point. I think that will help me in the long run.	Assignment 6 was rated as not having sufficient detail to express ideas. All assignments were organized satisfactorily.
UFA50	80.4	Yes, I was too concerned with technical vocabulary. I made foolish grammar mistakes.	Wording was unsatisfactory on assignments 1 and 6. Detail and clarity were judged to be unsatisfactory on assignments 1, 2, and 4. Syntax was unsatisfactory on assignments 2, 4, and 6.
UFW64	97.9	No.	
UFA19	97.0	No.	
UFD40	88.6	Yes, the quality of my writing has changed. I write more concise, and I organize my thoughts better.	All assignments were judged to have satisfactory organization.
UFP56	86.0	No.	

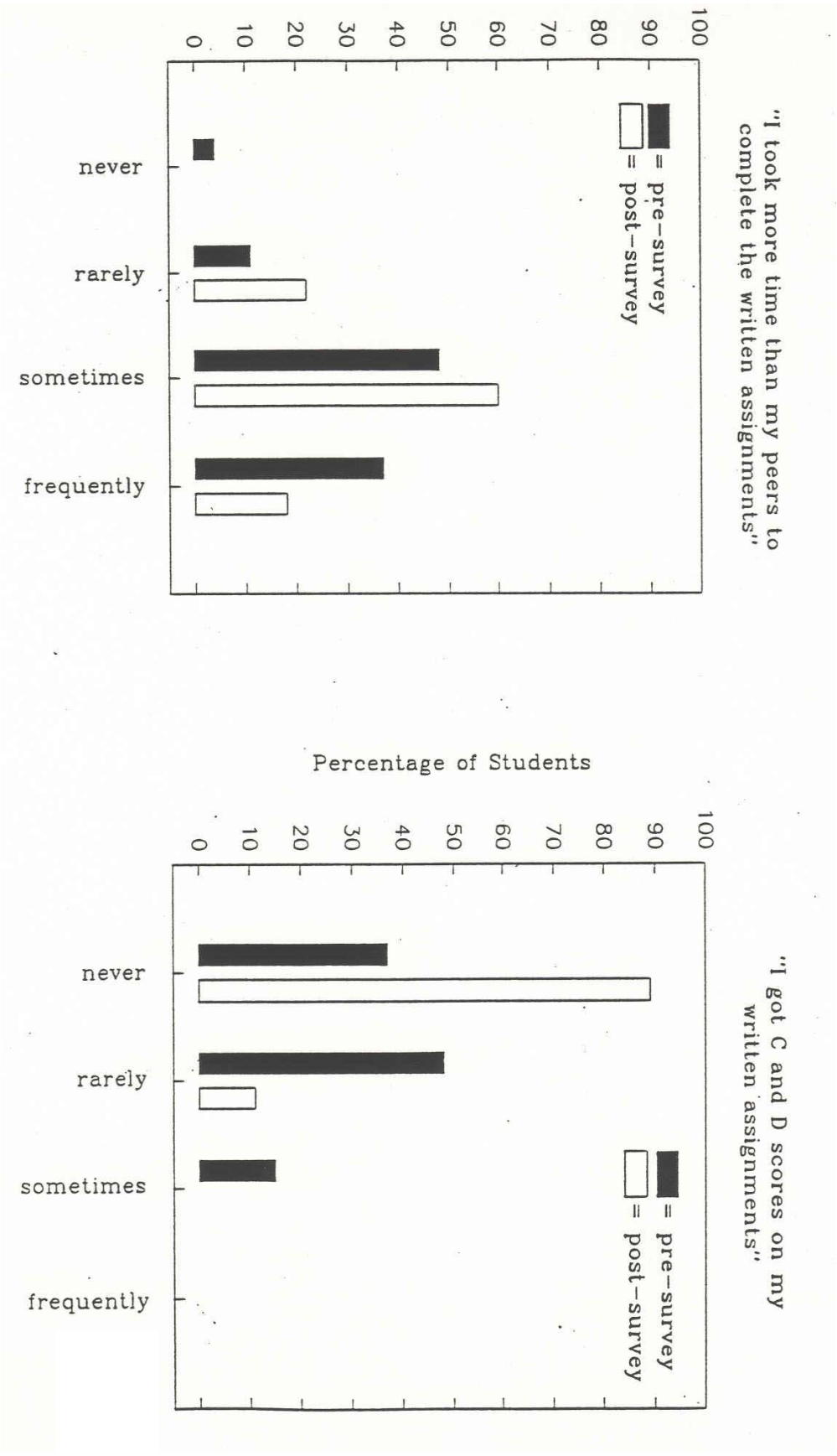
UFL44	80.4	I don't know. I think that I usually get A's and B's on writing assignments but I haven't had that many. I usually surprise myself.	
UFL22	90.1	No.	
UFP66	76.3	Yes, I've begun to use better wording and become more organized.	Organization was judged to be satisfactory on all assignments. Wording was judged to be unsatisfactory on assignment 1.
UMS27	89.2	(no comment)	

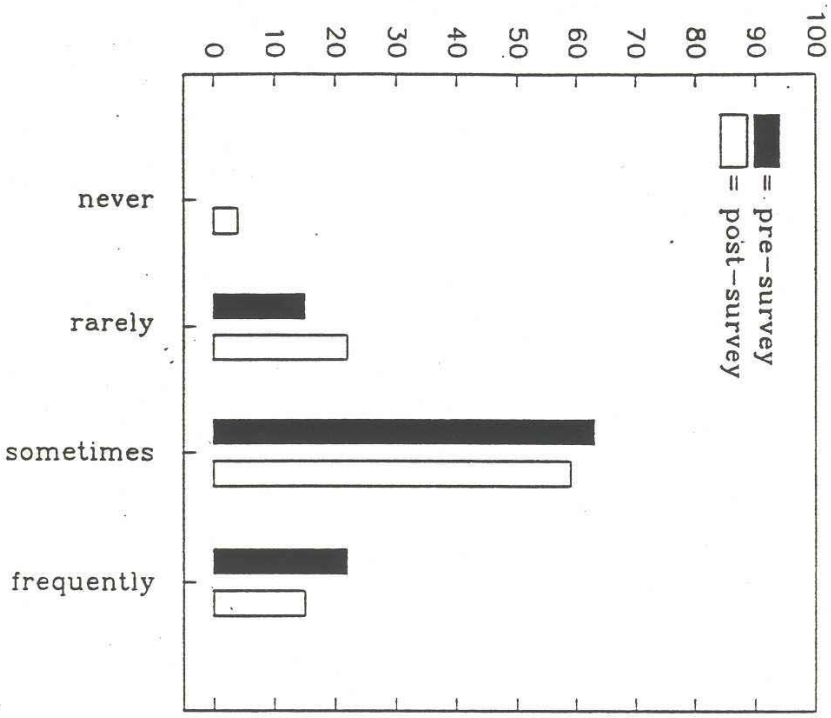
APPENDIX J
Pre- versus Post-Course Survey Responses

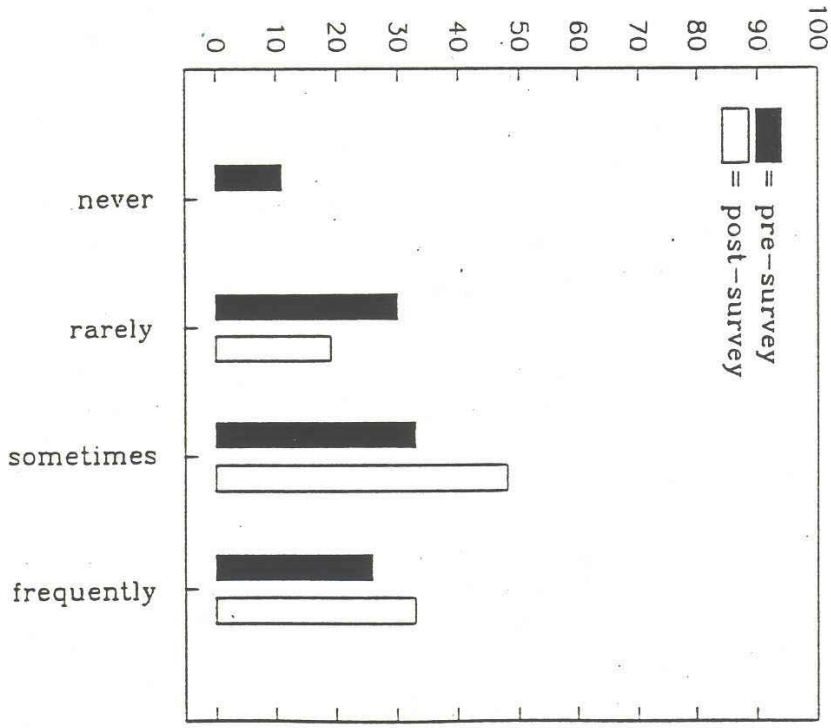

Style of Note Taking
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100
inefficient
excessive
efficiency contingent on professor
efficient
moderate
insufficient
= pre-survey
= post-survey
"I enjoy preparing short written assignments"
never
rarely
sometimes
frequently
= pre-survey
= post-survey

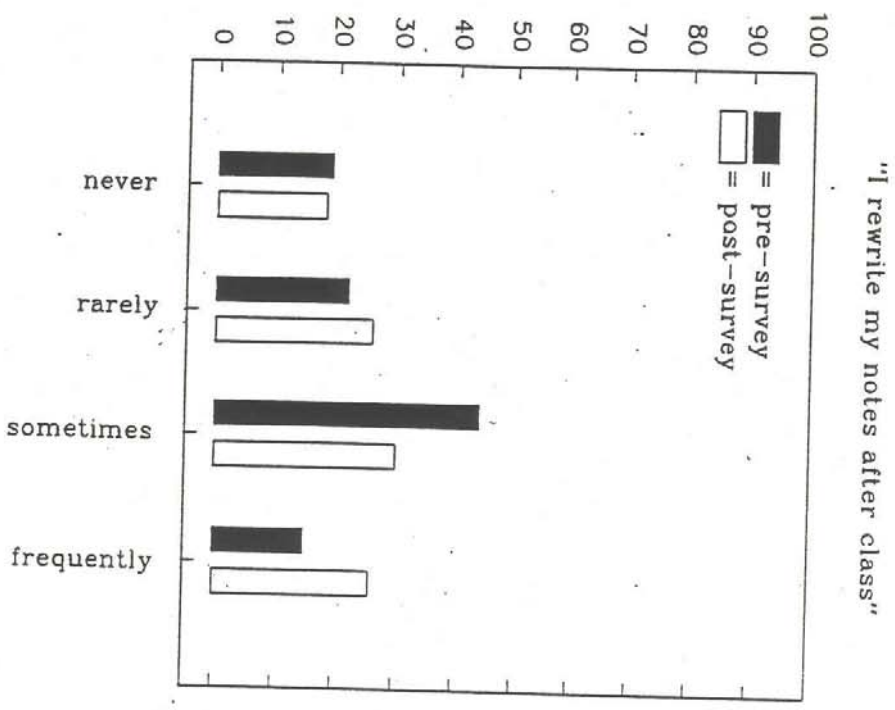

"I got A and B scores on my written assignments"
100
90
80
70
60
50
40
30
20
10
0
= pre-survey
= post-survey
never
rarely
sometimes
frequently

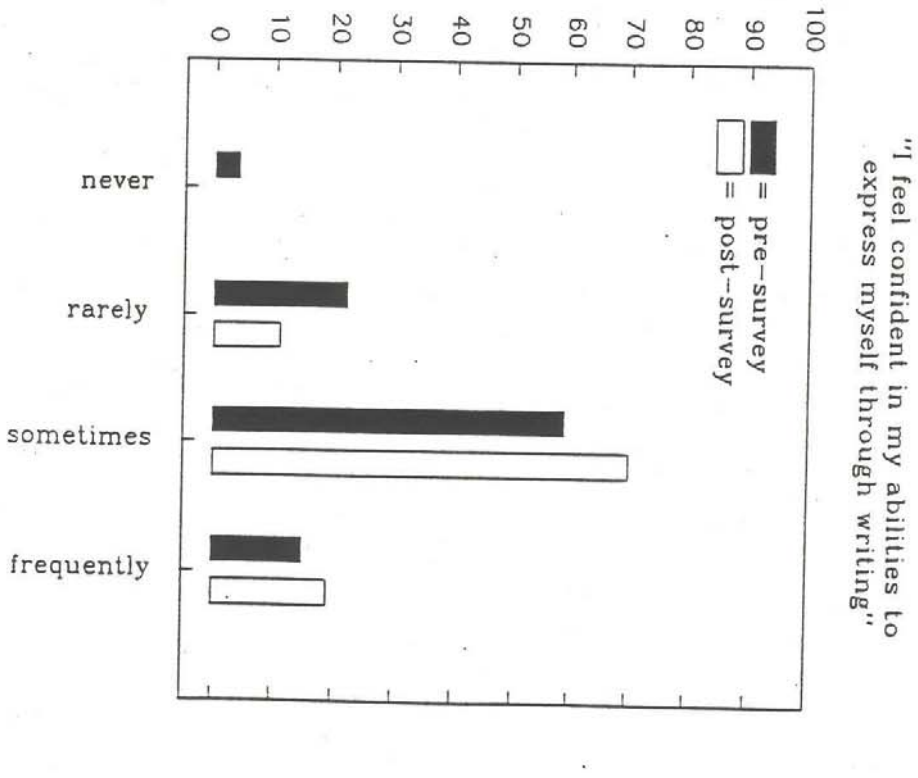

Percentage of Students
"Writing assignments make me anxious"
100
90
80
70
60
50
40
30
20
10
0
= pre-survey
= post-survey
never
rarely
sometimes
frequently

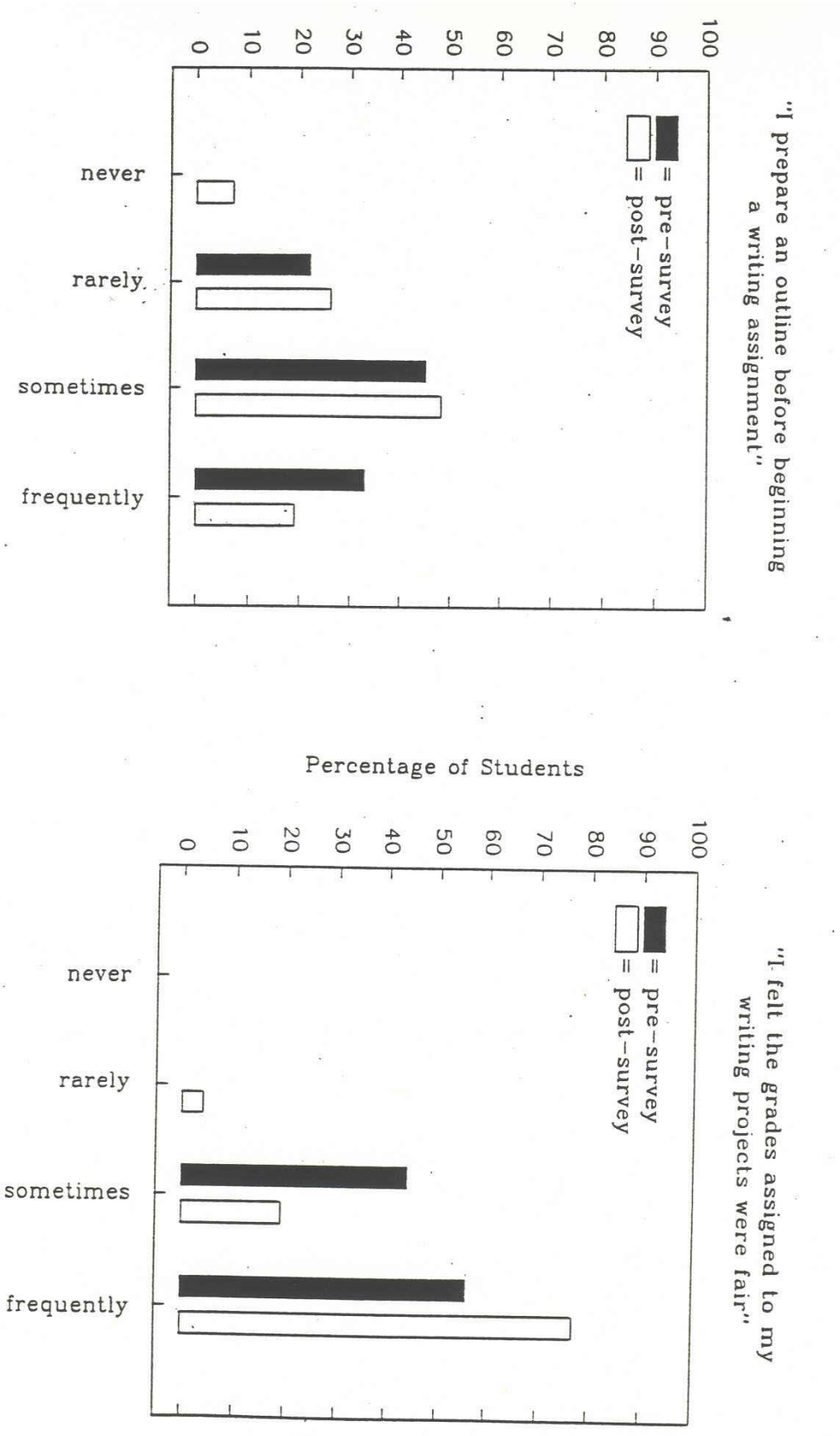

"I took more time than my peers to complete the written assignments"
"I got C and D scores on my written assignments"
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100
never
rarely
sometimes
frequently
= pre-survey
= post-survey

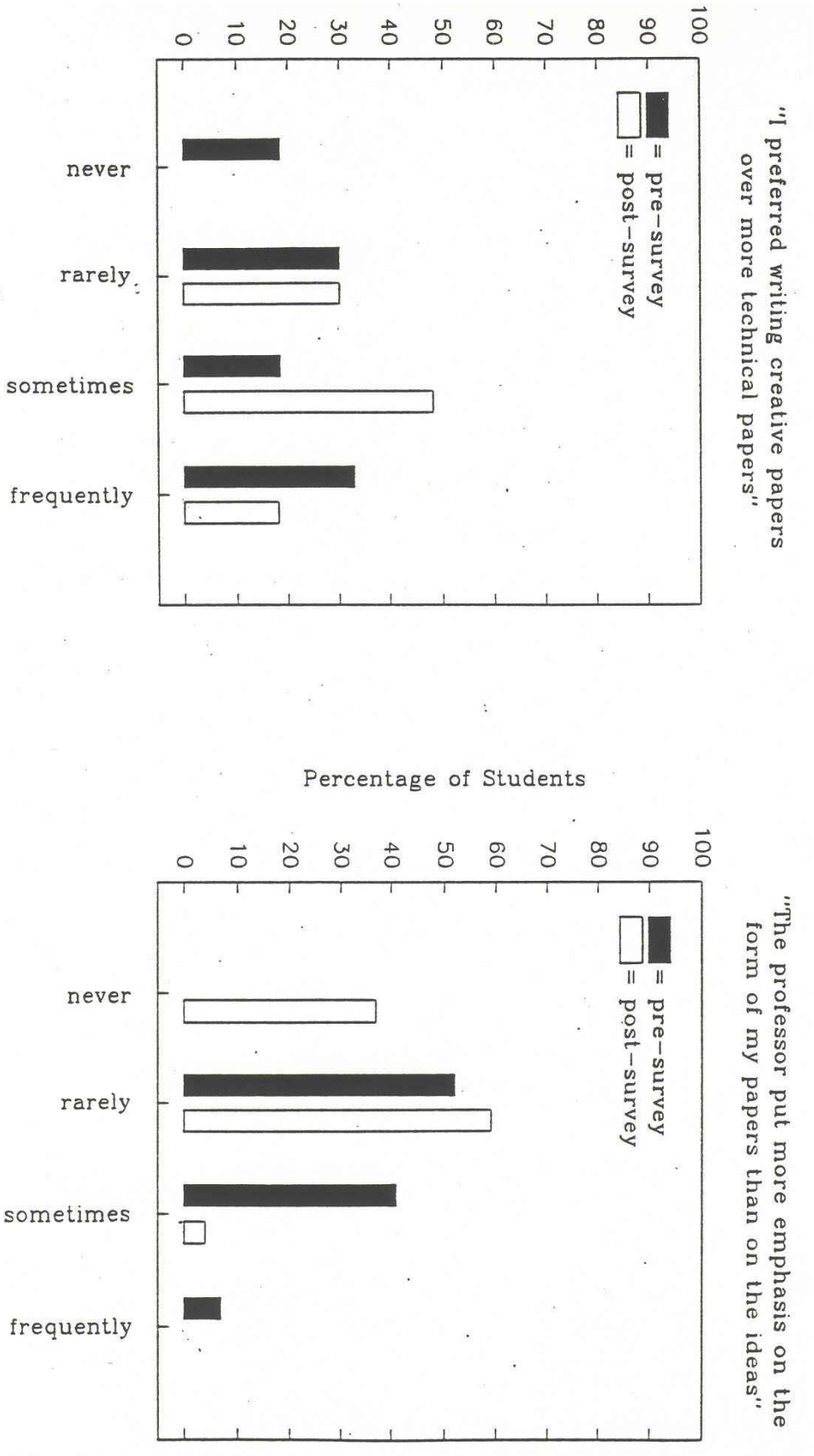

"The professor gave useful feedback on my assignments"
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100
never
rarely
sometimes
frequently
= pre-survey
= post-survey

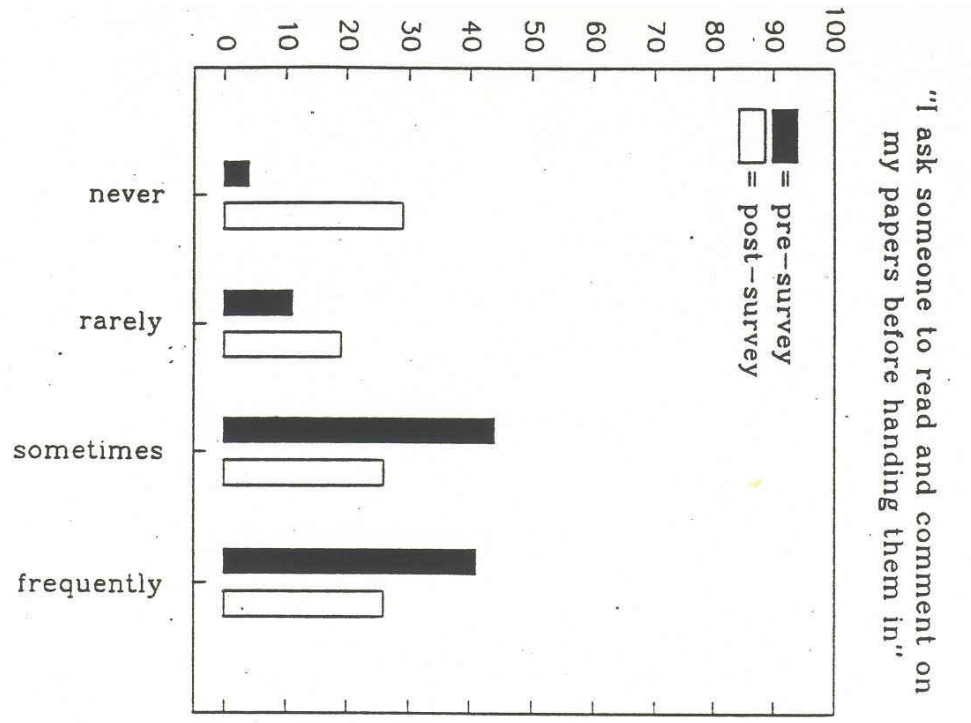

"I used the written assignments to help me study for exams"
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100
never
rarely
sometimes
frequently
= pre-survey
= post-survey

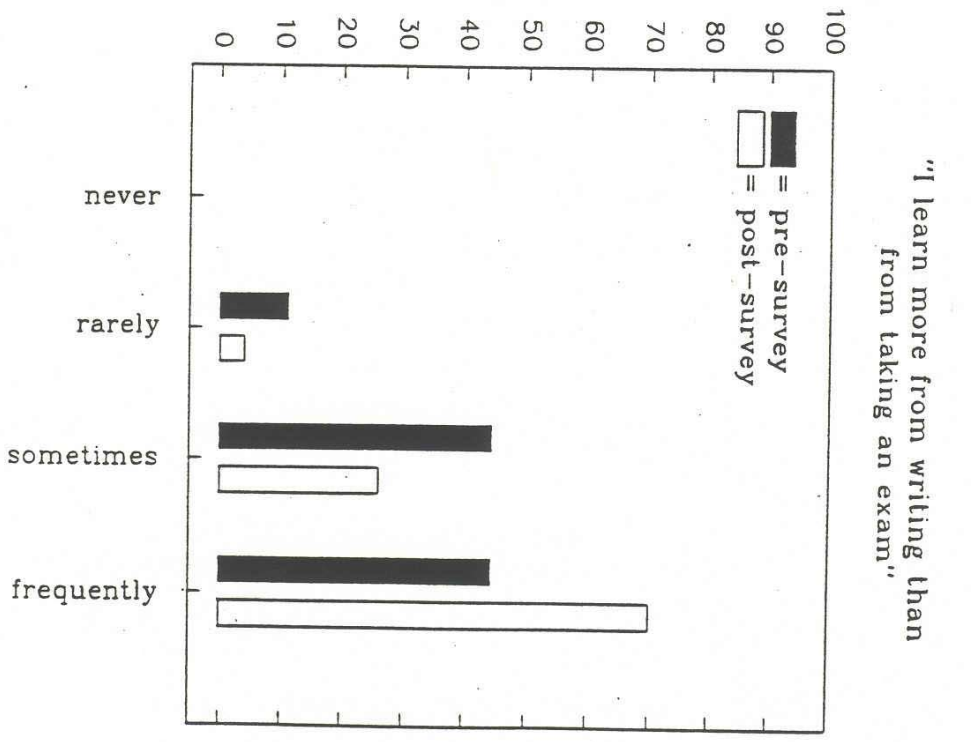

"I rewrite my notes after class"
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100
never
rarely
sometimes
frequently
= pre-survey
= post-survey

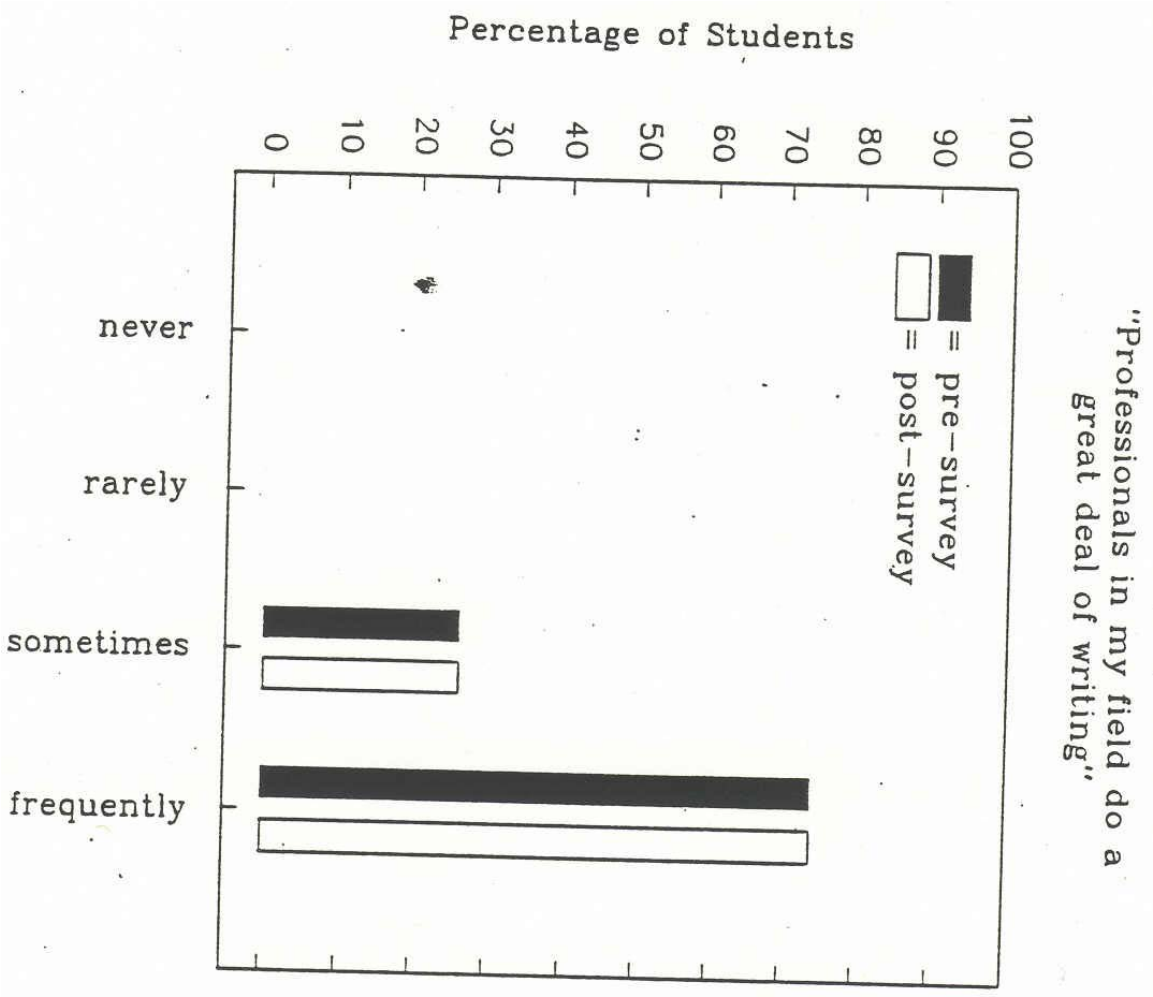

"I feel confident in my abilities to express myself through writing"
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100
never
rarely
sometimes
frequently
= pre-survey
= post-survey


"I prepare an outline before beginning a writing assignment"
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100
never
rarely
sometimes
frequently
= pre-survey
= post-survey
"I felt the grades assigned to my writing projects were fair"
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100
never
rarely
sometimes
frequently
= pre-survey
= post-survey


"I preferred writing creative papers over more technical papers"
"The professor put more emphasis on the form of my papers than on the ideas"
Percentage of Students
= pre-survey
= post-survey
never
rarely
sometimes
frequently
0
10
20
30
40
50
60
70
80
90
100


"I ask someone to read and comment on my papers before handing them in"
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100
never
rarely
sometimes
frequently
= pre-survey
= post-survey


"I learn more from writing than from taking an exam"
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100
never
rarely
sometimes
frequently
= pre-survey
= post-survey


"Professionals in my field do a great deal of writing"
Percentage of Students
0
10
20
30
40
50
60
70
80
90
100
never
rarely
sometimes
frequently
= pre-survey
= post-survey

APPENDIX K

Has your attitude towards writing changed since participating in this class? If so, how?

Subject Code	Course Average	Survey Response
UFJ35	90.6	Slightly. I found that writing about concepts is helpful. Rewriting notes is also helpful.
UFM30	86.4	I've come to realize that writing is important in helping me understand what information I do and do not know. I didn't mind the assignments as much because I knew they were really helping me out.
UFO14	88.2	Not really.
UFL18	96.5	Somewhat. I still am very anxious about writing. Although my confidence has been boosted because of the good grades I have received.
UFP24	91.0	Not really, but I know it helps in the long run.
UFN06	95.4	I feel I had initially underestimated my abilities and I am a little more comfortable producing written assignments.
UFM39	81.5	No.
UMB03	90.1	No, I've always enjoyed writing.
UFB13	94.6	No.
UFK07	79.4	Yes, I have learned how to write in a different context from this class.

UFW58	86.0	Yes, I feel more confident about writing especially about the field of speech-language pathology. And I knew more in the general sense than I thought.
UFH41	75.3	No.
UFS29	85.4	Not really. I usually like to have more time to do an assignment such as these – so I can reserve time on a computer – but with short notice I learned to get to some other ways to type up my papers.
UFW01	72.2	No.
UFS17	96.8	No.
UFR09	91.6	I am not scared of writing assignments anymore. I feel I am more confident with the assignments I turn in.
UFH25	80.8	No, I enjoy writing much more than taking exams.
UFH16	86.0	I think so, I'm very interested in the material I was writing on. I really tried to do well on the assignments. My grades were really important to me. Having me narrow down my assignments to meet the page requirements helped me be less wordy. I was more organized that way.
UFA50	80.4	No.
UFW64	97.9	No.
UFA19	97.0	Yes, I feel more confident writing more clinically than creatively.
UFD40	88.6	Yes, I still get frustrated while writing them, but I'd rather be examined this way than an exam.
UFP56	86.0	Yes, I feel more confident in my ability to write, but it still produces anxiety because it is so time-consuming for me.

UFL44	80.4	Not really. Although after writing these assignments it made me feel like I knew something. They saved my grade.
UFL22	90.1	No, not really.
UFP66	76.3	(no comment)
UMS27	89.2	(no comment)

APPENDIX L

Did the written assignments influence your learning of course material? If so, how?

Subject Code	Course Average	Survey Response
UFJ35	90.6	Sometimes. They only helped and aided in learning if we were exposed to the topic beforehand. I found a few projects very difficult which forced me to seek outside sources. The Treacher-Collins syndrome project was very hard because information on this topic was hard to find. The first three were very helpful. I like the opportunity to write these papers. It was very fair and gave us the chance to let you know that we understand (or don't understand) the information. I appreciated how you incorporated "real world" situations into our learning process. The papers did help but also caused some confusion as well (I would have gotten a worse grade in the class if it weren't for the papers.)
UFM30	86.4	The assignments helped me learn the material a lot more fully because I was applying it to real situations. Situations I might face someday if I ever actually graduate. The assignments were also a review of the material.
UFO14	88.2	Yes. The instructor was wise to include several elements of each unit in individual assignments. It helps to see how all the "parts" work together when you are required to discuss their physical and their psychological aspects.
UFL18	96.5	Yes, because I learned those topics faster and easier than other topics we didn't cover with assignments.
UFP24	91.0	Yes, it's an excellent idea and it shows me that I can think through ideas.
UFN06	95.4	They gave me a clearer picture of concepts that were the point of the assignments. I feel after writing the assignments I had a better grasp of the material.

UFM39	81.5	Yes, the assignments made me study harder and find out information that I most likely would not have done on my own. The assignments were very beneficial for me.
UMB03	90.1	I think they helped a great deal because they were direct applications of learning in the classroom. If you didn't know the classroom material it was impossible to do the assignments. Conversely, doing the assignment allowed you to apply it to a real life situation.
UFB13	94.6	Yes, for me, it really helped me learn the information, make it more concrete, and I was able to tie all the information together.
UFK07	79.4	Yes, if you didn't understand something, you were forced to by writing the paper. If you did understand it, writing the paper reinforced what you knew and helped you learn and remember for the exam.
UFW58	86.0	Yes, it made some things a lot easier, but, for example, on the source-filter theory paper. I was confused as to write so I don't feel I wrote it as well as I would have liked.
UFH41	75.3	Yes, by researching and going over the material I learned more. Also trying to figure out the information needed for the assignment helped me better understand and remember the concept.
UFS29	85.4	It made me read the chapter a bit more thoroughly.
UFW01	72.2	Helped me considerably to understand things that I couldn't get out of the book or in class.
UFS17	96.8	Yes, useful integration of material. I will not forget what I wrote. I will forget what I studied for exams.
UFR09	91.6	Yes, they forced me to look deeper into a subject than I might have and therefore I learned that material much better.
UFH25	80.8	Yes, it has helped me understand the material much better.

UFH16	86.0	They helped me apply the things I've learned. Usually, I'd read over the notes and book and not really understand the concepts, but know enough to get by on exams. This really helped me think about what was actually happening and I really did understand the concepts we wrote about. They were also a good reference to study from.
UFA50	80.4	Yes, it made me sit and figure things out early instead of the day before the test. Felt like I was actually learning something practical that I will use in my future. Assignment #4 was very unclear in what should be included for the body-cover theory, #6 assumed we know a lot more than we do with nowhere to turn for further information on the disease.
UFW64	97.9	Yes, it made me think about things more completely and to put concepts together.
UFA19	97.0	Yes, the papers I really did a thorough job on allowed me to know and learn the subject I was writing on, therefore I didn't have to study for the exam. Saved me time!
UFD40	88.6	I feel that through sitting down and organizing my thoughts then writing them down help a great deal in my understanding of many aspects in anatomy and physiology. This is especially true for the paper on hearing. These papers made me thing deeper into each topic.
UFP56	86.0	Yes, I think assignments 1, 2, and 5 aided my understanding of the material.
UFL44	80.4	It helped me learn a lot of practical things. It didn't help me learn specifics though like all of the muscles that we need to know.
UFL22	90.1	Yes, by making me deal with the material in a different manner than if I had to study for an exam.
UFP66	76.3	Yes, I probably wouldn't have looked at this particular subject so in depth. But I didn't really use them as much of a study guide. It does make you look in the book though.
UMS27	89.2	(no comment)