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Final Project Report
Department of Energy
Preservice Teacher Enhancement Program

Title: "Science Teachers and Docents as Mentors to Science and Mathematics Undergraduates in Formal and Informal Settings"
(Try Teaching Science & Mathematics)

by

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Respectfully Submitted

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DISCLAIMER

Project Summary

Twenty-four undergraduate science and mathematics majors who were juniors and seniors in the Colleges of Liberal Arts & Sciences and Engineering were recruited, and paid, to participate in an orientation seminar and act as teacher aides in regional schools and the Florida Museum of Natural History. Aides worked with teachers in the schools one semester and as docents in the natural history museum a second semester. Mentoring took place by the principal investigator and participating teachers and docents throughout the program.

Success of the program was measured by a specially prepared attitude instrument which was administered to participants before the mentoring started and when it ended each semester. Written logs (field notes) were also prepared and submitted by participants at the end of each semester. Further, a tally was kept of the number of participants who decided to go into science or mathematics teaching as a result of the experience.

Results of this project will be prepared for an article in The Science Teacher and for presentation at the Florida Association of Science Teachers and the National Science Teachers Association meetings.

Summary of Participants

	Science	Mathematics	Total
Fall Semester	7	6	13
Spring Semester	8	3	11
		Total	24

Number Committed to a teacher education program after participation.

Fall Semester	7
Spring Semester	4
Total	11

Follow-up.

The Department of Instruction and Curriculum will seek funds to continue a "Try Teach" program next academic year.

Introduction

The University of Florida, located in Gainesville, Florida is a residential university with 35,000 students. Along with Ohio State and the University of Minnesota, the University of Florida offers more academic programs on a single campus than any of the nation's other universities, private or public. The 20 colleges and schools and 140 departments produce undergraduates and graduates in every scientific and engineering field. More than 2,000 faculty members and graduate students are awarded research and training grants annually, ranking the University of Florida among the nation's top 35 research universities. Sponsored research projects exceed 225 million dollars per year.

Students attending the University of Florida come from every county in the state, every state in the nation, and from 100 countries. Eighty-nine percent of the universities' entering freshmen earned admission test scores above the national mean. Of this group approximately 6% of the undergraduate student body are African American students and approximately 7% Hispanic. Twenty percent of the 6,000 students in the graduate school are international students.

The approximately 4,000 faculty of the University of Florida have been recruited from major institutions nationally and internationally. Approximately one-tenth of the faculty are females and five percent of the faculty minority members. The student-teacher ratio university wide is approximately 25 students.

Finally, the University has the Florida Museum of Natural History on campus, as well as, thirty-three research and cultural centers. A new 40,000 square foot Natural History Museum addition is under construction. Recently, a performing arts center as well as an art museum have been completed. Schools in the geographic area have exemplary science and mathematics programs and work closely with the principal investigator.

Rationale

Some reasons why science and mathematics undergraduates do not gravitate toward careers in teaching are: a lack of knowledge of the personal and fiscal rewards; a lack of opportunity to test this career out while still pursuing their undergraduate studies; and the general, but erroneous perception, that teaching is "not fun" or the pathway to becoming a teacher is dull and boring. In addition, students generally think of the formal school setting as being the context within which they would teach rather than alternative, exciting, informal settings. What is needed on campus is a mechanism for recruiting promising undergraduate science and mathematics majors and exposing them to teaching experiences, under supervision, in not only formal school

settings, but also contrasting informal settings such as the science museum.

Project Objectives

This project proposed to recruit undergraduates from the biology, chemistry, physics, earth science, mathematics, and engineering areas to act alternately as teacher aids and museum aids. Students who participated in this project received continuous guidance and advisement from the principal investigator on alternative teaching career possibilities in both contexts, (the schools and museums), during a one hour seminar each semester.

Participants were placed in the Florida Museum of Natural History as docent assistants and in the schools of the surrounding counties as teacher assistants in the sciences and mathematics. The principal investigator worked closely with the Director of Interpretation of the Florida Museum of Natural History and the Science and Mathematics Curriculum Supervisors in surrounding counties to place participating students in a tutorial context suitable to their background. Since the objective of this program was to influence attitudes towards a career in teaching, measures of the success of this program were primarily affective. Academic credit on the undergraduate level was be given in the College of Education for the one hour seminar, and a tally was made of how many students participating in this program entered certification programs in Colleges of Education, statewide or nationally.

Program Design

The program objective was to familiarize potential science and mathematics teaching candidates (undergraduates) with the role conditions, rewards and potential of a teaching career. This was accomplished through a seminar exclusively for students in this project. It occurred one day a week for three hours and carried a College of Education independent study course number. Students were also provided the opportunity to teach or tutor in the schools or museum. Although funding of this grant was delayed, university-wide publicity yielded 13 students in the Fall and 11 in the Spring

Participating students were assigned to docent aide positions in the Florida Museum of Natural History, or a science teacher aide position in the surrounding county schools according to their background, interests, and wishes. Participants were also pretested and postested using a Likert-type attitude measure

The seminar focused on problems and issues students perceived as participants in the schools and museums. In addition the project coordinator always came prepared to discuss modes of administration in schools and museum, career opportunities, salaries and the roles of the teacher. A frequent focus of

discussion was the discipline problems in schools and the apparent lack of motivation to learn which students exhibited.

Participants were pretested and postested during each semester using a Likert-type attitude measure. This measure sought to determine if the experience influenced participant attitudes about four areas: 1) teaching in the schools, 2) teaching in museums; 3) school organization and administration; and 4) It also sought to determine who or what influenced participant attitudes about the above.

Data Collection:

a. Subject area and sex of participants.

Table 1 gives a summary of the subject area and sex of each participant. Another general characteristic of participants was that they had to be juniors or seniors with a grade point average of 3.0 or better (B grade).

Subject Area & Sex of Participants

Fall 1992		**Spring 1993**	
Subject Area		Subject Area	
Mathematics	6	Mathematics	3
Physical Sciences	2	Physical Sciences	2
Biological Science	3	Biological Science	4
General Science	2	General Science	2
N=13		N=11	
Sex		Sex	
Females	5	Females	6
Males	8	Males	5

Table 1

A number of observations can be made about Table 1. For one, there were more mathematics and physical science majors than anticipated. A majority of these majors came from engineering and were exploring alternative careers because of a declining market for graduates in engineering, or, because of a loss of interest in the field as a result of becoming acquainted with it. Some members of this group expressed the feeling that they were "people persons" and engineering did not afford that opportunity.

Those students labeled "general science" had a significant lower division background in science (21 hours +). They were in the junior class and where anticipating majors in one of the

sciences in the College of Liberal Arts and Sciences. The biological science majors were in the College of Liberal Arts and Sciences and were exploring possible careers that one could enter with a degree in botany or zoology.

The distribution of sexes was roughly equivalent 11 females and 13 males. Of this group there were five minority males all of whom were Hispanic.

b) **Who or What Influenced Attitudes About Teaching Careers?**

	Fall 1992 N=13	Spring 1993 N=11
University academic advisor	23%	25%
Friends	77%	63%
Parents	69%	63%
Experience as high school student	69%	50%
Mass media	54%	63%
Experience in classrooms	77%	75%
Experience in museums	69%	75%

Table 2

When asked who or what influenced their attitudes about a teaching career (Table 2) the responses were both expected and surprising. It was expected that the university academic advisor would have an influence, but unexpected that it would be so small and negative (23-25%). It was expected that parents and peers would have a positive influence on career interest, and the responses confirmed this (63-77%). Experience in museums and classrooms had a relatively positive influence on career decisions (69-77%) while mass media about education had a lower (54-63%) influence. While is was expected that experience as a successful high school student and subsequently successful college student would influence their attitudes positively, the response varied from one semester to the other, somewhat neutral to positive.

Two analyses were done on the Likert data one to get a mean score for each item and the second to get a percentage of response score above or below undecided. Measurement literature points out that the percentage score represents a more valid way to represent this data.

c. Summary of attitude responses about teaching: pretest to postest Fall 1992 .

Table 3 below summarizes the pre and post data regarding attitudes about school teaching (12 items). The principal investigator anticipated that as a result of being in schools the general attitude of participants would go up.

Summary of Attitudes About Teaching Pre-Post Fall 1992

	Pretest	Posttest	Change
Teaching science is challenging	100%	85%	negative
Classroom is excellent place to promote science & mathematics	92%	85%	negative
Familiar with responses of teachers	77%	69%	negative
Opportunities for advancement	.31%	.53%	positive
Teachers adequately paid	08%	00%	negative
I would enjoy teaching	100%	85%	negative
Teaching is a profession	100%	92%	negative
Students motivated	46%	30%	negative
Students prepared to learn	23%	23%	unchanged
Too many distractions	15%	15%	unchanged
Learn Science/Math best in schools	23%	23%	unchanged
Controlling discipline not difficult	15%	15%	unchanged

Table 3

In table three the negative change represents a change from the percent of responses that were positive to a lower percent. For instance, on items such as teaching is challenging, the classroom is an excellent place to promote science and mathematics, I am familiar with the responsibilities of teachers, teachers are adequately paid, I would enjoy teaching, teaching is

a profession, students are motivated. There were fewer respondents who agreed on the posttest than on the pretest. That is to say, before going into schools the participants in the Fall gorup were more optimistic about teaching prospects than after the experience. Participants did feel that there were opportunities for advancement in teaching after being in the schools. Their perceptives that were unchanged as a result of the experience were that: Students were prepared to learn, there were too many distractions in the schools, science and mathematics can best be taught in schools, and that discipline control is not difficult. On each of these there was a small positive agreement and it did not change.

d. Summary of Attitudes About Informal Teaching Pre-Post Fall 1992.

Table 4 below summarizes the pre-post data regarding attitudes about teaching in informal settings such as museums and zoos (7 items). The principal investigator anticipated that as a result of being in a museum as an aide, undergraduates would see another career opportunity that involves teaching.

Summary of Attitudes About Informal Teaching Pre-Post Fall 1992

	Pretest	Posttest	Change
Teaching in museums would be challenging	77%	62%	negative
Museums excellent to promote science/mathematics	92%	77%	negative
Familiar with responsibilities of docents	62%	08%	negative
Opport. for prof.advancement	31%	15%	negative
Workers adequately paid	00%	08%	positive/min.
Enjoy informal setting	54%	62%	positive/
Museum education is a profession	85%	69%	negative
Students motivated	92%	77%	negative
Students prepared to learn	39%	54%	positive
Too many distractions	46%	39%	negative
Student lrn science & math. best in informal settings	39%	46%	positive
Controlling student not difficult	54%	15%	negative

Table 4

Although only a small number of the total participants, five, were able or chose to do the second semester experience in a museum all students were exposed to the museum and discussions about the participants experiences in the museum. Table four shows that after being exposed to the museum or discussions about it, seven of the response categories went down in the degree of agreement and three went up. On the posttest, there was greater agreement that museum workers were adequately paid, the informal setting was enjoyable, and that students were prepared to learn when visiting a museum.

e. Attitudes about School organization and administrators Pre-Post Fall 1992.

Table 5 below summarizes the data on pre-post attitudes of participants towards the organization and administration of schools. The principal investigator anticipated that as a result of being in schools as an aide some indication of students perception of the administration would emerge. Pretest scores probably reflect preconceived notions of school organization and administration produced as a result of being a high school studentas well as scores that reflect changes in attitude after being in schools and observing the organization and administration.

Summary of Attitudes About School Organization and Administration: Pre-Post Fall 1992

	Pretest	Posttest	Change
School time is efficiently used	23%	23%	unchanged
Administrators encourage experimentation	08%	15%	positive
Non-teaching duties take up too much time	46%	62%	positive
Administration disciplines well	08%	08%	unchanged
Laboratory facilities are good	15%	15%	unchanged
Class sizes conducive to learning	31%	31%	unchanged.
Would like teaching if no bureaucracy	62%	46%	negative
I would become a teacher if no education courses	23%	46%	positive
College of Education encourages innovation	46%	46%	unchanged

Table 5

Table 5 is characterized by relative low levels of agreement. For instance, six categories did not show a change pre experience to post. They were: school time is efficiently used, administrators are helpful in diciplining, laboratory facilities are good, class sizes are conducive to learning and Colleges of Education are conducive to learning. Participants agreed that administrators encourage experimentation (but only to a slight degree), non-teaching duties take up too much time, and that they would become teachers if they did not have to take teaching courses. A lower level of percentage of participants agreed that they would like teaching if there were no bureaucracy.

f. Summary of attitude responses about teaching . Pre-post Spring. 1993.

Table 6 below, represents a summary of the data on participants during spring semester 1993. This table is the spring analogue of the Fall 1993 table 3. During the interpretation and discussion section analogue tables for Fall and Spring semester will be discussed collectively.

Summary of Attitude Responses About Teaching. Pre-post Spring 1993.

	Pretest	Posttest	Change
Teaching science is challenging	63%	100%	positive
Classroom is excellent place to promote science & mathematics	88%	82%	negative
Familiarity with responsibility of teachers	75%	100%	positive
Opportunities for advancement	25%	18%	negative
Teachers are adequately paid	13%	09%	negative
I would enjoy teaching	100%	100%	no change
Teaching is a profession	88%	100%	positive
Students are motivated	13%	27%	positive
Students are prepared to learn	38%	09%	negative
Too many distractions	13%	00%	negative
Learning science & mathematics is done best in schools	25%	00%	negative
Controlling discipline is not difficult	00%	09%	positive

Table 6

A comparison of scores in this table and in Table 3, fall semester show some major differences in preception. These may be attributed to changes in the group composition and/or their participation in different schools. Since basic trends still remain the same the stability of the measurement instrument does not appear to be called into question.

g. Summary of attitudes about informal teaching. Pre-post Spring 1993. Table 7 below represents a summary of the data on participants during the spring semester 1993. This table is the spring analog of the fall Table 4.

Summary of Attitudes About Informal Teaching
Pre-post Spring 1993

	Pretest	Posttest	Change
Teaching in museums would be challenging	63%	64%	positive
museum is excellent to promote science/ mathematics	100%	100%	unchanged
I am familiar with responsi-bilities of docents	25%	55%	positive
There are opporunities for professional advancement	13%	55%	positive
Workers are adequately paid	00%	00%	unchanged
I enjoy the informal setting	88%	73%	negative
Museum education is a profession	88%	100%	positive
Students are motivated	100%	100%	unchanged
Students prepared to learn	63%	55%	negative
To many distractions	13%	36%	positive
Students learn science and mathematics best in informal settings	38%	27%	negative
Controlling students not difficult	00%	27%	negative

Table 7

The results in Table 7 reflect the fact that members of the fall group who chose to work in the museum with docents were responding with experience. Hence in the investigator's view these responses were probably closer to reality than those in table four since they do reflect first hand experience rather than inferences from discussions only.

h. Summary of attitudes about school organization and administration: Spring 1993

Table 8 below represents a summary of the data on participants during the spring semester 1993. This table is the spring analog of the fall Table 5.

Summary of Attitudes About School Organization and Adminstation: Pre-Post Spring 1993

	Pretest	Posttest	Change
School time is efficiently used	00%	39%	positive
Administrators encouage experimentation	00%	27%	positive
Non-teaching duties take up too much time	63%	73%	positive
Administration disciplines well	25%	09%	negative
Laboratory facilities are good	25%	09%	negative
Class sizes conducive to learning	13%	36%	positive
Would like teaching if no bureaucracy	25%	55%	positive
I would become a teacher if no education courses	25%	27%	positive
College of Education encourages innovation	13%	18%	positive

Table 8

Interpretation of Data

Table 1 shows that the fall and spring groups were roughly balanced in terms of sex. There were more mathematics majors and participants who taught or tutored mathematics from the College of Engineering than the College of Liberal Arts and Sciences.

Table 2 indicates that in general, college advisors do not have a very great influence on career decisions about teaching. Rather, parents, peers, and experience in classrooms and museums appear to be the major determinants of career decisions. Surprising to this investigator, mass media and the somewhat negative hype about education and careers in education had a relatively smaller influence.

When considering attitudes about teaching on the pretest-posttest fall and spring 1992 (Table 3) and 1993 (Table 4) attitudes about teaching appeared remarkably consistent. These neophyte science and mathematics teachers were basically optimistic about teaching as a challenge and the class as a viable setting. However, both groups generally disagreed about students being motivated to learn, prepared to learn or that there was adequate control in the schools. Similarly, respondents either mildly agreed or eventually disagreed on the posttest about science and mathematics being taught best in schools. Regardless, of their attitudes on other items, the school experience for both the fall and spring groups appeared to be a positive one. Although they felt that teachers were inadequately paid, they agreed that they would enjoy teaching.

In general, attitudes about learning science in informal settings, pre-post, fall 1992, spring 1993 varied. The fall group (Table 4) would not have a museum experience until spring, and only one-half of those students could do the two semesters. The spring group would be comprised of students who were in the museum working as docent aides and others who were doing the school experience. Out of the latter group, none chose to do the summer museum experience. Hence, the responses for spring represent a first-hand experience based set of attitudes while those for fall probably represent an attitude developed over the years as a museum visitor and also the result of seminar discussions.

Overall the data in Table 4 and Table 7 show some consistencies. Both groups felt the museum was an excellent place to promote science and mathematics. Lower post-test agreement probably resulted from math participants who generally do not view the museum as a "mathematics laboratory." Both groups agreed that students are prepared to learn prior to museum visits and are motivated during museum visits. At the same time, the responses varied according to direct experience. For instance, the fall group felt they were not familiar with the role of docents, while the spring group, having worked in the museum agreed that they were familiar with the role. Surprisingly, both groups agreed

that museum workers were not adequately paid. They disagreed on the amount of distractions to learners based primarily on the observations of the second group.

When asked about their attitudes about school organization and administration (Tables 5 and 8) there again appeared to be some consistency. There was a relatively low agreement on items such as the efficient use of school time, administrators encouraging experimentation, administrators as effective disciplinarians, adequacy of laboratory facilities, and the large class sizes. The participants did agree that non-teaching duties take up too much time and they would become teachers if there were no requirement to take education courses.

Discussion and Conclusions

Liberal Arts and Sciences and Engineering students are eager to participate in a career experience in teaching in the schools and museum.

Both sexes and minority group members participated with the expectations of perhaps finding a viable career alternative to engineering or the pure sciences and mathematics. One reason is that engineering students must make a professional commitment at the end of the sophomore year while Liberal Art and Science majors can earn a degree and then commit to education as a post baccalaureate student. The engineering program appears to be too professionally convergent to allow for an easy transition here.

When it comes to career decision regarding teaching it is unfortunate that university academic advisors do not have more influence. One reason, is that in large, research universities, faculty are focused on research and the contribution to knowledge resulting from this research. Many of the most productive faculty do not view teaching as a "major" or potentially "fulfilling" role. At the same time, many of these advisors perceive Colleges of Education with a certain amount of doubt and suspicion. This investigator would hope that university advisors outside of education would engage in a more positive effort in helping students make wise career decisions, while setting aside ungrounded stereotypic biases.

University students coming out of the sciences and engineering appear to be remarkable perceptive (Tables 3 and 6). In both the fall and the spring groups they recognized the shortcomings of schools and the impediments to teaching. Further their responses reflect a healthy attitude towards teaching as a profession and about working with students. Early experiential programs such as this one, certainly appear to be an effective way to recruit a capable, optimistic group of scholars to teaching. The results of this pilot project indicated that approximately half of those who participated in the project felt sufficiently

positive to sign up for science or mathematics preparations programs. Anecdotal data (Appendix 1) support these observations.

Tables 4 and 7 are interesting in the following ways. Attitudes reflective in Table 4 were the result of memorable experiences while those on Table 7 were the result of direct experience. Anecdotal evidence provides some illumination. During discussions, the group which was in the museum felt that it was "boring" and there was not enough "action." They also confessed during discussions in the seminar that it was hard to get visitor attention and to teach. Unlike their teaching experience where their role was well defined and recognized by students, in the museum they had to create a role. As undergraduates this was difficult for them and it was reflected in the spring 1993 responses. Direct knowledge and experience clearly influenced attitudes about museums.

The principal investigator expected the experience in the schools to yield negative attitudes towards the organization and administration of schools. Participants again showed remarkable insights for neophytes. Consistently, in class discussion participants decried the large class sizes, low motivation of students, the lack of discipline and interest and the inefficient use of class time and over abundance of non-teaching duties. These are issues that academic educators are very aware of, but their ability to influence change in schools has been minimum As this investigator constantly reminds his students, we know more about teaching and learning then we communicate and practice in schools. Someday soon we will have to do much better or the public school as we know it will be a thing of the past. Perhaps radical surgery is what is necessary both on schools and on Colleges of Education. Neophytes like these participants certainly were able to identify problems, issues and solutions that educators seem reluctant to take action on.

Epilogue

This project demonstrated a number of things to the principal investigator.

1. We can recruit the best and the brightest to teaching in science and mathematics. Better salaries, school conditions, and a concerted effort to change school pupils' attitudes, behavior and motivation are part of the answer.

2. Colleges of Education need to become, and be seen, as an integral part of the comprehensive university. Early experience-oriented programs like "Try Teaching Science and Mathematics" are a successful way to do this.

3. The University community is receptive to, and cooperative with, projects of this type. The attitudes of advisors in the sciences and mathematics can be

positively influenced by projects of this type. This project experienced excellent support and enthusiasm.

4. Schools and Colleges of Education need to rethink their roles with each other. The best that we know about teaching and learning must be reflected by school practice or neophytes will view the role of teacher negatively and not choose a school career.

Finally, the fact that eleven of twenty-four participants were influenced by this experience to choose a teaching career was encouraging, and further evidence of the need for and success of, this program.

Appendix 1

University Advertisement for Try Teach Program

Undergraduate Science and Mathematics Students

'Try Science & Mathematics Teaching'

A project sponsored by:

The U.S. Department of Energy
The U.F. College of Education
The Florida Museum of Natural History

For information
Contact:

Dr. John J. Koran, Jr.
Professor of Education & Curator
Florida Museum of Natural History
Norman Hall 305
Phone: 392-0761 ext 268

*Consider an undergraduate seminar on science & mathematics teaching (EDG 4930) with Dr. Koran on problems in science and mathematics teaching. Tuition Rebates Available.

Appendix 2

Instrument
Attitudes About Teaching Science & Mathematics

Name_____
College Major_____
Science background_____
College year_____

***Attitudes About Teaching Science and Mathematics**

I. Formal teaching settings include public and private schools.

A. Teachers

	Strongly Agree	Mildly Agree	Undecided	Mildly Disagree	Strongly Disagree
Teaching science in the public schools is challenging.	_____	_____	_____	_____	_____
The classroom is an excellent place to promote science & mathematics learning.	_____	_____	_____	_____	_____
I feel I am familiar with the responsibilities of a teacher in the public schools.	_____	_____	_____	_____	_____
There seem to be opportunities for teacher professional advancement in schools.	_____	_____	_____	_____	_____
I think teachers are adequately paid.	_____	_____	_____	_____	_____
I think I would enjoy teaching science and mathematics.	_____	_____	_____	_____	_____

* An instrument prepared for the Preservice Teacher Enhancement Program of the Department of Energy.

	Strongly Agree	Mildly Agree	Undecided	Mildly Disagree	Strongly Disagree
I think teaching in schools is a profession.					

B. Students

School students are motivated to learn science.					
Students come to school prepared to learn.					
There are not too many distractions for students in schools.					
Students learn science and mathematics best in school settings.					
Controlling student discipline is not difficult in schools.					

II Informal teaching settings include: Natural History Museums, Zoos, Science and Technology Centers, Marine Centers, Clubs, Churches and Family.

C. Teaching (Docents) and student visitors.

	Strongly Agree	Mildly Agree	Undecided	Mildly Disagree	Strongly Disagree
Teaching science in a museum or other informal settings would be challenging work.					

	Strongly Agree	Mildly Agree	Undecided	Mildly Disagree	Strongly Disagree
Museums and other informal settings are excellent places to promote science and mathematical learning.					
I feel I am familiar with the responsibilities of a docent (teacher) in an informal setting.					
There seem to be opportunities for professional advancement in museums, zoos and other informal settings.					
I think workers in informal settings are adequately paid.					
I think I would enjoy teaching in an informal setting.					
Being an educator (teaching) in a museum or zoo is a profession.					
B. Students					
Students visiting museums and other informal settings are motivated to learn.					
Students visiting museums and other informal settings are prepared to study and learn.					

	Strongly Agree	Mildly Agree	Undecided	Mildly Disagree	Strongly Disagree
There are not too many distractions for students in informal settings.					
Students learn science and mathematics best in informal settings.					
Controlling student discipline is not difficult in informal settings.					

III. School organization and administration.

School time is efficiently used for teaching.					
Administrators encourage teachers to experiment with new ideas.					
Non-teaching delegated duties take up too much time.					
School administrators do a good job of disciplining students.					
Laboratory facilities in most schools are good.					
Class sizes are conducive to learning in the schools.					

	Strongly Agree	Mildly Agree	Undecided	Mildly Disagree	Strongly Disagree
I think I would like teaching if it were not for the school bureaucracy.					
I think I would become a teacher if I did not have to take education courses.					
Colleges of Education encourage innovation and creativity.					

IV. How have your attitudes towards teaching been shaped? (Check two numbers--positive or negative and degree)

	Positively	Strongly	Moderately	Slightly	Not at All	Negatively
By my academic advisor in the University.						
By my friends.						
By my parents.						
By my experiences as a high school student.						
By mass media and literature.						
By my experience in classrooms.						
By my experience in informal settings.						

Appendix 3

Selected Annecdotal Participant Responses

Anecdotal Data (Sample)
Fall, 1992

Chemistry Major/Math Minor

Student worked well in geometry when they tutored each other.

Some of them are very confused. I don't think current on previous teachers could afford enough time to give them good background.

I don't have enough patience to deal with obviously intelligent students don't care.

Physics

I am generally so infavor of active learning that I feel like any criticism, I give it is so small compared to the support I give it.

Physics

Problems hampering education "the lack of team work or communication that exists between teachers and administrators"."

The main problems teachers face is the students lack of interest in learning.

Biology

none

Mathematics

Mr.---- puts far too much emphasis on proofs and not enough on solving problems.

Our schools can only improve so much in contrast to our kids and their families, or lack there-of who don't really care how school is going.

The teachers I met really cared--They are relatively educated just like a lot of white collar workers. But--students walking into the classroom with respect for the idea of an educator could do more than any reforms.

Mathematics

Not all students who wanted help in this course could show up after class because of lack of transportation home or sports practice.

Mathematics

As a person she is great (the teacher). She is very conscientious and caring about her work.

I was surprised that the students could not make the connection of the application of algebra to geometry.

I don't think I want to be a classroom teacher, the students' apathy would bring me down, but I feel it would be something I should consider in the future.

Mathematics

I plan to go into mathematics teaching. I feel as if my age and enthusiasm will play a major role in my teaching success. I recommend this program to anyone questioning an education professor. This program gives you the chance to see if you have the tools to teach, and if not, at least now you know!

General Math

Now, I can understand why teachers get frustrated when students do poorly on tests. I knew the students knew how to do the problems but did not study.

Chemistry

None

Mathematics

While we were walking between classrooms (the teacher) told me she has been teaching for 5 years and was ready for a change. She said teaching in high school was 70% teaching and 30% teaching parenting. She liked the teaching part of it.

I don't understand why "trig" is not taught using the unit circle--since I was introduced to the concept of the unit circle, trig makes much more sense to me now.

Physics

None

General Science

. . ."Her main problem was that she could not read the work sheet well enough to know what she was supposed to do. . ."

Anecdotal Data
Spring, 1993 Sample

General Science/Mathematics

It might have helped the students to understand the subject matter (today) if the teacher would have held a discussion either before or after the presentation in order to help students pick up on the intended message.

Museum of Natural History

"I learned that informal teaching settings can be challenging, and an excellent place to compliment the classroom education."

(Junior H. Visitors) "My impressions was that they took the visit to the museum more as a social act than anything else."

Chemistry/Physics

I think it takes some charisma, some energy to spark their interest. Students have so much curiosity and science has so many potential answers.

General Science/Math

"I've seen dramatic changes in our system of education since my childhood. . . students are encouraged to assume a much higher level of responsibility in today's schools.

. . . Learning experiences could be enhanced by a more controlled in-class atmosphere.

Mathematics

"The students definitely had more control of the classroom than Mrs. X. This is something I won't allow to happen in my classroom."

(The Discipline Committee) This is an excellent idea to have teachers make the decisions regarding punishments.

Chemistry

"I think teaching entails a lot of work just to be mediocre in it. A good teacher like X spends 120% of his time organizing his class and adapting to adversity."

Mathematics

. . . Watching him solving problems reminds me of my struggle with the infamous word problem. I see him begin to make a mistake so I intervene. We discuss what he is doing and why it is a mistake. He understands and even sees the mistake right off but only after I stop him.

All too often those students who are labeled gifted are given special privileges. I think it would be better not to treat them differently, instead, push then to do more instead of less.

Museum of Natural History

"The museum should invest in more software. What they have is somewhat informative but very slow and outdated."

Today is the first day I have seen any black families visit. It is very disturbing that few black children are exposed to such places.

In general people do not touch anything--exhibits should encourage interaction.

People move through the exhibits clockwise.

General Science/Mathematics

The students main problem is that because they have so much freedom they often get distracted and are slow at completing their work.

Museum of Natural History

"I feel that even if visitors don't learn as much as they would in a classroom or with a lecturer, they enjoy and remember what they did learn."

Museum of Natural History

I definitely enjoyed working in the schools much more than in the museum although I learned more here.

A visit "behind the scenes" in the museum has certainly positively influenced considering museums as a career.

The longer one stays in the museum the less likely they are to read long labels.