R E P O R T R E S U M E S

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AN EIGHT WEEK SUMMER INSTITUTE TRAINING PROGRAM TO TRAIN INSTRUCTORS OF INSTRUMENTATION TECHNOLOGY.

BY- ZIOL, FRANK J.
PASADENA CITY COLL., CALIF.

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AN INSTITUTE WAS CONDUCTED TO ASSIST IN THE DEVELOPMENT OF KNOWLEDGES AND SKILLS ESSENTIAL FOR TEACHING SPECIALIZED TECHNICAL COURSES. THE PARTICIPANTS WERE 16 TEACHERS IN THE TECHNICAL-VOCATIONAL AREA OF INSTRUMENTATION. THE ACTIVITY INCLUDED LECTURE AND DISCUSSION, DEMONSTRATION, LABORATORY WORK, AND FIELD TRIPS. THE SCOPE OF THE PROGRAM INCLUDED MATHEMATICS, PHYSICS, ELECTRONICS, MECHANICAL MEASURING PRINCIPLES, AND INSTRUMENT SHOP PRACTICES. THE INVESTIGATOR CONCLUDED THAT THE PROGRAM ADEQUATELY MET THE NEEDS OF THE PARTICIPANTS. (RS)

6-2142

EIGHT WEEK SUMMER INSTITUTE TRAINING PROGRAM

TO TRAIN

INSTRUCTORS OF INSTRUMENTATION TECHNOLOGY

Professor Frank J. Ziol, Director

Grant OE 4-6-062142 VEA '63, P. L. 88-210, Section 4 (C)

Pasadena City College
1570 East Colorado Boulevard
Pasadena, California, 91106

December 1, 1966

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Supported by a Grant from the
U. S. Department of Health, Education, and Welfare
Office of Education
Bureau of Research
Division of Adult and Vocational Research

Grant OE 4-6-062142-0717 VEA '63, P.L. 88-210, Section 4 (C)

An Eight Week Summer Institute Training Program to Train Instructors of Instrumentation Technology

Professor Frank J. Ziol, Principal Investigator

Pasadena City College, 1750 East Colorado Blvd., Pasadena, California 91106

July 5 to August 26, 1966

Purpose

The major purpose of the program was to assist in the development of knowledges and skills essential for teaching specialized courses in Instrumentation Technology. The Office of Education had recognized the importance of this area of instruction by developing a curriculum guide, Instrumentation Technology, OE 80033, and by support of a developmental program in the summer of 1965 to train teachers in this area. The 1965 program was presented to only a limited number of participants and could therefore not hope to alleviate the whole country's need for competent teachers in the technical-vocational area of instrumentation. Therefore, it appeared to be expedient to further enhance the implementation of the ideas presented in Instrumentation Technology by continuing and even expanding the training of teachers in this area. The summer 1965 experience suggested that teacher preparation in this area may best be accomplished by a two-summer program. The first summer would emphasize the material contained in the first two semesters of Instrumentation Technology and the second summer would prepare the teacher to undertake the courses offered in the last two semesters outlined in the curriculum guide.

The program was one of two such proposals submitted under the sponsorship of the Instrument Society of America. The other program was offered by State University of New York, Agricultural and Technical College at Morrisville.

Procedure

The Institute solicited applicants by brochure (Appendix A) and announcements in professional publications. The sixteen participants (Appendix B) spent seven hours per day, except one-half day on Friday, for the eight week period. The activity included lecture and discussion, demonstration, laboratory work and field trips.

The scope of the training program included the mathematics, physics, and electronics related to Instrumentation work; mechanical measuring principles and instrument shop practices.

Daily critiques of the program's conduct were utilized to convey the group's reaction and success to the staff. A similar critique of the experiments served additionally to evaluate the laboratory equipment available.

Results and Conclusions

The desired result of the program would be a motivation and confidence on the part of the participants to teach instrumentation.

This accomplishment is reflected in the report (Appendix C) tendered directly to the U.S.O.E. by a committee composed of F. Parker Wilber, President, Los Angeles Trade Technical College; J.C. Groenewegen, Consultant, Crawford Fitting Company and Past I.S.A. District XI Vice-President and; Robert Messamer, Manager, Data-Graph Engineering Department, Consolidated Electrodynamics Corporation.

A personal evaluation form submitted by each participant at the conclusion of the eight week period indicates the relative merits of each specific contribution and procedure. See Summary - Appendix D

The daily critique forms provide an illuminating exposure of the individual's acclimation to the program as well as the sensitive response of the staff to expressed concerns. See Summary - Appendix E

Conclusions as drawn by the principal investigator are:

1. The selection of candidates was validated by the effective rapport established between themselves and the staff. The deliberate inclusion of two high school teachers vitally interested in instrumentation was appreciated by their enthusiastic participation. They are and others may well be a source of post-high instrumentation instructors. The candidate from the industrial training scene gave considerable of industry's dynamic viewpoint.

2. The distribution of the training program over a two summer period is confirmed. Even more time seems desirable as the participants and the evaluation team call for more "skull" sessions. A repeat of this session "as is" would be desirable for another first year group.

3. The integrated teaching method so effectively presented by Professor Austin Fribance, found popular acceptance with the participants. Additional efforts and certainly a continued application to the next summer's program is indicated.

4. The lectures, demonstrations, and field trips adequately met the needs. In the area of laboratory equipment and experiments, there is much work to be done. The available items vary in quality, durability, and effectiveness. The participants suggested a period of time for development and construction of individual teaching aids. It is suggested that the supplies needed be included in the proposal funding and the participants transport the finished goods to their respective institutions. Some of the participants and staff members are enthusiastic about sharing their successful aids with the group.

5. Courtesy loans of equipment and the rental provision of the contract represent as effective way of dealing with the equipment problem.

6. An earlier contract award is essential to secure a full complement of participants. Institutional planning and support is difficult at the last moment.

7. Participants remain interested and desirous of credit for their efforts, but not necessarily at the expense of tuition fees to some other institution of record. Credit from the two-year institution conducting the program does not have particular significance.

8. A Summer 1967 Proposal will be submitted because:

   a. Eleven of the participants have firmly and enthusiastically indicated a desire to complete the second year portion of the U. S. O. E. Guide.

   b. The evaluation team clearly recommended a follow-on program.

   c. The initial and urgent need for Instrumentation teachers persists and the participants need to be brought to full degree of preparedness.

9. The grant will be concluded at an amount approximately $8,000 less than had been approved.

SCHEDULE

Students will attend class, lectures, and seminars for approximately four hours per day and have two and a half hours per day in laboratory sessions. The following tentative daily schedule will be followed:

8:30 - 10:30—Class on topic for day
10:30 - 10:45—Break
10:45 - 12:00—Seminar, individual study on special topics (math review), or guest lecture
12:00 - 1:00—Lunch
1:00 - 2:15—Continuation of class topic or guest lecture
2:15 - 2:30—Break
2:30 - 4:30—Laboratory

Two to three hours per day of outside study and homework will be required of each participant. Saturdays and Sundays will be free (as well as one afternoon per week). The total class, seminar, and lecture time will be 156 hours; laboratory time will amount to 79 hours (based on seven weeks and four days with one afternoon a week off, except for the first week).

STIPENDS AND ALLOWANCES

Participants will receive a stipend of $75 per week. Allowance for dependents accompanying the participant are available on a limited basis at $15 per dependent per week.
Travel allowance for one round trip(maximum 1000 miles) will be granted at 8 cents per mile.

APPLICATION PROCEDURE

Qualified applicants will be considered in order of application received. Address your request to:

Professor Frank J. Ziol, Director
Institute in Instrumentation Technology
Pasadena City College
1570 E. Colorado Blvd.
Pasadena, California 91106

The application shall set forth:

1. Vital data (name, age, address, etc.)
2. Present teaching assignment (subjects, location)
3. Educational and employment history
4. Reason for participation in this institute

INSTITUTE IN INSTRUMENTATION TECHNOLOGY

PASADENA CITY COLLEGE
1570 East Colorado Boulevard
Pasadena, California 91106

SUMMER INSTITUTE

in

Industrial Instrumentation Technology

for Instructors
in Junior Colleges and
Technical Institutes
July 5-August 26, 1966

PASADENA CITY COLLEGE
1570 E. COLORADO BLVD.
PASADENA, CALIF. 91106

PROFESSOR FRANK J. ZIOL, DIRECTOR

Supported by
United States Office of Education

Sponsored by
Instrument Society of America

Appendix A

OBJECTIVES

The primary objectives of the Institute are:

1. To assist present and future faculty members of technical institutes and junior colleges in preparing themselves to teach Physics for Instrumentation, Mathematics, Measuring Principles (Mechanical), and Electrical Circuits, AC and DC, from the first year of the Instrumentation Technology Curriculum as suggested in the presently available guide. (U.S. Office of Education OE 80033.)
2. To assist in the effective utilization of the Guide.

ELIGIBILITY

The participants will be selected from those now employed (or who expect to be employed in September, 1966) as teachers of Instrumentation or Automatic Control at technical institutes or junior colleges where it is expected that preparatory curricula will be given in instrumentation and automatic control. All participants should hold at least a B.S. degree or the equivalent. Selection will be made on the basis of the needs of the school. Those schools having no teachers would be given a preference. Teachers in schools which need to expand their staffs would also be considered most favorably. The remaining class openings will be filled by persons with an adequate background and who are currently involved in teaching instrumentation in technical or vocational schools.

PROCEDURE

This program will consist of courses with content designed to meet the needs of the teachers for the first two semesters outlined in the Instrumentation Technology Guide. Topics to be considered include the mathematics, physics, and electronics related to instrumentation; mechanical measuring principles; and instrument shop practices. The program will feature lecture, seminar, and laboratory sessions. Outside guest lecturers will be employed to present special topics of interest and field trips to observe instrument manufacture and use will be made.

Effective methods of teaching will be emphasized as consideration is given to subject matter. Attention will be given to the philosophy and principles of technical education. All participants will attend the same core of classes. A brief description and tentative outline of these courses follows:

Mathematics

Primary focus in mathematics for the participants of the first summer's program will be an attempt to identify the essential skills and level of achievement in mathematics required by students of Instrumention Technology. Several seminars will be devoted to these discussions. The participants will be encouraged to examine their own weaknesses in mathematics as well as to express their feelings on the best ways to present the subject in an applied manner to students.

Physics for Instrumentation

A study of the basic principles of physics emphasizing mechanics, heat, light, sound, and electricity, with particular emphasis on the principles embodied in the design of indicating and sensing devices. Emphasis will be upon developing a grasp and effective technique of teaching applied physics.

Mechanical Measuring Principles

A study of the more common sensing devices and components employed for the measurement of temperature, pressure, flow, and related phenomena. The laboratory portion of the course would provide practical information and experience with the application of basic theories to commercial instruments. Major concern will be given to instructional aids necessary for the participant to implement his future teaching assignment.

Instrument Shop Practices

A laboratory course designed to provide practical information on the application of basic theories to commercial instruments; instrument construction, tests, and accepted test procedures; and safety precautions which must be observed when working on instruments.

Electrical Circuits—AC and DC

A study of the basic laws pertaining to series and parallel circuits, reactance, impedance, and polyphase systems.

COURSE CONTENT

Outline of Program

First Week
- Careers in Instrumentation
- Teaching Instrumentation
- Diagnosing Basic Skills
- Classification of Instruments
- Organization of an Instrument Shop

Second Week
- Engineering Characteristics of Common Materials
- Review of Mechanics

Third Week
- Pressure Measurement

Fourth Week
- Temperature Measurement

Fifth Week
- Mathematics of Instrumentation
- Thermal Properties of Materials
- Instrument Installation

Sixth Week
- Liquid and Flow Measurement

Seventh Week
- Level, Humidity, Specific Gravity, and Viscosity Measurement
- Instrument Maintenance
- Review of Basic Electricity

Eighth Week
- Electrochemistry and Thermoelectricity
- Sound Instrumentation
- Optical Instrumentation

TUITION, FEES, AND HOUSING

No tuition or fees will be charged by Pasadena City College. Books will be available for loan. Living accommodations may be secured at an adjacent motel ($12 per day, two persons per room) or more modestly in the dormitories of the Fuller Seminary ($50 per month, two persons per room) located two miles away. Public transportation is available.

Eating facilities are available on the campus and immediately off campus. The cafeteria of the Fuller Seminary will be available after August 1.

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Appendix B

INSTITUTE FOR INSTRUCTORS OF INDUSTRIAL INSTRUMENTATION TECHNOLOGY

Pasadena City College
July 5 - August 26, 1966

PARTICIPANTS

Age 24 BS Tech. Educ., Okla. State U. '65	Oklahoma State U. Technical Institute '64 Oklahoma City, Okla. Instructor, Electronics	AYLER, Donald
Age 49 BS Physics, Winona C. '40 MS Educ., U. So. Calif. '56	Mt. SanAntonio C. '56 Walnut, Calif. Chairman, Engr. Dept. Instructor, Engr., Phys, Math Chem.	ALLEN, George
Age 59 Voc. Ed. Credential	Santa Monica City C. '39 Santa Monica, Calif. Chairman, Elect. Eng. Tech. Instructor, Ind. Electronics Automatic Controls	ANDERSON, Oliver
Age 46 BA Hist., Phys., Whitworth C. '66	Spokane Community C. '64 Spokane, Wash. Instructor, Instrumentation	ANDRE, Louis
Age 30 BA Management, Mich. St. U. '66	Dow Chemical Company '66 Midland, Mich. Instructor, Electronics	BROWN, Roger
Age 31 BS Ind. Eng, Penn. State U. '56 MA Math, Bowdoin C. '64	Allan Hancock College '56 Santa Maria, Calif. Chairman, Eng. Math, Phys. Instructor, Math, Calculus	COCKS, III Orrin

Age 48 BS Math, Idaho State U. '66 BA Education, Idaho State U. '64	Idaho State U. Trade & Technology '55 Pocatello, Idaho Instructor, Electricity Ind. Electronics, Math	DOWD, David
Age 46 BA Math, Drake U. '65	Casper College '61 Casper, Wyoming Instructor, Electronics	DINGES, Harry Jr.
Age 35 BA Phys. Science, U. of Iowa '62	Municipal U. of Omaha '65 Omaha, Nebraska Instructor, Electronics	FAHRLANDER, Daniel
Age 34 BS Chem. Engr., U. of New Mex. '53 MS Chem. Engr., Carnegie Inst. of Tech. '56	San Jose City C. '61 San Jose, Calif. Instructor, Eng. Draw, Math Str. of Materials, Statics	FORD, Herbert
Age 43 BS Ind. Ed., Stout State U. '51	Hawaii Technical School '64 Hilo, Hawaii Instructor, Physics, Math. Blueprint Reading	GOTO, Alfred
Age 37 BA Chem., Phys. Augustana C. '51	Lincoln Senior High '65 Sioux Falls, So. Dakota Instructor, Instrumentation	GRIFFITH, Robert
Age 50 Voc. Ed. Credential	Idaho State U. Trade & Tech. Dept. '60 Pocatello, Idaho Instructor, Instrumentation	MCDONALD, Walter

Age 36

BA Sociology, Whittier C '52
MA Ind. Ed., Cal. State at L. A. '62

La Puente High School '65 PIERCE, Kenneth
LA Puente, Calif.

Instructor, Ind. Ed.

Age 34

Voc. Ed. Cred.

Emily Griffith Opportunity Sch. SIDES, Robert
Denver, Colorado

Instructor, Electronics

Age 47

BS Chem., Indiana Central C. '47
MS Educ., Butler U. '48

Fullerton Junior College '65 SMITH, Hobert
Fullerton, Calif.

Instructor, Metallurgy, Math.

Appendix C

LOS ANGELES TRADE-TECHNICAL COLLEGE

400 West Washington Boulevard, Los Angeles 15

COPY

October 4, 1966

Dr. Robert Knoebel
Department of Health, Education, and Welfare
Office of Education
Washington, D. C. 20202

Dear Dr. Knoebel:

The volunteer evaluation committee has completed its evaluation report of the Summer Institute in Instrumentation Technology. The evaluation findings are based primarily on first-hand observations at different intervals throughout the summer session.

Our report includes (a) summary (b) evaluation of the institute and (c) suggestions regarding courses covering instrumentation technology.

I hope the enclosed evaluation report may be of value to you or your staff in appraising the value and usefulness of the Instrumentation Technology Institute conducted at Pasadena City College. Our committee unanimously felt that the program was very effective and recommends the continuation of this type project for the summer session period, 1967.

Sincerely,

F. Parker Wilber
President

FPW:gf

Enclosure - Evaluation Report

cc: Dr. A. Sarafian
Dr. F. Ziol

EVALUATION REPORT

Summer Institute in Instrumentation Technology

Conducted at Pasadena City College

Summer, 1966

A. Summary Recommendations

B. Evaluation of the Institute

C. Suggestions Regarding Courses Covering Instrumentation Technology

Prepared by the

Volunteer Evaluation Committee

J. C. Groenewegen, Consultant, Crawford Fitting Company
Past District XI Vice-President, Instrument Society of America
Residence - 2229 Guadalana, Palos Verdes Estates, California

Robert Messamer, Manager, Data-Graph Engineering Department
Consolidated Electrodynamics Corporation
360 Sierra Madre Villa, Pasadena, California

F. Parker Wilber, President
Los Angeles Trade-Technical College
400 West Washington Boulevard, Los Angeles, California

A. Summary Recommendations

The committee is certain that the institute program is well-organized, conducted to the specifications of the contract, of high quality as a technician educational project, and provides essential instruction for post-high school technology in instrumentation.

Based on our findings, the committee unanimously supports the general objectives of the institute; it further recommends the extension of this program into a second phase institute session for summer period 1967. The 1967 summer institute is needed in order to provide the present participants (or others) the advanced instruction they will need to teach specialized courses in technology at the post-high school level.

Recommendations:

(1) The Summer Institute in Instrumentation Technology offered at Pasadena City College through the grant provided by H.E.W. is commended for conducting a program of educational quality, and one that meets the objectives of the grant (contract). The Institute should be continued in Summer, 1967, as a Phase II of the present program for those condidates who completed Summer School, 1966, and for the benefit of other candidates who may qualify.

(2) The Pasadena City College Board of Trustees and the administration of the college are encouraged to approve and appropriately support the 1967 Institute proposal. The Institute is an excellent example of a program achieved through proper cooperation of community Education-Industry relationships and by assistance of government.

(3) The attendance to the Institute should be broadened without additional financial costs. A selected and limited number of Southern California Junior College technician instructors should be allowed to audit the lecture periods and observe the industry equipment presentations. This procedure would neither dilute the quality of the instructional presentation nor overcrowd the facility. There are ample empty seats in both the lecture periods and in the equipment presentation periods. Such an added group would live at home and entail no cost to the program.

The inclusion of qualified "observers" or "auditors" would contribute to further implement the objectives of the Institute and also publicize the field of instrumentation technology within the Southern California area.

(4) The Institute, if conducted in Summer 1967, should attempt to widen the representation of industrial concerns and equipment to assure that the candidates are exposed to the fullest variety of modern equipment possible in the scheduled time. Repetition of equipment procedures should be avoided whenever feasible.

Signed:

J. C. Groenewegen

Robert Messamer

F. Parker Wilber

B. Evaluation of the Institute

I. Evaluation Committee Activity

The approved volunteer team accepted responsibility for evaluation of the Summer Institute in Instrumentation Technology. The committee agreed upon an outline for observing program characteristics and specific activities conducted in the Institute.

The committee met upon three stated occasions. Thereafter, each member individually visited the Institute upon several occasions and personally inspected the program at first-hand. The evaluation observations were made at different intervals during the Institute. The findings of the three committee members are substantially in agreement.

II. Meeting Objectives

The announced purpose of the program is "to assist in the development of knowledges and skills essential for teaching specialized course in Instrumentation Technology." This has been sucessfully accomplished. The enrolees were well chosen in both background and geographical spread. The instructional staff was effective as well as very competent. Objectives of the course were clarified on the opening day and were agreed to by all. At least ninety per cent of the objectives wer attained. At the conclusion of the Institute eleven of those who had participated indicated their desire for the opportunity to attend a similar course covering the third and fourth semesters of the curriculum (OE-80033)

The instruction conducted by Professor Ziol and the other instructors encompassed (1) demonstrations of effective teaching, (2) applied and theoretical mathematics, (3) physics for instrumentation, (4) mechanical measuring principles, (5) basic electrical circuits. The program schedule was reasonably divided in time allotments between lecture, demonstration seminars and laboratory periods, and essentially as outlined in the proposal. Some prescribed outside study was required of the participants.

The morale of the participants was good generally, and much enthusiasm for the Institute program was observable and noted in personal interviews with the students. Complaints were minor and generally seldom related to class instruction or projects; suggestions made by the participants were identified and responded to by the faculty and Professor Ziol. Daily critiques of instruction were made by the students and handed in daily to the teaching staff.

III. Curriculum

The instructional content of the course avoided narrow specialization and was held to a level consistent with that for training technicians. Course materials were up to date in all respects. In a few cases some revision of the allocated time was found to be necessary. This was done at no sacrifice to the program.

Some additional opportunity for "skull sessions" would be helpful.

Lectures, laboratory problems and outside study of given reference books were the basis of the course. The opportunity to observe the varied skills needed by the Instrument Technician was provided by field trips to industrial facilities employing that end product. Qualified guest speakers from local industries presented some of the material.

IV. Facilities

The air conditioned classrooms and laboratories are modern and excellant in every way. While Pasadena City College does own a considerable number of instruments and related equipment, this was supplemented by items loaned by local firms and some rented items which a commercial firm had produced for the educational field. These last mentioned items were not of a quality or design suitable for the intended usage. The laboratory tool room was well equipped and met all needs.

The college library made special arrangements, which made a wide assortment of text and reference books available in one of the rooms used for this course. Library cards had been provided for each enrolee, and the self-service principle applied. Guest presentors presented the principles of their products and not the proprietary aspects. Each had actual items along for study by the group.

V. Support By Local Sections of the Instrument Society

The District Vice-President of the Instrument Society Association participated in one session and audited a second. Other members participated in other ways. One section provided the coffee for the duration of the course.

Further, the welcome extended to the group by local hosting firms during the field trips indicated the general and complete support by the industrial community.

VI. Evaluation by the Participants

Student instructional project and subject matter evaluation was encouraged by the professors: An Experiment Critique Form was utilized and gave the participants the opportunity to not only check the on-going experiments/projects, but to measure the potential usefulness of the experiment or project in their own school programs.

Also employed was a Daily Critique Form that was filled out by one student who was chairman and whose duty it was to obtain typical view points of the class to the various instructors, presentations or projects. The Daily Critique Form requests from the students their "constructive assessments and suggestions", and further, they delineate their ideas in the columns "positive factors" and "negative factors".

A perusal of these daily reports was made by the committee, and it is noted that the class members actively participated in improving instruction and in measuring the worth of various instructional activities. Professor Ziol and the staff took these student reactions seriously.

VII. Candidates for the Institute

The participants were representative of potential instrumentation teachers or teachers currently assigned teaching instrumentation in post-high school programs at area vocational schools, private institutes or junior colleges. They varied considerably in educational background and actual industrial experiment. Many of them had limited or no exposure to some of the modern equipment that was demonstrated in presentations or utilized laboratory projects.

As a group, they represented a superior level of technical instructors. They are bright, eager, enthusiastic and generally well-selected for the program. They were not just "summer scholars" chasing a few college units.

VIII. The Faculty

The instructional staff included both professional and industrial members. The staff was well selected and presented specialized units that as a total institute session comprised an appropriate, well-balanced curriculum for meeting the objectives of the contract project. The presentations made by industry representatives were objective, and equipment sales promotion was not condoned.

The instruction and leadership provided by Austin E. Fibance, Professor, Rochester Institute of Technology, was of exceptional value and a great contribution to the effectiveness of the Institute.

C. Suggestions Regarding Courses Covering Instrumentation Technology

Re: OE-80033 Instrument Technology- A suggested Two Year Post High School Curriculum.

Page 9, upper half, summarizes the four semesters and the subjects to be covered. It should prove to be helpful if several of the subjects were presented by faculty members other than the instructor in Instrumentation. While the summary shows an average of just over 3½ hours per week of combined classroom, laboratory and outside study, this should be considered as the absolute minimum. Increasing this to 15 hours per week would be more realistic. This is based on the need for a broad and complete training.

Page 96, Basic Equipment. This listing is very comprehensive in its suggestions for items related to the electric/electronic part of the training. That same listing is woefully short of suggestions for equipment to be used for training on pneumatics.

Page 27, Sequence of Division VI and Division VII. Instructors, in developing their own schedules, will most likely find it desirable to reverse the order of these suggestions. This order of study is also the logical approach.

Additional items. Proper documentation of all moves made during calibration of the various items should be stressed. Along with this comes the need for emphasis on the proper sequence of the steps taken. The effect of angularity and multiplication in link and lever is an example. The plotting of "S" curves during calibration of such machanisms can be very helpful.

Soldering - both soft and silver, light welding and the fabrication of various items which will become a part of the student's personal tool kit should be a requisite.

The skills required for trouble shooting should be developed through practice on items which have previously been incapacitated. Again the desirability of making notes on each move, and at the successful completion of the project a review of those notes as a means of determining incorrect moves, should be stressed.

Another item which could well be covered would be the use of a multi-channel recorder to plot the related changes in process control. An example would be a pressure transmitter connected to a vessel, and receiver-controller and its output to a control valve and the movement of the stem of that control valve. This might be a simple "homemade" device as well as a commercial item.

The above leads to the study of responses of components and systems using pneumatic signals as well as step and frequency changes.

Acquisition of equipment for use in training technicians.

Frequently, local industry is able to donate items no longer needed after plant changes have been made. These may not be the most modern, but they do represent the basics. It has been said that it takes a far better qualified technician to maintain an old plant than a new installation. Also, the older employees are usually assigned to the newer equipment. Government surplus lists often lead to useful items which can be acquired At a recent government surplus auction there were many lots of items which contained articles which could well have been used by technical school courses in Instrumentation. Shipping and crating costs can become a problem with such items.

Most instrument producing firms are reluctant to contribute obsolete models, for fear that they might be considered as current items. They do in many cases offer a "educational institution discount". Those same firms can be a source of informat on as to where plant changes may be releasing components which would be of use in training activities. Occasionally, the ads of auctioneering firms will reveal items of possible value in training. These recently, in one community, ranged from balances to zero cold environmental chambers.

Perhaps the area of equipment provides an opportunity for the student to apply through trouble shooting or systmes "check-out" during his last semester, the principles he has learned through theoretical projects. A term project involving a hardware output might be beneficial as a means of developing fundamental occupational skills.

Appendix D

INSTRUMENTATION INSTITUTE EVALUATION

As a participant you have conveyed your daily reactions to one of your associates who summarized the key points and thereby influenced the activity of the following day. Now you are asked to review the entire period and make relative comparisons. We also ask your guidance for a follow-on program next summer. Thank you.

1. Please rate the following persons who made presentations as indicated. Use the scale (1) low to (5) high.

		1	2	3	4	5
7/5-8 F. J. Ziol	Introduction, Technician, Standards, Linear Measurement, Instrument Factors			1	8	7
7/5 George Morrow	Employment Opportunities	2	3	9	2	
7/6 Joe Huffman	Instrument Society of America Opportunities for the Technician			9	6	
7/7 Gordon Stuart	NOTS - Standards Laboratories		2	7	6	1
7/11-15 Alec Ball	Mechanics and Materials			2	12	2
7/13 Howard Martens Marty Liepold Dave Fishbach Bill Carrol Bob Bounty Bob Freeland	JPL Materials Problems			3	11	2
7/13 Phil Carpenter	JPL - The Technician			7	7	1
7/18 Larry Johannsen	Nuclear Instrumentation		1	4	7	4
7/19 Wes Towner	Shell Chemical - Instrument Shops & Maintenance Prcblems		3	6	7	
7/20-21 Vern Spaulding	Basics of Electricity			2	7	7
7/22 Warren Root	Fluidics			3	11	1
7/25 8/12 Austin Fribance	Pressure, Temperature and Flow		1	3	4	9
8/3 Bert Biles	Barton - Measuring Instruments			9	6	1
8/11 Chuck Gardner	Electrical Power Plant Instrumentation	1	4	7	3	
8/15 F. J. Ziol	Vacuum Production & Measurement			1	7	7
8/16 Steve Kerstner	Pneumatic Instrumentation		1	6	5	2

Appendix D (Continued)	1	2	3	4	5
8/17 Dan MacGilvary - Fluid Power	1	2	9	4	
Bob Wilsher - Fluid Connections	1	1	9	5	
8/17 Ted Garrett - Mass Spectrometry		2	3	10	1
Jonas Saunderson - Spectro Photometry		4	6	7	
Ed Escher - Chromatography	2	5	6	3	
8/19 Pete Perino - Introduction to Transducers			1	6	8
Ken Pinkham - Universal Strain Gage		1	9	6	
8/22 Emery Ferree - Thermo Electricity & Resistance Thermometry		1	6	6	2
8/23 Tony Schneider - Sound Instrumentation		2	10	2	
8/24 Tom Kehoe - Analytical Instrumentation			2	10	4
Bill Ulrich - Spectro Photometry			2	12	2
Bob Villalobos - Chromatography		1	1	11	3
Bob Jones - Electrochemistry			6	10	
E. Houser - Sample Handling		1	4	9	
T. Przysiecki - In-House Training		4	5	7	
R. Serne - Technician Needs			5	9	

2. Please rate the teaching equipment available to the Institute

	1	2	3	4	5
Linear Measurement (PCC)			2	9	3
Materials Testing (Scott)		1	7	7	
Materials Testing (PCC)			4	9	2
Nuclear (PCC)		1	1	8	5
Electrical Basics (PCC)			6	7	3
Fluidics (Imperial-Eastman)		2	10	5	
Pressure, Temperature, Flow (PCC)		1	10	3	1
(Scott)		1	4	11	
(Hickok)		6	6	3	
(Brodhead-Garrett		2	6	8	
Pneumatics (PCC)		1	6	7	
(Foxboro			4	8	3

3. Field Trips Number Too Many 15 Adequate 1 Insufficient

Best Trip

Overall Rating 4 7 6

	1	2	3	4	5
4. Library Facilities			2	9	4
5. Institute Management			2	4	10

6. Constructive Suggestions

Split pay sessions up into four periods. Keep dependent stipend. Provide some means to make speaker's voice heard in plant tour. It is discourging to race through a plant area and not be able to hear what is being said about the area.

I would like to see more of the plant or facility when we go on field trips. I feel to actually see Instrumentation in use & explained as did the Forman for S C Edison in the afternoon tour, so that we may keep up with actual changes and new techniques in the industry, would be helpful. I wish to say many thanks to Professor Frank J. Ziol for a job well done in planning and directing this institute, for a most enjoyable eight weeks and for a wealth of information I am taking with me to upgrade our program at Idaho State University.

I would suggest more lab equipment with the opportunity to do more experiments. This summer's work was well worth while. I am glad I did not miss it. Thanks to all for their great effort in carrying on the Institute.

Perhaps 3 more during 3 weeks period. A. Full day alloted to the Wescon show plus perhaps another half day for discussion would have been valuable.

Think "How to's" good, but how about 10-15 per week instead of 2 large blocks? My participation this summer may be unique in that I seriously doubt that I will be called upon to teach any instrumentation. I do feel, however, I will have a great deal to say as far as establishing curriculum - which this summer certainly gave me much foundation for, and in the selection of the teacher. I do not think that I could have possibly gathered so much information that will benefit our school and students in a short weekend seminar. I appreciate much more the whole instrumentation picture, thanks to your institute, and feel confident that within a few years we will have a going program at Allan Hancock College.

Might be interesting to tour another educational facility that offers instrumentation to check curriculum, laboratory facilities, etc. Would require no more than a half day.

I honestly feel that a six hour per day session would be sufficient time to cover the essential material. I am basing this remark on the experience of this institute.

Bus had a square wheel. Put round one on. Institute was very good. It is the best one that I have attended.

More formalized or structured labs. Much more efficient use of everyone's time would be to split participants into at least two groups with each group having labs on two afternoons (or parts of afternoons) a week, with the other groups having free time of some sort. Shorter doses of everything. Most field trips were too long with a tendency for the oral presentations to drag on and on. Shorter "doses" of everything. Very difficult for both teachers and especially participants to keep up interest on one relatively small area for a whole day. If possible try to have at least two different subjects or main areas in any one day, even if they have to be continued for several days. Arrange for housing possibilities for families with children. Furnished housing for children is very difficult to obtain on the open market. Easiest way might be to arrange for participants to be able to use the housing office facilities of, say, Cal. Tech.

The magnitude of task you set for yourself this summer could only be appreciated by one who attended this institute As with many efforts, there were high lights and low spots. I think however, that the overall program was well conceived and executed. The results of your efforts on our behalf were obvious time after time. This summer you had your "shake-down" cruise. I predict smoother sailing with each passing summer. Thank you for inviting me to attend, and a special vote of thanks to you and your charming wife for the consideration and kindness extended to ourselves and our families.

Have a personnel man to question on field trips assign experiments to be followed to completion so a quanitative evaluation can be made of procedure and equipment. Preview more educational films. More student participation in classroom. Introduce concepts and equipment used in PSSC Physics. Keep up the flow of instrumentational aids, charts, films, etc. Keep visiting lecturers to one half day.

Lab organization, procedure and follow up can be improved. When equipment is limited, participants could stage a formal lab demonstration with all members of the class situated so they have an optimum view of the action, we should be involved in recording and evaluating the experiment. A P.A. system should be provided for speakers with small voices who do not respond to a request to speak louder.

Consider visiting Autometics Metrology Installation during the physical measurements presentation.

Laboratory activities could be better planned: where possible have eight specific experiments to be done (groups of two); list of equipment, price, and catalog identification supplied for each. If possible get Austin Fribance for next year again.

Would like to have had a more structured laboratory.

7. Count me in for a "follow-on" second year Institute - June 28 - August 22, 1967

11 Yes 3 No 2 Undecided

Appendix E

Date

DAILY CRITIQUE

Critique Chairman

ACTIVITY (Lecture) (Demonstration) (Laboratory) (Field Trip)

Briefly Describe ——

Names of Contributors ——

CONSTRUCTIVE ASSESSMENTS AND SUGGESTIONS

Positive Factors	Negative Factors
1.	1.

DAILY CRITIQUE

July 5, 1966

Positive Factors	Negative Factors
1. Air Conditicning Wonderful!	1. Self introduction of participants, should have been requested, many not heard.
2. Orientation, Dr. Ziol, Excellent information given and questions answered completely.	2. Mr. Morrow, material too general, vague presentation. (Questions answered very well however, and as accurately as possible).
3. Dr. Sarafian, background and history of school well covered. Interesting and informative.	3. Seats in lecture room, not as comfortable as those in many other rooms.
4. Tour, adequate, but not too lengthy.	
5. Program outline satisfactory. (Most of us were uncertain as to what to expect or what was expected.	
6. Informal atomsphere appreciated.	

July 6, 1966

1. The morning session was good. The prepared transparencies helped to maintain interest.	1. A five minute break each hour, would soften the chairs and would allow us to stimulate our circulatory systems.
2. Mr. Huffman's talk was a great deal more interesting than Tuesday's speaker. His candid remarks enabled us to see more behind the scenes, than did Tuesday's speaker. The question and answer period provided us with much needed information on at least one industry's needs. His enthusiasm made it much easier to communicate with him.	2. The transparencies were slightly out of focus.
	3. A little more instruction could have been used on the measuring instruments in the lab downstairs.

July 7, 1966

1. The division of health facities motivated a break at 10:15.	1. Several fellows feel we're moving too slowly, (I'm one of them) because, apparently, we have had some of this before.
2. Several of us at the break decided we might be training and not really educating. Some of us teach WHY	2. A suggestion-Permit the teachers to

only, and no HOW. 3. Lecture on optical looking, beneficial for understanding field trip. 4. Field trip very well coordinated with the daily unit.	submit additional material that may be covered along with the objectives of the institute. 3. Possible for us to have an upright ashtray in aisle outside of lecture room?
July 8, 1966 1. All contributors felt that the speed with which the subjects were covered was much better. None wanted to slow down, feeling that questions would slow down the lecture when the going gets tough. This was about the only comment received.	1. One or two members still think the seats are too hard.
July 11, 1966 1. More student participation than (yesterday), before. Both in lecture room and lab. 2. Best day of six. 3. Day well spent	1. No Comments
July 12, 1966 1. Some participants welcomed the more frequent breaks so they could stand up. 2. Some felt that the class work was proceeding at just the right pace. The ABC approach (to quote the instructor) to the properties of materials seemed to be a good review for some. 3. Everyone seemed quite interested in the Scott equipment and glad of the opportunity to evaluate it for use in his school.	1. Some participants felt that time was wasted with the extra breaks. 2. One person felt that we were going too slowly, not getting enough done. He felt that the discussion of atomic theory was too elementary and in fact not necessary at all with this group. 3. Other men felt in the morning that the development of the lecture and discussion was somewhat slow, but were satisfied by afternoon that the ground was being covered. 4. One participant requested that the professor speak just a bit louder. 5. It was suggested that the laboratory work groups be made smaller, with more laboratory equipment available so that each individual could get his "hands on" the equipment.
July 13, 1966 1. Well planned 2. Hit our needs very closely, moved along rapidly, questions answered expertly. 3. All contributors displayed assurance and confidence. 4. PERSONALLY, I think this was one of the best tours I have ever been on.	1. Could have expanded on Bosco School somewhat. 2. Prefer to view Engineering-Aid in action, rather than assembly and fabrication people. 3. Final morning speaker (vibration man) became a little too technical. 4. On tour, some areas were a little too noisy to hear speaker well. 5. Presence of feminine pulchritude occasionally caused visitors to collide with door jams.
July 14, 1966 1. Good idea to intersperse talks by participants with the lecture. Better than all lecture and then all talks. 2. Good coverage in lecture material. Interesting and moved fairly well.	1. Some talks by participants were too long. Only way to limit teachers to five minutes is probably with a timer and bell. Average for five people was fifteen minutes each.

July 17, 1966

Appendix E (Continued)

COMMENTS FOR THE DAILY CRITIQUE SHEET

1. First morn ng session too detailed-the rest, (the other thirty minutes), good.
2. If you can't say something good, don't say anything.
3. Introduction to some good slides to be used in Physics class as well as fluids.
4. I think the two days did a sincere job in presenting what they think (or thot) was important.
5. I feel this a lot of help in seeing the actual mechanics of the fluid power field as an aid to teaching hydraulics and pneumatics.
6. Good practical info., too much detail in the various "hook-ups"
7. Stimulated an awareness for the importance of fluid-power instructions.
8. Too much repititive detail, but this is sometimes unavoidable with company men making a presentation. At times it was difficult to hear.
9. Interesting, but sometimes difficult to connect to instrumentations.
10. Somewhat too much of a company-customer oriented development, but probably unavoidable.
11. When men making presentation have to principally face this type problem, when developing their presentations.
12. Men presenting material should talk louder.
13. Probably should have alloted about half as much time to this com any as a few key items well covered would have given a good picture of fluid power for our purposes.

	Brought up topics that could be futher studied by those interested but not in such detail to bore those not so interested.	2. A small number felt material was beyond them and too brief for their understanding.
3.	Good laboratory demonstrations by Daniel Zicl.	3. Some people were interested in getting brief dittoed specification sheets with approximate cost for the various lab. instruments and equipment.
July 15, 1966		
1.	A very good morning	1. Material covered too rapidly for those with lesser backgrounds.
2.	He has good teaching methods. (Suggestions helpful)	2. More time should be allowed for student reports - Countered by "some fellows take too much time."
3.	Alec gave a good broad view of the picture - helpful.	3. We should've spent an hour at least "wrapping up" our JPL tour. (Numbers two and three were suggestions).
4.	Helped uncover "weaknesses" in this area.	
July 18, 1966		
1.	Mr. Johannsen is a terrific instructor.	1. Would like to have had instructor spend more time demonstrating each piece of equipment before turning students "loose" on their own. (All participants did not concur on this).
2.	Mr. Johannsen always answered questions very well and completely.	2. Several participants disturbed by the discourtesies shown the instructor by a small fraction of the class.
3.	Very well organized methods of putting across difficult information.	
4.	Very efficient instructor to make such good use of limited time.	
5.	Termed a very valuable day in the course of the institute by most all participants.	
July 19, 1966		
1.	Appreciate literature on shop instruments, tools etc.	1. Perhaps too much time was spent reading lists given out.
2.	Instrument course of plant gives good suggestion for upgrading course.	2. Suggest a trip through part of plant to see instruments in operation would be helpful.
3.	Trip through instrument shop very good.	3. Visual Aids might help to "spark up" presentation.
4.	A lot of work and effort was put forth to make this trip a success.	
5.	Appreciate the detail that instrument forman went into training schedule.	
6.	Over all, this field trip accomplished a great deal in giving us a picture of what our students need to be employable by such an industry.	
July 20, 1966		
1.	Well organized.	1. Too brief and rapid for those with little or no background. Agreed that this could not be helped.
2.	Emphasized teaching techniques.	
3.	Emphasized advantages for understanding operations rather than memorizing formulae.	
4.	Maintained interest.	
July 21, 1966		
1.	Dynamic personality of Mr. Spalding, held the interest of the class.	1. Could have had more demonstrations showing the application of principles, before turning class loose to flounder.
2.	Covered material that is considered essential to the Instrumentation Technician.	2. Could have mixed those members who are familiar with subject, with those who

3. Material was well planned and organized. 4. Caused class participation by solving problems on test. 5. Caused no embarassment of those who were unfamiliar with the subject matter. 6. Showed valuable movie on pertinent subject. 7. Sprinkled humor in at the appropriate times. 8. Developed valuable and interesting laboratory experiment, which helped to tie principles together.		are not, so that the ones who were unfamiliar might be guided somewhat better. 3. Could have recommended some more text books covering the subject of electronics and electricity as applies to the Instrumentation Technician.
July 22, 1966 1. Mr. Root is a dynamic and personable speaker who quickly generates interest in his subject. 2. The use of slides and the chalkboard was effective in explaining new concepts. 3. The speaker was straightforward and honest in readily admitting when he did not have an answer to a question. 4. The session moved along briskly and the interest of the audience was maintained. 5. Everyone contacted was favorably impressed by both the speaker and the field of fluidics.	1.	The material was justifiably covered extremely fast. And under the circumstances involved, the class feels that Mr. Spalding did an outstanding job. 1. Only one minor negative factor was noted--the speaker had not brought along enough of some of the hand out material to supply the complete class.
July 25, 1966 1. Challanging questions, "making one uncomfortable enough to think. 2. Unusual approach to gain attention, resistance concept. 3. Enthusiasm and humor appreciated.		1. Units of measurement needed clarification - "slug" was unknown to some. 2. "Stretch" needed about every hour-those chairs are non-human engineered, (or is it non humanely?) 3. Pounds force and pounds mass used indiscrimately at times.
July 26, 1966 1. Very informative and interesting, and thorough. A sincere and effective presentation of material with just the right amount of Enthusiasm to keep the group's interest. A simple and effective presentation of essential and pertinent instrumentation information. Excellent technique in obtaining class participation and involvement. Excellent and Simplified development and unification of basic concepts and principles, patient and careful assessment of groups comprehension.	1.	Dragged a little at times, (one comment); Two or three of group pushing development of material a bit too fast for adequate assimilation by majority of group.

1. Lecture very well done, informative. No hesitation about repeating answers, even tho it shouldn't be necessary with teachers. 2. Demonstration with new equipment was appreciated. 3. Consideration of Hickck to supply information and prices on equipment available in binder form, excellent. The projects outlined, at least as far as we went seemed good.	1. Demonstration of test equipment not adequate. Not enough material for a group of our size, too many lookers-not enough doers.
July 28, 1966	
1. Data from sheet passed among the group indicates that today's work was well received. Mr. Fribence's enthusiasm has done much to keep up interest. 2. The student experiments, that Mr. Fritance has suggested have been well received. The group seems hungry for more such ideas.	1. The only negative comment was upon the open lab. door, letting in the smog and upsetting the airconditioning. 2. There seems to be a small uneasiness concerning the arrival of the checks.
July 29, 1966	
1. All points were made in a neat, concise manner. 2. The rate of presentation was very good. 3. Use of visual-aids was helpful. 4. Lack of contributors to this critique indicates everyone was moderately happy with the ½days work.	1. Some of the fellows would like to see more of the actual hardware as the principles are discussed in class. 2. More lab. equipment is a must. Many of the fellows would like to work slower than is possible when groups rotate in the lab.
August 1, 1966	
1. Theory in lecture room and practice in lab. went together well. 2. Class was asked to look at equipment with a critical eye.	1. Debug demonstrations equipment before class observes. 2. Not enough lab. equipment for one-piece per student.
August 2, 1966	
1. A lot of good material was presented both in lecture and lab. 2. Lab. was very worth while. 3. Appreciation was expressed on demonstration of Tech-Trainer equipment.	1. Lecture & Lab. were very disorganized. 2. Let's stay with the basic fundamentals of each topic. 3. It was suggested that lab. equipment should have been checked ahead of lab. time.
August 3, 1966	
1. There was a general agreement among the participants that the work with temperature measuring devices was well worth while. 2. The afternoon visit to the Barton plant proved to be most interesting.	1. Some participants expressed the desire for a more extensive preview of the activities and equipment to be observed on a plant tour and the suggestion was made that a follow-up discussion session be held the day after the tour.
August 4, 1966	
1. Good follow-up on field trip. Hands-on in lab good; Good flow discussion.	1. Problem solving largely wasted time as problem too far in advance of discussion. (AM) 2. Clear up board work by setting problems off by themselves and erasing that which does not apply. (PM)

	3. Incomplete solution of mornings fluid flow problem (by using data in the text) greatly reduced the value of the whole discussion on Fluid Flow. 4. Lab should be more "Goal-Oriented" 5. Let's have discussion of methods actually used in industry by Technicians to measure Flow and Calibration of equipment. 6. Hickock breadboard equip, poor craftmanship- takes too long to set up. 7. Lab manual difficult to follow.
August 5, 1966	
1. The initial discussion about aims and desires for the institute members at this time was very helpful and might have helped "clear the air". This type of discussion and follow-through should be repeated at least once or twice again during the last three weeks.	1. The compressed air movie proved again that all films should be previewed. 2. Various interuptions during the morning seemed to cut down on the effectiveness of the discussion and lecture.
August 8, 1966	
1. "Both instructor & class displayed new enthusiasm. 2. "Pressure group bull session beneficial. I'm grateful each day for the results of this institute. 3. "We need more of this way of going about the lab. 4. "This is one of the better labs." "We have improved participation in lab. " "Experiment Critique well "thought up." 5. "A good day " "Agood discussion on level, liked breaking up into smaller groups for experiments." "Lecture was straightforward and basic, Lab, evaluating equipment worthwhile."	1. "I approve of this type of thing (reports) but more time is needed for preparation." 2. "Spent too much time in lab. 3. "More time is needed for preparation (pressure group member)
August 9, 1966	
1. Very informative "Bull Session" 2. A welcome change-of-pace in the instructional pattern. 3. A highly-interesting and very valuable discussion about some of the common problems connected with teaching Instrumentation other than Technical information. 4. A very successful exchange of ideas and information. 5. Laboratory work continued on in an interesting and informative procedure.	1. Three or four members expressed a desire to have the "panel discussion" or "report giving" limited to an hour and a half, rather than three hours.
August 10, 1966	
1. An interesting approach to the teaching of few was presented.	1. Some felt the group discussion should have been limited and this time left be spent in instruction from Austin Fritance, as they stray too far from

2. I, for one, feel that any instruction we have received from Austin Fribance has been of the up most value, as none of our backgrounds can even begin to compare to his in the field.	subject at times.
3. Group discussions are very beneficial as it gives all a chance to view different persons experience and understanding.	
4. The opportunity to see and use Lab Equipment available to schools is appreciated. It gives those who who are starting in Instrumentation a place to start and those who have been teaching the course, a chance to enhance their existing course or program.	
August 11, 1966	
1. Training Facility A.M. Gained ecquaintance with one industry's method of preparing technicians.	1. Contributors not prepared to present material well. (A.M.)
2. Interesting mock up of process used in steam plant.	1. This was a valuable trip. Perhaps more time for tour of plant. (P.M.)
Steam Plant (P.M.)	
1. Valuable to see the high degree of instrumentation used in this process and the variety of devices used.	
August 12, 1966	
1. Block diagram & explanation of processes at Edison Power Plant was well taken by class; Involved good thinking on part of Prof. Fribance.	1. As admitted by Prof. Fribance, the explanation of the processes involved at the Edison Power Co. should have been given previous to the visit to the plant; particularly for those members who were not familiar with such a process.
2. Presentation given by Panel members on subject of temperature measurement, seemed to be well taken by the rest of the class.	2. If the main purpose of the visit by the gentlemen (Mr. Roenwagen, Mr. Messamer, Parker Wilber) was to make personal contact with each member in order to get members feelings & attitudes toward the institute, then it is felt that the purpose was not satisfactorily accomplished. Certain members were not contacted at all. Possibly this was the fault of the use of laboratory equipment during the time involved.
3. Summary of previous three weeks with Prof. Fribance was valuable to class as a brief review.	3. Possibly a more effective solution would have been to have a room where each member could have been asked a few pertinent questions with a resulting brief discussion.
4. Class members indicated a friendly and grateful attitude towards Prof. Fribance.	
5. It appears that majority of class members have a desire to continue institute next year.	
August 15, 1966	
1. Evaluation of Hickock material has value as to improvement of equipment and the lab manual.	1. The class should have been notified ahead and prepared for the session, on The Hickock, material.
2. The film presented the design of various compressors in a good straightforward manner.	2. The sorting of "How To's" could have been done by student assistants.

Appendix E (Continued)

3. The vacuum lecture was interesting and informative, Well illustrated with slides.

August 16, 1966

1. Explanations clear and well illustrated. (Good reinforcement).
2. Laboratory dissection of controls very good.
3. Very worth while for us.
4. Appreciate getting well-illustrated brochure on instruments' mechanisms,
5. Foxboro very helpful to instructors with brochures and large illustrated panels for those already teaching instrumentation.
6. Kerstner very knowledgeable.

1. Repetition of a great deal that had been covered in class by Fribance (not necessarily negative)
2. When material of day's work is covered class should be free to depart.

August 18, 1966

1. Very interesting and useful
2. Literature and bibiography much appreciated.
3. Excellent exposure to more sophisticated aspects of instrumentation.
4. "Thank you " for lunch
5. Very Comfortable Chairs
6. Descriptions on plant tour very audible.

1. Lecturers on occasion could have spoken a little louder.

August 19, 1966

1. This seems to be one of the best received lectures from industry yet. Class was very enthusiastic.
2. The presentation was much better organized than some of the previous industrial visitor presentations.

1. No negative factors

August 22, 1966

1. Helpful information
2. Knowledgable speaker
3. Excellent presentation
4. Interesting
5. Good down to earth lecture
6. Answered many questions

1. Too much circuitry
2. Most information was redundent
3. Too detailed

The above items are quotes from the 'comment' sheet circulated through the class.
Comment: Some of the group is very interested in getting a transcript from PCC. They ask that you discuss this tomorrow morning.

August 23, 1966

1. Certainly an exp rt or specialist in his field.
2. An excellent presentation with a nice blending of technical and practical aspects of Acoustics.
3. Exposure to little known factor in instrumentation fine----------
4. Interesting subject.
5. Literature rec'd and appreciated
6. High quality equipment demo. was beneficial
7. Good presentation

1. Poorly presented, not enough enthusiasm
2. but too detailed for general information.

August 24, 1966

1. Excellent

1. Didn't have enough time