DOCUMENT RESUME

ED 195 418 SE 033 413

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TITLE REACH* KIT: Research Extended As Classroom Help.
INSTITUTION Arkansas Univ., Fayetteville. Rehabilitation Research and Training Center.
SPONS AGENCY National Science Foundation, Washington, D.C.
PUB DATE Sep 74
GRANT NSF-SED74-19584
NOTE 65p.

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Audiovisual Aids: Curriculum Development: *Curriculum Evaluation: *Energy: Higher Education: *Physics: Research Utilization: Science Education: Science Instruction: Scientific Research

ABSTRACT

Presented is an evaluation of the Research Extended As Classroom Help (REACH) Kit. Developed by the University of Arkansas physics faculty, the REACH KIT is intended to bring current energy-related research results into college physics classrooms. The completed product consists of a package of instructional materials which contains a text, slides, overhead transparencies, and tape cassettes. Data gathered by means of evaluation questionnaires mailed with sample kits to 251 institutions show that the material was generally well received, but participants indicated they would purchase the kit only at a price below the actual production cost. Informal contacts with publishers reveal that various factors make it impractical for them to commercially produce the REACH KIT. The developers anticipate that materials will be disseminated, at cost, through the American Association of Physics Teachers. (Author/WB)

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REACH* KIT: Research Extended As Classroom Help

University of Arkansas, Fayetteville

III.1 (c) Data on Scientific Collaborators

Physics Department, College of Arts and Sciences

M. Lieber, Associate Professor (Project Director)
D. O. Pederson, Assistant Professor (Associate Professor and Dept. Chairman since July 1978)
C. B. Richardson, Professor (Dept. Chairman 1975-8)
G. J. Salamo, Assistant Professor

Department of Management, College of Business Administration

R. D. Hay, Professor
J. R. Walker, Graduate Assistant
D. G. Whitis, Graduate Assistant

Department of Marketing, College of Business Administration

J. E. Swan, Assoc. Prof. (now Distinguished Professor of Marketing at the Univ. of Alabama, Birmingham).
D. E. Boerner, Graduate Assistant

III.1 (e) Technical Summary

REACH*KIT was prepared in 1974 as a vehicle for bringing current research results into the college physics classroom. It was hoped that this would enliven the curriculum, and stimulate the students, by introducing them to the frontiers of research. We proposed producing a small flexible multimedia kit containing some 20 slides, several overhead transparencies, tape recorded interviews with researchers, together with a self-contained explanatory text -- the subject matter of which would all focus on some recent research "breakthrough." Participating members of the Physics Department at the University of Arkansas would act as a quick response team to go to the site of the breakthrough and collect the materials. It was hoped that the project could eventually become self-sustaining, and this was to be tested by an experiment, involving the free distribution of a prototype REACH*KIT, conducted by the Departments of Management and Marketing in the College of Business Administration.

When the grant was awarded, it was decided that the subject of the prototype kit should be "New Energy Sources." Because the four Physics faculty involved were constrained to work on REACH*KIT during the summer, we decided to visit many of the key laboratories where energy research was known to be conducted. These were ascertained initially, and primarily, by communication with key personnel in the newly established U.S. Energy Research and Development Administration. The entire summer of 1975 was spent in visiting the sites and collecting materials on a wide assortment of energy-related research. A list of the sites visited is attached (Appendix A).

During our visits we had many unexpected difficulties. Many researchers were not accustomed to the use of tape-recorded interviews, and balked at the idea of speaking "on-the-record." Some laboratories, especially industrial centers, would not allow us to bring in our equipment. Often we had to work through public relations personnel, who would arrange itineraries not fully relevant to our

purpose. Most devastating, we were unable, with a few exceptions, to establish ourselves as a group to be kept abreast of changes or new developments. Finally, many researchers, especially those working in areas they perceived as under-funded, were afraid that our kit would be unbalanced or even politically biased. The latter fear was also frequently expressed by potential kit recipients when we discussed REACH*KIT (in its early stages), at meetings of the American Association of Physics Teachers (Appendix B). Those presentations also produced numerous valuable suggestions for improving the utility of the kit. For example we decided to de-emphasize the tape-recorded interviews since most felt that extended recordings would not work in a classroom situation.

As a result of these activities we felt great pressure to produce a kit which would provide a broad spectrum of energy research activities, both high and low technology (but always with useful physics content), rather than the narrowly-defined kit of the original proposal. A study of economies that could be achieved, e.g. replacing the expensive overhead transparencies ("view-graphs") by line drawings suitable for producing such transparencies on readily available copying machines, would enable us to greatly enlarge the size of the kit while remaining within our budget. In this way the prototype kit evolved into its final form (Appendix C).

We found the actual preparation of the enlarged kit a much more difficult task than originally anticipated. In some cases the material to be included was far outside the expertise of any of us, and required extensive study of widely scattered and often not readily available literature, in order to enable the writing of the pre-digested self-contained text. (This process would have been required of any faculty using the original short-version kit). The number of overhead transparency masters needed to present a coherent lecture proved, as we found in our own trials, to be quite large. Numerous delays in the kit preparation were caused by the constant burden of our regular duties, some of

which greatly increased during this period. These delays, coupled with the ever-accelerating pace of energy research stimulated by federal support and with our inability to get most researchers to keep us abreast of developments, led to rapid obsolescence and prevented us from completing the project as scheduled. In several cases when we sent rough-draft text to the researchers for their critical review we discovered that extensive revisions were necessary in text, slides and figures.

Even after the kit contents were finally frozen in the Fall of 1977, numerous unanticipated production delays were encountered, most notably in printing, so that the kits could not be mailed out until May 1978, after the expiration of the second and last of our grant extensions. This was, regretably, a very poor time to put the kits into the hands of the college teachers, and prevented us from obtaining their post-use comments.

During the initial phases of the REACH*KIT, i.e. spring, summer and fall of 1975, the personnel from the Department of Management conducted a study of the project. This was intended to be used in a graduate class. But the rapidly changing conception of the kit, and the delays in producing it frustrated their attempts, and invalidated much of the material they had collected. As a result, their contribution remains incomplete and obsolete, and we have not included it in this report.

Conversely, the personnel from the Department of Marketing were able to design the experiment in a sufficiently flexible way that enabled them to complete at least a part of their study. They selected the target schools to which the kit was mailed, designed the questionnaires, and evaluated the results received up to the cut-off date in August 1978. The Marketing report is attached as Appendix D, and unedited, unanalysed comments by recipients are included in Appendix E.

To summarize, the kit was generally very well received (except perhaps for the tape cassettes: we clearly had a problem of undetermined origin in the duplication process). However, most recipients felt that they would (or could) purchase the kit only at a price far below the actual cost of production. This agreed with informal feedback we received from some publishers representatives, who felt that market limitations and price factors, plus their own inexperience in the multimedia format, made it impractical for them to get involved.

On the other side, we feel that the individual sections of the prototype kit, e.g. fusion (or just laser fusion), wind energy, etc. would have been more viable kits in terms of effort needed to produce the kit and cost of the kit, and would have provided a better test of the original concept. It would also have been better had we been allowed to pick a less sensitive area for a prototype narrow-focus kit. Nevertheless we are pleased that we were able to perform an important additional service -- putting a kit of useful and timely materials into the hands of many potential users, and judging by their comments in Appendix E, a much appreciated and successful job.

NOTE: We have received an expression of interest from Dr. Dean Zollman, Editor of the Film Depository of the American Association of Physics Teachers, who would like to subdivide the kit and make it available to a wide audience of physics teachers at the cost of duplication. We intend to obtain the necessary permissions to make this possible.

Appendices

A. Research Centers Visited

B. Papers on REACH*KIT Presented to National Meetings

C. Table of Contents of Prototype REACH*KIT

D. Survey Analysis by Marketing Personnel

E. Unedited Comments by Recipients of REACH*KITs.

APPENDIX A: RESEARCH CENTERS VISITED

(Dates approximate)

M. Lieber

Bell Telephone Laboratories, Holmdel NJ	(May 29, 1975)
Princeton Plasma Physics Laboratory, Princeton NJ	(May 30, 1975, Feb. 6, 1976)
Research Laboratory for Electronics, MIT Cambridge, MA	(June 3, 1975)
AVCO Everett Laboratory, Everett MA	(June 4, 1975)
United Aircraft (now United Technologies) Research Laboratories, E. Hartford CT	(June 5, 1975)
Univ. of Tennessee Space Institute, Tullahoma TN	(July 15-16, 1975)
Oak Ridge National Laboratory, Oak Ridge TN	(July 17-18, 1975)
Argonne National Laboratory, Argonne IL	(Aug. 14-15, 1975)
Other: 2nd Laser Energy Conversion Conference, NASA-Ames	(Jan. 27-28, 1975)
NSF-Rann Conference, N.Y.U.	(May 24, 1975)

D. O. Pederson

Sandia Laboratories, Albuquerque NM	(June 29-30, 1975)
Los Alamos Scientific Laboratories, Los Alamos NM	(July 1-3, 1975)
KMS Fusion, Ann Arbor MI	(July 7-8, 1975)
Univ. of Wisconsin, Madison WI	(July 9-10, 1975)
Lawrence Livermore Laboratory, Livermore CA	(July 21-22, 1975)
Varian Associates, Palo Alto CA	(July 23, 1975)
IBM Laboratory, Palo Alto CA	(July 23, 1975)
Electric Power Research Institute, Palo Alto CA	(July 24, 1975)
Stanford University, Palo Alto CA	(July 24, 1975)
World Solar Energy Conference, Los Angeles CA	(July 25-26, 1975)

C. B. Richardson

Univ. of Arizona - Optical Sciences Center, Tucson AZ	(June 29-30, 1975)
Imperial Valley, CA and Cerro Prieto, Mexico, Geothermal Sites	(June 9-11, 1975)
The Geysers, Sonoma County, CA	(June 12, 1975)
TRW, Inc., Redondo Beach, CA	(June 13-14, 1975)
Lockheed Missiles and Space Corporation, El Centro, CA	(June 15, 1975)
USERDA, Laramie, WY facilities	(July 15, 1975)
USEROA National Reactor Test Center, Idaho Falls ID	(July 16-17, 1975)
Aerojet Nuclear Co., Idaho Falls ID	(July 17-18, 1975)
Carnegie Mellow Univ., Pittsburgh PA	(June 29-July 1, 1975)
Westinghouse Electric Corp., Dutch Mills PA	(July 1-2, 1975)
USERDA, Washington D.C. and Gaithersburg MD	(Aug. 4-6, 1975)
US Naval Research Lab, Washington D.C.	(Aug. 7-8, 1975)

G. J. Salamo

C.L.E.A. Conference, Washington, D.C.	(May 29-30, 1975)
Univ. of Maryland, College Park, MD	(June 2, 1975)
National Bureau of Standards, Washington, D.C.	(June 3, 1975)
USERDA, Washington, D.C.	(June 4, 1975)
Univ. of Rochester, Rochester, N.Y.	(June 5-6, 1975)
Sandia Laboratories, Albuquerque, NM	(June 29-30, 1975)
Los Alamos Scientific Laboratories, Los Alamos, NM	(July 1-3, 1975)

G. J. Salamo con't.

Lawrence Livermore Laboratories, Livermore, CA	(July 21-23, 1975)
Stanford University, Palo Alto, CA	(July 24, 1975)
U. Cal. San Diego, La Jolla, CA	(July 25, 1975)
General Atomics Corp., San Diego, CA	(July 25, 1975)
NASA-Lewis Research Center, Cleveland, OH	(July 29, 1975)
Battelle Research Labs, Columbus, OH	(July 30, 1975)

APPENDIX B: PAPERS PRESENTED

Papers were presented at national meetings of the American Association of Physics Teachers (AAPT) with a two-fold purpose: (a) creating an awareness among potential kit recipients of REACH*KIT and its purposes, to enhance the likelihood of cooperation when the kit was received, and (b) to solicit ideas for making the kit more useful to the recipients. One side effect was that we received dozens of requests for kits or information about availability of materials. We hope to satisfy this need through AAPT's Film and Slide Depository at Kansas State University.

1. Boulder, Colorado July, 1975 (AAPT Summer Meeting)

   "REACH*KIT: A New Educational Tool," M. Lieber, D. O. Pederson, C. B. Richardson, G. J. Salamo, and A. V. Larson (Georgia Institute of Technology).

2. New York, N.Y. Feb., 1976 (AAPT/APS Annual Joint Meeting)

   "REACH*KIT -- Progress Report," M. Lieber, D. O. Pederson, C. B. Richardson, and G. J. Salamo.

3. San Juan, P.R. June 1977 (AAPT Summer Meeting)

   "REACH*KIT Components," D. O. Pederson, M. Lieber, G. J. Salamo, and C. B. Richardson.

4. New York, N.Y. Jan., 1979 (AAPT/APS Annual Meeting)

   "REACH*KIT: A Final Report," M. Lieber, D. O. Pederson, C. B. Richardson, G. J. Salamo, and J. E. Swan (U. Alabama).

APPENDIX C: REACH*KIT CONTENTS AND FRONT MATTER

REACH * KIT

NEW ENERGY SOURCES

Prepared by the
University of Arkansas
Physics Department

Supported by the
National Science Foundation under
Grant No. SED 74-19584

REACH * KIT

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SLIDE INDEX

Introduction

REACH*KIT was conceived as a tool to help college teachers of physics bring current energy-related research into the classroom. As physics teachers ourselves, we are well aware of how difficult it is to make physics seem relevant. And even with a good idea, we know how difficult it is to locate current usable aids to facilitate the presentation. Of course, with luck, a good film might be available, but films often do not suit the level, provide the desired depth of detail, or fit the time allotted or available to the subject matter. Furthermore, they inhibit the all-important student-instructor interplay. Therefore, we have striven to make REACH*KIT as flexible as possible, so that it can be used in a wide variety of courses and formats, at different levels, with little or much time devoted to a topic. REACH*KIT contains good quality 35 mm slides, audio cassettes of interviews with persons prominent in the energy field, and lots of drawings, most of which can be used to make overhead transparencies. To support these materials, and eliminate a lot of outside research when the area is outside the instructor's particular expertise, we have devoted a great deal of time and effort in preparing an adequate supporting text. The text is aimed at the instructor, intended to be self contained, and is replete with technical detail (but we have added bibliographies containing some references for student supplementary reading). In this way, we hope that REACH*KIT will prove useful in courses ranging from physical science, introductory physics, and energy-and-society, to intermediate and upper-level physics and engineering courses. We have actually used portions of REACH*KIT, with some supplementing, in graduate-level colloquia!

The four members of the University of Arkansas physics faculty who formed the REACH*KIT team, consist of a theorist and three experimentalists specializing in atomic, solid-state, and laser physics. We spent the entire summer of 1975, and some time beyond, travelling around the U.S. (and even, at one point, into Mexico), visiting laboratories and field sites, interviewing researchers and staff personnel, gathering information and materials, and making contacts which proved invaluable in keeping the material up-to-date during the long writing phase which followed. For, as may be well-imagined, the enormous effort being made in energy research has led to progress sometimes faster than we could keep up with it, but in several cases we have tried to update technical details, and in others, by stressing the fundamentals, we have sought to avoid obsolescence.

A glance at the table of contents will show how REACH*KIT is organized. We have tried to select energy-related research areas which have substantial physics content. Thus we have omitted such important subjects as coal liquefaction, for which the problems are largely chemistry, or biomass conversion, for which the problems are biochemical. We have included only new energy sources, i.e. those not yet making a significant impact on our energy production, but with the potential for doing so in the next few decades. Thus there is no coverage of current energy sources such as conventional nuclear power. We have not tried to cover all the remaining areas, nor have we treated those included with equal thoroughness. Instead, we have tried to emphasize the important principles of

physics that each approach illustrates or explores.

Controlled thermonuclear fusion, having so many basic physics problems and entailing so many different approaches has proved to require the largest apportionment of space. To unify these approaches, this portion begins with a broad overview which stresses the common features. In the rest of the fusion portion, as well as in each of the other sections on More Efficient Use of Natural Fuel Resources, and Energy from the Earth and Sun, we report on the research going on in the many diverse laboratories and pilot plants, both government operated and privately supported, and include technical background text, bibliography, and a large number of illustrations. Whenever possible we have sought to make the latter line-drawings. These, we feel can be used to produce good quality overhead transparencies on any Xerox, Thermofax, or similar copying machine. (Note: to minimize "print through" of the material on the reverse side of the desired figure, we recommend placing a sheet of black paper on the reverse side before Xerox reproduction if possible). The captions for the figures may be found just preceding the figures at the end of each section.

For technical reasons the slides had to be collected together and not distributed throughout the sections. They are arranged in the order to which they are referred in the text, in sequence by columns i.e. 01 to 05 down the first column, 06 to 10 down the second, etc. Also for technical reasons, it has been necessary to orient all the slides in the file pages the same way and to place the number in the same corner. A few slides having vertical format (long direction vertical) must be reoriented before inserting in the projector. See the Slide Index for the breakdown of the slides into sets according to the different sections. A separate set of slide captions has been provided. Like the figure captions, these are not intended to stand alone, but require reference to the text for full explanation in many cases.

The two audio cassettes contain a variety of material bearing on energy research which will convey some of the flavor of that effort that cannot be obtained in any other way. Since they help make the enterprise come alive, and provide some "humanity" to balance the "technology", we hope that the instructor will make this material accessible to the student by playing selections in class or providing for individual listening opportunities. We do not pretend that any sort of "balance" has been achieved on the tapes, in contrast to the rest of the KIT nor that we have achieved any sort of professional level as interviewers, tape editors, etc.

REACH*KIT is an experiment. We are most anxious to receive detailed critical evaluations of the individual sections or the KIT as a whole, both pre-use and post-use whenever possible. We hope that it will prove useful in stimulating many students.

GENERAL ACKNOWLEDGMENTS

We must acknowledge our former colleague, Dr. Alan V. Larson, who originated the REACH*KIT concept and who carried much of the burden in preparing the proposal for NSF and seeing it through to its successful completion.

We also wish to express our deep gratitude to all the people, too numerous to mention individually, who made this REACH*KIT possible. These include: researchers, who took time off from their work to discuss their research with us and to proofread our manuscripts; project directors and staff members who gave us the "big picture" and the small details; public relations personnel who coordinated our visits and kept us abreast of subsequent developments; and government officials who helped guide us to the major projects and open the doors for us.

M. Lieber, Associate Professor of Physics

D. O. Pederson, Associate Professor of Physics

C. B. Richardson, Professor of Physics

G. J. Salamo, Assistant Professor of Physics

Spring 1978

APPENDIX D: SURVEY RESULTS

INSTRUCTOR EVALUATION OF THE REACH*KIT

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CONTENTS

LIST OF TABLES

INSTRUCTOR EVALUATION OF THE REACH*KIT

I. INTRODUCTION TO THIS REPORT

This is a report on a study of evaluation of the REACH*KIT by physics instructors. The REACH*KIT is a package of instructional materials (text, slides, overhead transparencies, and tape cassettes) designed to aid physics instructors in presenting material on new energy sources. The purpose of this study was to measure the extent to which physics instructors who examined a copy of the REACH*KIT felt that the Kit met its objectives. This study is summarized briefly in Section II. The reader who is interested in a detailed presentation of the purpose, methods, and findings of the study should read Section III of this report. The information on how physics teachers evaluated the Kit can be best interpreted by understanding the methodology of the study presented in Section IV.

II. SUMMARY OF THE STUDY AND FINDINGS

This study was designed to obtain an evaluation of the REACH*KIT by physics instructors. A sample kit composed of text, slides, overhead transparencies and tape cassettes on new energy sources was mailed to 251 institutions along with two questionnaires (502 total) to be completed by instructors teaching undergraduate physics courses for which the kit would be appropriate. Replies were received from 92 of 502 individuals (18% return rate) and 72 of the 251 institutions (29% response rate). The questionnaire sought an evaluation of the kit in terms of: (1) the degree to which topics covered in the kit were useful and the text was understandable and of proper depth and breadth; (2) meeting its general instructional objectives; and (3) pricing the kit.

The specific topics covered in the kit were seen as useful in teaching. The five different topics in thermonuclear fusion were seen as useful from 60% to a little over 70% of the respondents. Interest was high in solar energy with over 90% indicating that the topics would be useful. From 70% to 80% of the respondents saw material on the liquid metal fast breeder reactor, laser isotope separation, and MHD power generation as useful. Generally, the text on the different topics were seen as easy to understand (about 95%), with right depth (63% to 86%) and breadth (71% to 98%) of coverage. However, some topics received relatively low ratings as explained in the main body of this report.

The general evaluation of the kit was quite favorable. About 80% of the respondents would recommend its purchase and about 90% or more felt that the kit was current, convenient for class preparation, had interesting examples of physical principles and would increase student interest in courses. None of the evaluations were very negative, however about 40% felt that

using the kit would require a great deal of time for class preparation and important course material would have to be eliminated to use the kit. Social pressure (from colleagues, superiors, students) would not work against use of the kit.

In order to appraise user acceptance of a product it is helpful to know how the user evaluates attributes of the item (e.g. is the kit felt to be current?) and how desirable such attributes are to the user (e.g. is it desirable that the kit be current?) The highly rated positive attributes of the kit, such as convenience for class preparation, were seen as desirable so acceptance of the kit should be facilitated. However, the negative attributes of the kit such as time it would take for class preparation were seen as undesirable, not neutral. Such attributes may hinder acceptance of the kit among those respondents that felt the negative attributes would in fact apply to the kit (from 4% to 45% felt that some of the different negative attributes would apply).

Respondents were asked if they would recommend purchase of the kit at prices from $50 to $300. The kit would be widely recommended at $25 (85% yes) or $50 (70% yes) with good acceptance at $100 (40% yes) but at $150 only 13% gave a "yes" answer.

An analysis of the responding institutions indicated that a wide cross section of schools responded. All degree levels (Ph.D. to Junior college) and most states were represented. The typical respondent was about 44 years old with 14 years of teaching experience. Some 90% taught introductory physics and used most of the instructional media (slides and overhead transparencies) included in the REACH*KIT.

III. THE STUDY AND ITS FINDINGS

Purpose of the Study

The objective of this study was to obtain information on how physics instructors evaluated the REACH*KIT. The specific topics covered in the Kit were appraised in terms of usefulness in teaching and if the text was easy to understand with proper depth and breadth of coverage. The kit was also appraised in terms of: (1) instructional objectives that the kit was designed to meet; (2) if some factors would be barriers to use of the kit; and (3) how important the barriers to use and achieving the instructional objectives would be to the Kit user. The influence of alternative prices for the Kit on whether or not the user would recommend its purchase were sought. Finally, information was desired on the instructor that answered the questionnaire; his usage of different instructional media; and openended comments about the Kit were requested.

How the Study was Conducted

The study was conducted by designing a questionnaire (a copy of which is in Appendix) to obtain the information mentioned above. Essentially, the questionnaire sought the response of physics instructors to items that were relevant to the educational objectives of the Kit, possible barriers to its use, topics covered in the Kit, pricing, and characteristics of the respondent.

A random sample was drawn from the Directory[1] of physics institutions at the Ph.D., Masters, bachelors, and a combined category of non-major physics programs by four years institutions plus two year colleges with physics programs. In addition a convenience sample of 51 institutions was employed. The convenience sample consisted of institutions where a faculty

[1] Directory of Physics and Astronomy Staff Members (New York: American Institute of Physics, 1976-1977).

member had expressed interest in the Kit or a member of the REACH*KIT team knew a faculty member. Two copies of the questionnaire and one Kit were mailed to each institution in the sample. A total of 251 institutions and 502 questionnaires were in the planned sample. The packet of questionnaires and Kit was addressed to the person in charge of the physics program and he (she) was requested to ask two people on the faculty that were most likely to teach courses (including the addressee) for which the Kit was appropriate to look over the Kit and respond to the questionnaire. Replies were reviewed from 92 individuals for an 18% response rate in terms of the questionnaires mailed out, 72 institutions provided replies for a 29% response rate of institutions. The data from the questionnaires returned was analyzed and forms the basis for this report.

The major limitations of this study are: (1) while the response rate was fair for a mail survey, the results could be different if all of the sampled respondents had replied. Generally, persons with more interest in a subject are likely to respond and this could result in a more favorable evaluation of the Kit. (2) The overall evaluation of the Kit was quite favorable; however we lack experience and thus a bench mark to compare the Kit against. Commercial organizations that test new products have developed norms that indicate the probability of success given how favorable the response to a questionnaire about the product may be.

The reader who is interested in more details about how the study was conducted and the reason for undertaking certain steps in the study should read Section IV of this report: Detailed Presentation of the Methodology of the Study.

Results of the Study

The presentation of the results will first cover (1) user appraisal of the Kit topics; (2) evaluation of the Kit and rating of its attributes; and (3) pricing; followed by (4) a report on characteristics of the respondents; (5) respondent characteristics related to the evaluation of the Kit; and (6) answers to the openended request for comments or suggestions about the Kit.

1. Usefulness of Kit Topics in Teaching

The respondents were asked to indicate whether or not the main topics included in the REACH*KIT would be: "useful to you in teaching". All respondents were asked to reply, even if they had not looked over the REACH*KIT treatment of the topics. As will be explained in the next section, from 50% to 30% of the respondents read the various topics, so many answers were in response to the general topic and not the REACH*KIT material on the topic.

The topics in Section 3, Energy from the Earth and Sun appeared to be of greatest interest as from 88% to 95% of the respondents indicated that the six topics covered (solar sun power, wind, geothermal, solar electric, solar thermal, solar heating) would be useful in teaching, see Table 1. The overview of thermonuclear fusion was also of wide interest (96% reported it would be useful) and interest in the other thermonuclear topics ranged from 74% to 60%. About three quarters of the respondents felt that the liquid metal fast breeder reactor, laser isotope seperation, and MHD electric power generation would be useful topics.

TABLE 1
USEFULNESS OF TOPICS IN TEACHING

Question	Would this topic be useful to you in teaching?[a]		N
Section 1 Controlled Thermonuclear Fusion	YES	NO	
1.1 Overview of Thermonuclear Fusion	96%	4%	92
1.2 TOKAMAK Experiments	69%	31%	88
1.3 Magnetic Mirror Approach	72%	28%	88
1.4 High-Beta Approach	60%	39%	88
1.5 Fusion by Inertial Confinement	74%	26%	88
Section 2 More Efficient Use of Natural Fuel Resources			
2.1 Liquid Metal Fast Breeder Reactor	80%	29%	92
2.2 Laser Isotope Separation	74%	26%	91
2.3 MHD Electric Power Generator	77%	23%	91
Section 3 Energy From the Earth and Sun			
3.1 Solar Sea Power	91%	9%	90
3.2 Energy From the Wind	93%	7%	90
3.3 Geothermal Power	88%	12%	89
3.4 Solar Electric Cells	95%	5%	89
3.5 Solar Thermal Electric Energy	93%	7%	89
3.6 Solar Heating and Cooling	93%	7%	90

[a]Percentages may not total 100% due to rounding.

2. Evaluation of REACH*KIT Topics on Ease of Understanding, Depth and Breadth of Coverage

Respondents that read the REACH*KIT topics were asked to check yes or no to the question: was the text easy to understand? It was easy to understand. About 95% of the readers found the different topics easy to understand, (See Table 2). The most diffecult topic to follow, High-Beta Approach, received 88% easy to understand and two topics (solar thermal electric energy, laser isotope separation) were easily understood by all readers.

The readers of the different topics were also requested to rate the depth of coverage as Good, Too Much, Too Little and breadth as Good, Too Wide, Too Narrow. The overview of thermonuclear fusion received such a high rating (94% good depth and 98% good breadth) that perhaps it could serve as a pattern for coverage on future REACH*KITs. The three sections on "more efficient Use of Natural Fuel Resources" also achieved a very good balance as over 80% rated the sections as good on both breadth and depth. The pattern of responses to the section on "Energy from the Earth and Sun" indicates that about 25% of the readers wanted more depth and about the same proportion felt that the breadth of coverage was too narrow. However, a substantial proportion of respondents felt the kit was good on depth (65% to 79%) and breadth (62% to 83%). It is possible that if rewritten the kit would lose appeal. The detailed topics on Thermonuclear Fusion, received relatively low scores on depth but still a clear majority of readers felt that the depth was good. The breadth of coverage was typically rated as good by over 80% of the readers.

In summary, the kit was easy to understand and a high proportion of readers found that the topics were good on depth and breadth. The reader of this report should note that for most topics less than half of the respondents rated the topic thus the respondents were probably familiar with and interested in the topics. Other respondents may not have rated the kit as favorably.

TABLE 2
EVALUATION OF TOPICS ON EASE OF UNDERSTANDING,
DEPTH AND BREATH OF COVERAGE

IF YOU READ THE TOPIC PLEASE ANSWER:[a]

Section 1 Controlled Thermonuclear Fusion	Was the text easy to understand				Depth of Coverage					Breadth of Coverage				
	No	Yes	N	% MISSING	Good	Too Much	Too Little	N	% MISSING	Good	Too Wide	Too Narrow	N	% MISSING
1.1 Overview of Thermonuclear Fusion	4%	96%	48	48%	94%	4%	2%	48	48%	98%	0%	2%	47	49%
1.2 TOKAMAK Experiments	7%	93%	40	57%	69%	26%	5%	42	54%	85%	12%	2%	41	55%
1.3 Magnetic Mirror Approach	3%	97%	29	69%	65%	26%	10%	31	66%	81%	13%	7%	31	66%
1.4 High-Beta Approach	12%	88%	25	73%	63%	22%	15%	27	71%	78%	11%	11%	27	71%
1.5 Fusion by Inertial Confinement	7%	93%	27	71%	72%	14%	14%	29	69%	82%	4%	14%	28	70%
Section 2 More Efficient Use of Natural Fuel Resources														
2.1 Fast Breeder Reactor	3%	97%	30	67%	80%	7%	13%	30	67%	83%	3%	14%	29	69%
2.2 Lazer Isotope Separation	0%	100%	26	72%	83%	4%	13%	24	74%	83%	4%	13%	23	75%
2.3 MHD Electric Power Generator	3%	97%	29	69%	86%	11%	4%	28	70%	82%	11%	7%	28	70%
Section 3 Energy From the Earth and Sun														
3.1 Solar Sea Power	7%	93%	43	53%	71%	4%	24%	45	51%	77%	2%	21%	44	52%
3.2 Energy From the Wind	5%	95%	41	55%	79%	5%	16%	43	53%	83%	0	17%	42	54%
3.3 Geothermal Power	6%	94%	35	62%	68%	5%	26%	38	59%	76%	3%	22%	37	60%
3.4 Solar Electric Cells	3%	97%	40	57%	70%	5%	26%	43	53%	74%	0	26%	42	54%
3.5 Solar Thermal Electric Energy	0%	100%	34	63%	69%	5%	26%	39	58%	71%	0	29%	38	59%
3.6 Solar Heating and Cooling	3%	97%	40	57%	65%	5%	30%	43	53%	62%	0	38%	42	54%

[a]Percentages may not total 100% due to rounding.

3. Intentions to Purchase and Evaluation of Kit

The respondents were asked to give their opinion about the REACH*KIT by agree/disagree with a set of statements. The proportion of respondents that gave favorable or unfavorable answers (scoring was such that a high score indicates a favorable evaluation) either agreement with a positive statement or disagreement with a negative one, appears in Table 3. Generally, the evaluation of the KIT was quite favorable. About 80% of the respondents would recommend that their institution purchase it. The main strengths of the kit were:

- It presents current material (98% favorable)
- Convenient source for class preparation (95% favorable)
- It would take less time to prepare a topic than locating articles (95% favorable)
- Presents interesting examples of physical principles (93% favorable)
- Increase student interest in courses (87% favorable)

Other favorable evaluations of the kit included:

- The respondents immediate supervision would not object to his use of the kit (82% favorable ratings)
- Kit will meet the needs of physics teachers (80% favorable)
- Kit will convey the excitment of physics to classes (78% favorable)
- Kit will be appropriate for respondents courses (78% favorable)

Three of the remaining ratings while relatively less positive than the above, were not negative as they all had median scores that were in the slightly favorable range. Such items included:

- Kit will show the contributions of physics to solving social problems (74% positive ratings)
- It would be easy to work into courses (71% positive)

- Colleagues would approve of the respondents use of the kit (67% positive)

The next two items received neutral median ratings. A majority of respondents giving positive replies, but a substantial proportion of physics instructors did not view the kit in favorable terms. These items included:

- About 38% of the respondents agreed that it would take a great deal of time for class preparation to use the kit, while 48% disagreed.
- Some 43% of the respondents felt that if the kit were used, important course material would have to be eliminated. On the other hand, 45% disagreed.

Finally, the most common opinion of physics instructors was that students would neither think highly or unfavorably of a teacher that used the kit. This was indicated by the 49% of neutral ratings of that statement.

In summary, the kit was evaluated quite favorably and appeared to meet some of its original objectives of presenting current material in a form that would save the instructor time and help increase student interest in physics. The kit was seen as appropriate for physics instructors and classes. In some cases, innovative items are not used because the potential adopter feels that important individuals, (superiors, peers, and others) would not approve. The kit should not face such problems as the respondents felt that superiors and colleagues would approve of its use and students would be neutral about it. A number of respondents did, perhaps realistically, view the kit as time consuming in terms of instructor preparation and that it would require the displacement of other course material.

TABLE 3
EVALUATION OF THE REACH*KIT

QUESTION	Median	UNFAVORABLE 1	2	3	Neutral 4	FAVORABLE 5	6	7	N[b]	% FAVORABLE (5-7)
1. If the KIT could be purchased by my institution for my use, I would recommend that it be purchased	5.9	4%[a]	0	4%	10%	16%	36%	29%	92	81%
2. The KIT presents current material	6.4	1%	0	1%	0	3%	50%	45%	92	98%
3. KIT will provide me with a convenient background source for class preparation.	6.3	2%	2%	1%	0	19%	31%	45%	92	95%
4. The KIT would take much less time to prepare a current topic for class than would locating articles and working up a presentation.	6.3	0	0	0	4%	15%	36%	44%	91	95%
5. It presents interesting examples of physical principles.	6.2	1%	0	3%	3%	12%	47%	34%	92	93%
6. The KIT would increase student interest in my courses(s).	5.6	2%	3%	2%	5%	32%	42%	13%	92	87%
*7. The person that I am directly responsible to in my institution would not like me to use the KIT.	6.6	2%	2%	0	13%	3%	23%	56%	87	82%
*8. KIT will not meet my needs as a physics teacher.	5.8	4%	1%	9%	7%	19%	32%	29%	91	80%
9. It would convey the excitement of experimental physics to my class.	5.3	2%	2%	2%	15%	37%	36%	5%	92	78%
*10. The KIT would not be really appropriate for my courses.	6.1	7%	2%	5%	7%	12%	26%	40%	92	78%
11. The KIT would show the contribution of physics to solving social problems	5.5	3%	7%	3%	12%	23%	37%	14%	91	74%
12. It would be easy to work into my course(s)	5.3	4%	9%	7%	9%	27%	35%	9%	91	71%
13. Physics teachers that I respect would approve of my use of the KIT.	5.4	1%	1%	0	31%	19%	40%	8%	90	67%
*14. To use it would take a great deal of my time for class preparation.	4.3	4%	14%	20%	13%	13%	28%	7%	90	48%
*15. Time using the KIT would require eliminating important course material.	4.1	10%	6%	27%	11%	15%	21%	9%	91	45%
16. Students in my class(es) would think highly of a teacher that used the KIT	4.3	5%	0	5%	49%	16%	21%	4%	92	41%

*Scoring reversed for analysis, high score indicates favorable evaluations, e.g. disagreement with a negative statement.

[a]Percentages may not total 100% due to revolving.

[b]Numbers of respondents that answered question.

4. Desirability of Attributes of the Kit

In order to appraise user acceptance of a product it is helpful to know how the user evaluates the attributes of the product and also how desirable or important each attribute is to the user. As an example, from the last section we saw that the kit was evaluated quite favorably on "it presents current material." This would help facilitate acceptance of the kit if the users also wanted the kit to present current material. Table 4 shows that the user did rate that attribute as desirable.

For each attribute of the kit, the respondents were instructed to assume that the results stated would occur, e.g. the kit would present current material, and to rate the result as desirable or undersirable on a scale of 1 to 7. The results appear in Table 2 with scoring such that rating a positive attribute as very desirable or a negative attribute (kit will not be appropriate for courses) as very undesirable would yield a high score.

All of the positive attributes appeared to be desirable and the negative attributes undesirable to the respondents. Using the median score as an indicator of the importance of the attributes, only one attribute fell in the neutral range; physics teachers that I respect would approve of my use of the kit.

The five most desired attributes of the kit:

- Take less time for preparation of a topic than would locating articles.
- Present interesting examples of physical principles (question repeated).
- Increase student interest.
- Present current materials.

were also the five attributes of the kit that were evaluated most positively. The acceptance of the kit should be facilitated as what the respondents most wanted from the kit (desired attributes) the kit delivered (evaluation of the

kit). In addition, since such results related to the objectives of the kit, it appears that it was on target.

Two results that were seen as relatively low in importance were the opinions of students and other physics teachers of someone that used the kit. The respondents also evaluated such attributes as not being strongly related to the kit.

Some factors that would hinder acceptance of the kit including ideas that using the kit would require eliminating other material and the instructors time were of importance to the respondents. Such factors should be considered in future efforts. In particular, a less detailed kit should present fewer demands on the instructors time and elimination of other course material.

TABLE 4
DESIRABILITY OF ATTRIBUTES OF THE REACH*KIT

QUESTION	UNDESIRABLE			Neutral	DESIRABLE			
	Median	1	2	3	4	5	6	7	N[b]
1. KIT would take much less time to prepare a current topic for class than would locating, studying articles and working up a presentation	6.4	0	1%[a]	0	2%	17%	33%	47%	91
**2. Present interesting examples of physical principles	6.4	0	0	0	1%	8%	48%	43%	90
3. Increase student interest in my course(s)	6.3	0	0	0	3%	21%	31%	45%	91
4. KIT would present current material	6.2	0	0	0	2%	12%	54%	32%	91
**5. Present interesting examples of physical principles	6.2	0	0	0	1%	17%	44%	39%	91
6. Provide me with a convenient background source for class preparation	6.2	0	0	0	2%	14%	45%	39%	91
7. Convey the excitement of experimental physics to the class	6.1	0	0	0	6%	17%	42%	35%	91
8. Be easy to work into my course(s)	6.0	0	0	0	2%	26%	45%	26%	92
9. Show the contribution of physics to solving social problems	5.8	0	0	0	9%	26%	40%	24%	91
*10. Not be really appropriate for any of my courses	5.7	1%	0	.6%	19%	17%	28%	29%	86
*11. Time using the KIT would require eliminating important course material	5.4	0	1%	1%	23%	29%	29%	18%	91
*12. The administrator that I am directly responsible to in my institution would not like me to use the KIT	5.3	0	0	0	35%	18%	15%	32%	87
*13. Take a great deal of my time for class preparation	5.3	0	0	4%	15%	36%	25%	19%	91
14. Students in my class(es) would think highly of a teacher that used the KIT	5.0	1%	0	0	34%	32%	17%	16%	90
15. Physics teachers that I respect would approve of my use of the KIT	4.7	0	0	2%	40%	31%	14%	12%	90

*Scoring reversed for analysis, high score indicates favorable evaluation, e.g. negative attitudes rated as undesirable

**Same question asked twice.

[a]Percentages may not total 100% due to revolving

[b]Numbers of respondents that answered question

5. Response to Different Prices for REACH*KIT

The respondents were asked if they would recommend purchase of the kit at prices ranging from $50 to $300. As expected, with an increase in price, the proportion of respondents that would recommend a kit declined, see Table 5. The best price to choose would depend upon costs and how much of the cost the sponsor of the kit hoped to recover by sales revenue. The kit would be widely recommended at a price of $25 (85% yes) or $50 (70% yes). A price of $100 could yield good acceptance of the kit (25% no, 35% not sure, 40% yes) but $150 (13% yes) or more appeared to be too high.

TABLE 5
RESPONSE TO ALTERNATIVE PRICES FOR
REACH*KIT

If the REACH* KIT could be purchased by your institution at the prices listed below, would you recommend that it be bought?[a]

	No	Not Sure	Yes	N
A. $50	7%	8%	85%	85
B. $75	15%	17%	70%	81
C. $100	25%	35%	40%	80
D. $150	48%	39%	13%	79
E. $200	78%	19%	3%	78
F. $300	91%	8%	1%	78

[a]Percentages may not total 100% due to rounding.

6. Characteristics of Responding Institutions

The sampling plan called for obtaining a diverse sample of institutions and that goal was achieved. As shown in Table 6, the responding institutions were from different types of schools in terms of the highest degree offered and the number of instructors. The sample covered 33 geographical areas including 32 states plus Washington, D.C. However, not enough institutions responded in the different subcategories (e.g. Ph.D. institutions vs. masters) to allow much in the way of meaningful or fruitful comparisons between subcategories.

TABLE 6
CHARACTERISTICS OF RESPONDING INSITUTIONS

1. Highest Degree Offered	N	%
Ph.D.	17	19%
Masters	11	12%
Bachlors (4 yr.)	43	47%
Jr. College/Technical Inst.	20	22%
	91	100%
No Response	1	1%

2. Number of Physics Instructors	N	%	Cumulative %
One	13	14%	14%
Two	8	9%	23%
Three	13	14%	37%
Four	6	7%	44%
Five	5	5%	49%
Six	8	9%	58%
Seven to ten	19	21%	79%
Eleven to sixty	19	21%	100%

Mean 8.6

3. Number of Responses by State

State	N	State	N
Alabama	1	Missouri	1
Arizona	1	Nebraska	1
Arkansas	2	New Hampshire	1
California	6	New York	5
Colorado	3	North Carolina	3
Connecticut	2	Ohio	3
District of Columbia	1	Oklahoma	2
Florida	5	Pennsylvania	7
Georgia	1	South Carolina	1
Illinois	4	Tennessee	4
Indiana	2	Texas	3
Kansas	2	Utah	2
Kentucky	2	Vermont	1
Louisiana	3	Virginia	6
Maryland	3	Wisconsin	3
Michigan	4		
Minnesota	2		
Mississippi	4		

7. Characteristics of Respondents

Information about the respondents that was felt to have a possible bearing on acceptance of the kit was obtained and is reported in Table 7. The kit was designed for teachers of introductory physics courses which are typically offered at the freshman, sophomore level. Some 98% of the respondents taught at least one such course. More specifically, the respondents were asked if they taught an introductory course and 90% did so. The respondents were questioned about their current duties and 55% were primarily teachers, 43% combined teaching with research or administration. In conclusion, it appears that the kit went to the right audience.

Since the kit provided instructional media (slides, overhead transparencies) the respondents were asked if they had used five kinds of media at the institution where they were working. About 90% or more had used slides, overheads, films, and demonstrations. Tape cassettes were not as widely used (60% usage). The results indicate that the physical resources to use the three media included in the kit (cassettes, slides, overheads) are widely available and that the respondents had experience in using them. The high percentages using films (94%) and demonstrations (99%) indicate a willingness on the part of physics instructors to use a variety of educational media. The use of media is favorable to the kit.

TABLE 7
CHARACTERISTICS OF RESPONDENTS

A. Age 43.6 mean (years) N=91

B. What level of courses have you taught or will you teach in 1978 (please answer for each level).

	No	Yes	N
1. Freshman, sophomore	2%	98%	89
2. Junior, senior	20%	80%	85
3. Graduate	60%	40%	62
4. Freshman, sophomore only	74%	26%	62

C. (1) Have you ever used the following instructional media at the institution where you are currently working? (please answer for each).

	No	Yes	N
Tape Cassettes	39%	61%	88
Slides	12%	88%	91
Overhead transparencies	9%	92%	91
Films and/or video tape	7%	94%	90
Demonstrations	1%	99%	92

C. (2) Use of different media excluding demonstrations.

	%	N
No media used	2%	2
One media	2%	2
Two media	10%	9
Three media	29%	25
All four media	56%	49
Missing answers		5

D. Please check the single statement below that best describes your current duties:

primarily teaching	55%	teaching & administration	21%
teaching and research	22%	primarily administration	2%
primarily research	0%	mising Data	1

E. How many years of experience in teaching at the college/university level do you have? 13.8 mean (years).

F. (1) Have you taught or will you teach the courses below in 1978? (answer for each).

	No	Yes	N
Introductory physics for science and engineering students	26%	74%	89
Introductory physics for non-technical students	27%	73%	90

F. (2) Teach at least one of the above introductory courses 10% 90% 92

Analysis Of Characteristics of the Respondents Related to Evaluation of the Kit

In some cases interest in a product is high or low among certain types of users and it is useful to identify the characteristics of the likely user. An analysis was made of the following characteristics of the respondents and their evaluation of the Kit (question 1a through p):

1. The type of school (Ph.D. to 2 year institution).
2. Use or nonuse of instructional media (tape, slides, overhead transparencies).
3. Whether or not the respondent taught graduate courses.
4. Whether or not the respondent taught introductory physics for technical students or nontechnical students.
5. Age.
6. Years of Teaching Experience.

The first four set of factors listed above were tested using one way analysis of Variance (ANOVA) to see if one of the groups rated the Kit higher than another group.[1] Instructors from different types of schools did not rate the kit differently.[2] The principal media use factors that differentiated those who rated the Kit more favorably was that the 54 tape users in contrast

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[1]See Section IV. A.3. for the advantages and dissadvantages of using ANOVA for the data obtained in this study.

[2]The data in this analysis has not been presented in Tables because it is extensive and due to small sample sizes in some groups it should only be considered as a possible rough indicator of Kit acceptance by different instructors.

to the 34 nonusers rated the kit higher on nine of the sixteen questions of question one (questions a, b, c, f, j, k, m, n, o, see Appendix A, Questionnaire). Instructors who taught graduate courses rated the Kit lower on two items (presents current material and would take a great deal of time for class preparation). Instructors who taught an introductory course (either technical four questions higher, or non-technical, three questions higher) rated the Kit high on a few questions. It should be remembered that over 70% of the respondents reported teaching each of the two introductory courses (Table &) so the non-teacher sample of those courses was small (around 23).

It has been found that younger persons are more likely to adopt new ideas (innovations) before older persons. Age and years of teaching experience were correlated with the sixteen evaluations of the Kit questions (1a-p). The sign of the resulting correlations were usually negative, indicating that as age and experience increased, evaluation of the Kit was less favorable; however, only three of the thirty two correlations were significantly greater than zero. The evidence was weak that age and experience were related to evaluation of the Kit.

In summary, only one strong user characteristic was related to rating the Kit more favorably, tape cassette users rated the kit higher than non-users.

9. Openended Comments or Suggestions About the Kit

The last section of the questionnaire solicited comments about the kit by using the phrase, "Any Comments or Suggestions About the Kit Would Be Most Appreciated," followed by space for the respondent to write in an answer. A total of 89 (out of 92 questionnaires returned, three were omitted due to clerical oversight) questionnaires were examined for comments and comments were found on 72 or 81% of the questionnaires. The high proportion of comments indicates a high level of respondent cooperation. Some 69 comments were classifiable as containing some evaluation of the Kit as positive, both positive and negative or negative.[1] The comments included 28 that were positive (41%), 22 that were both positive and negative (32%) and 19 that were negative (28%). The specific comments included items such as strengths/weakness of the kit, suggestions for improving the kit, brief explanations as to why and how the respondent planned to either use or not use the kit, and remarks that the kit was too advanced or not advanced enough. The comments are all listed in Appendix E.

[1]The other 3 included two remarks about the questionnaire and one respondent who reported that he evaluated the kit quickly, see #018 in Appendix E.

IV. DETAILS CONCERNING THE METHODOLOGY OF THE STUDY

A. Sample

1. Methods

The sample was in two parts, a random and a convenience sample. A stratified systematic random sample of 200 institutions was drawn from the Directory of Physics and Astronomy Staff Members.[1] The Directory was felt to be an adequate sampling frame in the opinion of the physics instructors that the author of this report consulted. However, its coverage of all institutions offering a physics program is not known. The stratification was by the highest degree program offered and the sample sizes per stratum were allocated on a judgmental basis as follows:

Ph.D.	40
Masters	25
Bachelors	89
4 year non-major, Two Year Jr. College	46

The sample was designed to secure responses for the four levels of institutions listed above.

The convenience sample consisted of 51 institutions where an instructor had expressed an interest in the Kit or a member of the REACH*KIT team knew a faculty member. The convience sample was utilized to try and insure that enough responses would be available in order to have at least a "convience" sample of responses. The project called for user evaluations of a rather lengthy package of materials and it was felt that a risk existed that the nonresponse rate would be high in the random sample.

2. Analysis of Response Rates

The response rates were felt to be adequate. Details on the response rates are shown in Table 8. Each of the 251 insitutions were sent two questionnaires, thus the planned sample size was 502. The response rate in

[1] Directory of Physics and Astronomy Staff Members (New York: American Institute of Physics, 1976-1977).

the random sample was 18% in contrast to 20% in the convenience. Seventy-two of the 251 institutions replied for a 29% response rate of institutions (See Table 9).

3. Analysis of Convenience versus Random Sample

The convenience and random samples were combined for analysis. That procedure had the advantage of providing a larger sample for analysis. However, if members of the two samples rated the Kit differently, the total sample results could be misleading. As an example, if members of the convenience sample had rated the kit extremely favorably and the random sample fairly favorably, a combined sample would indicate a favorable evaluation. Such results would obscure group differences. The convenience and random samples were contrasted using one way analysis of variance. If differences in responding were evident, the one way analysis of variance would indicate whether or not such differences were larger than could be expected due to the element of chance that is inherent in sampling.[1]

Essentially no differences were found between the two samples. No significant differences were found for question 1a to p, (evaluation of Kit). Two differences out of 32 comparisons were found for question 3, (response

[1] One way analysis of variance (ANOVA) was used because it is a sensitive and convenient measure and would be likely to indicate any differences if such existed. It was not strickly speaking a completely appropriate measure since much of the data was either rank order (Questions 1, 2, part of 3 and 4) or nominal questions 3(part) and 5(part), while ANOVA assures interval level data. However, since no important differences were found, and ANOVA would be likely to "magnify" differences, the use of an alternative to ANOVA would not likely find different results.

TABLE 8

ANALYSIS OF RESPONSE RATES BY INDIVIDUALS

		Planned Sample	Obtained Sample	Response Rate
I.	Random Sample	N	N	
	A. Overall Response Rate	400	72	18%
	B. Response Rate by Institutions Classified By Highest Degree Offered			
	Ph.D.	80	10	13%
	Masters	50	7	14%
	Bachelors (4 yr.)	178	39	22%
	Non-major and Jr. College	92	16	18%
II.	Convenience Sample	102	20	20%
III.	Overall Response Rate Combined Random and Convenience Sample	502	92	18%
IV.	Response Rates by State for Combined Sample (Random and Convenience)			
	State			
	Alabama	12	1	8.3%
	Arizona	4	1	25 %
	Arkansas	8	2	25 %
	California	40	6	15 %
	Colorado	10	3	30 %
	Connecticutt	10	2	20 %
	D.C.	4	1	25 %
	Florida	18	5	27.8%
	Georgia	4	1	25 %
	Illinois	22	4	18.2%
	Indiana	12	2	16.7%
	Kansas	16	2	12.5%
	Kentucky	8	2	25 %
	Louisiana	10	3	30 %
	Maryland	10	3	30 %
	Michigan	24	4	16.7%
	Minnesota	6	2	33.3%
	Mississippi	12	4	33.3%
	Missouri	14	1	7.1%
	Nebraska	6	1	16.7%
	New Hampshire	4	1	25 %
	New York	42	5	11.9%
	North Carolina	12	3	25 %
	Ohio	18	3	16.7%
	Oklahoma	16	2	12.5%
	Pennsylvania	32	7	21.9%
	South Carolina	2	1	50 %

TABLE 8 (continued)
ANALYSIS OF RESPONSE RATES BY INDIVIDUALS

IV. (continued)	Planned Sample	Obtained Sample	Response Rate
State			
Tennessee	12	4	33.3%
Texas	32	3	9.4%
Utah	4	2	50 %
Vermont	4	1	25 %
Virginia	14	6	42.9%
Wisconsin	6	3	50 %

TABLE 9

RESPONSE RATE BY INSTITUTION FOR COMBINED SAMPLE

Number of Institutions		Total Number of Institutions Replying	Planned Sample Institutions	Response Rate
With Two Replies	With One Reply			
20	52	72	251	29%

to Kit topics) and no differences were found for pricing questions. Combining the samples appeared to be justified.

B. Questionnaire

The different parts of the questionnaire were used for the following reasons:

Question 1 - This section of the questionnaire used a set of 16 items that employed a Likert scale format. The Likert scale involves a series of items that the respondent indicates agreement or disagreement with. Some of the items are positive and some negative in order to avoid possible response bias (where a respondent may simply check one end of a scale without giving the items much consideration). The Likert was selected because it is easy to construct and instructions for its use are easily understood.[1]

Question 1a. ..."I would recommend that it be purchased" was designed to measure purchase intentions which is a good indicator of potential user acceptance of a new product. Some of the other items (1b, d, f, g, j, m, n, o, p) were designed to measure user perceptions of benefits that the Kit was designed to deliver to the user. The remaining items were used to measure possible disadvantages of or barriers to use of the Kit (1c, e, h, i, k, l) if the respondent agreed with the negative items or disagreed with positive statements. To the extent that the Kit was seen as delivering benefits and not involving disadvantages, the

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[1]Donald S. Tull and Del I. Hawkins, Marketing Research (New York: Macmillan, 1976), pp. 348-350.

possibility of acceptance should be enhanced.

The items in Question #2 asked the respondents to indicate for each possible benefit or disadvantage of the kit in Question #1, how desirable were the benefits or undesirable the disadvantages of the Kit. Highly desirable benefits (Question #2) that the respondent felt the Kit had (Question #1) should enhance acceptance. Undesirable disadvantages that the Kit was perceived as having, would create problems for the Kit.

In Question #3 information about the usefulness of REACH*KIT topics were sought from all respondents. It was felt that even if the respondent had not read a topic, he (she) could indicate its usefulness. If the topic had been read, then the respondent was asked to indicate if the text was easy to understand and had the right depth and breadth of coverage. The reason for including should items was two-fold. First, if the kit had not been accepted (Question #1a) it could have been due to a lack of interest in the basic concept of the Kit or that the Kit was poorly written. Section #3 would give an indication about how well or poorly the Kit had been written. Second, the information in that question should be useful if any future work was to be done on a new Kit

Question #4 on pricing was designed to give an indication of how alternative prices would influence use of the Kit. The last question (5) sought information on characteristics of the respondents that it was anticipated could have had some influence on their opinions of the Kit.

The questionnaire was developed in close cooperation with the REACH*KIT team but beyond that it was not pretested due to resource limitations.

C. Analysis

All of the data analysis was done using the SPSS system of computer programs.[1] As noted in this report, in some cases techniques that assume internal level data were used on what is probably only rank order data.

[1]Norman H. Nie, G. Hadlai Hull, Jean G. Jenkins, Karin Steinbrenner, and Dale H. Bent, Statistical Package for the Social Sciences, 2nd ed. (New York: McGraw-Hill, 1975).

REACH* KIT
Department of Physics
University of Arkansas
Fayetteville, AR 72701

ID# _____

REACH* KIT QUESTIONNAIRE

1. Please give us your opinion about the REACH* KIT by indicating how much you agree or disagree with the following statements about it. For each question (a to p) circle a number that best expresses your opinion.

Disagree very much
Disagree on the whole
Disagree a little
Neutral
Agree a little
Agree on the whole
Agree very much

OFFICE USE ONLY

a. If the KIT could be purchased by my institution for my use, I would recommend that it be purchased	1	2	3	4	5	6	7	C _____
b. The KIT would increase student interest in my courses(s).	1	2	3	4	5	6	7	C _____
c. The person that I am directly responsible to in my institution would not like me to use the KIT.	1	2	3	4	5	6	7	C _____
d. The KIT would show the contribution of physics to solving social problems	1	2	3	4	5	6	7	C _____
e. Time using the KIT would require eliminating important course material.	1	2	3	4	5	6	7	C _____
f. KIT will not meet my needs as a physics teacher.	1	2	3	4	5	6	7	C _____
g. The KIT presents current material	1	2	3	4	5	6	7	C _____
h. To use it would take a great deal of my time for class preparation.	1	2	3	4	5	6	7	C _____
i. Students in my class(es) would think highly of a teacher that used the KIT	1	2	3	4	5	6	7	C _____
j. It would convey the excitement of experimental physics to my class.	1	2	3	4	5	6	7	C _____
k. Physics teachers that I respect would approve of my use of the KIT.	1	2	3	4	5	6	7	C _____
l. It would be easy to work into my course(s)	1	2	3	4	5	6	7	C _____
m. It presents interesting examples of physical principles.	1	2	3	4	5	6	7	C _____
n. KIT will provide me with a convenient background source for class preparation.	1	2	3	4	5	6	7	C _____
o. The KIT would not be really appropriate for any of my course(s)	1	2	3	4	5	6	7	C _____
p. The KIT would take much less time to prepare a current topic for class than would locating articles and working up a presentation.	1	2	3	4	5	6	7	C _____

2. Please assume that the results below would occur if you used the KIT in your class(es). How desirable or undesirable would each result be to you?

	Extremely undesirable	Quite undesirable	Undesirable	Neutral	Desirable	Quite desirable	Extremely desirable	OFFICE USE ONLY
a. KIT would take much less time to prepare a current topic for class than would locating, studying articles and working up a presentation	1	2	3	4	5	6	7	C
b. Be easy to work into my course(s).	1	2	3	4	5	6	7	C
c. Not be really appropriate for any of my course(s).	1	2	3	4	5	6	7	C
d. Provide me with a convenient background source for class preparation.	1	2	3	4	5	6	7	C
e. Time using the KIT would require eliminating important course material	1	2	3	4	5	6	7	C
f. Convey the excitement of experimental physics to the class.	1	2	3	4	5	6	7	C
g. The administrator that I am directly responsible to in my institution would not like me to use the KIT.	1	2	3	4	5	6	7	C
h. Physics teachers that I respect would approve of my use of the KIT.	1	2	3	4	5	6	7	C
i. Present interesting examples of physical principles	1	2	3	4	5	6	7	C
j. KIT would present current material	1	2	3	4	5	6	7	C
k. Students in my class(es) would think highly of a teacher that used the KIT.	1	2	3	4	5	6	7	C
l. Show the contribution of physics to solving social problems	1	2	3	4	5	6	7	C
m. Take a great deal of my time for class preparation	1	2	3	4	5	6	7	C
n. Increase student interest in my course(s)	1	2	3	4	5	6	7	C
o. Present interesting examples of physical principles.	1	2	3	4	5	6	7	C

3. The questions below ask you about the topics in the KIT. Please answer the first question for each topic listed, even if you did not look over the topic. Answer questions 2 - 4 for topics that you read or looked over. (Circle a number to answer.)

Section 1 Controlled Thermonuclear Fusion	1. Would this topic be useful to you in teaching?		IF YOU READ THE TOPIC PLEASE ANSWER: 2. Was the text easy to understand		3. Was the depth of coverage?			4. Was the breadth of coverage?		
	No	Yes	No	Yes	Good	Too Much	Too Little	Good	Too Wide	Too Narrow
1.1 Overview of Thermonuclear Fusion	1	2	1	2	1	2	3	1	2	3
1.2 TOKAMAK Experiments	1	2	1	2	1	2	3	1	2	3
1.3 Magnetic Mirror Approach	1	2	1	2	1	2	3	1	2	3
1.4 High-Beta Approach	1	2	1	2	1	2	3	1	2	3
1.5 Fusion by Inertial Confinement	1	2	1	2	1	2	3	1	2	3
Section 2 More Efficient Use of Natural Fuel Resources										
2.1 Liquid Metal Fast Breeder Reactor	1	2	1	2	1	2	3	1	2	3
2.2 Lazer Isotope Seperation	1	2	1	2	1	2	3	1	2	3
2.3 MHD Electric Power Generator	1	2	1	2	1	2	3	1	2	3
Section 3 Energy From the Earth and Sun										
3.1 Solar Sea Power	1	2	1	2	1	2	3	1	2	3
3.2 Energy From the Wind	1	2	1	2	1	2	3	1	2	3
3.3 Geothermal Power	1	2	1	2	1	2	3	1	2	3
3.4 Solar Electric Cells	1	2	1	2	1	2	3	1	2	3
3.5 Solar Thermal Electric Energy	1	2	1	2	1	2	3	1	2	3
3.6 Solar Heating and Cooling	1	2	1	2	1	2	3	1	2	3

4. If the REACH* KIT could be purchased by your institution at the prices listed below, would you recommend that it be bought?

	No	Not Sure	Yes		No	Not Sure	Yes
A. $50	1	2	3	D. $150	1	2	3
B. $75	1	2	3	E. $200	1	2	3
C. $100	1	2	3	F. $300	1	2	3

OVER PLEASE →

5. Please give us some information about yourself.

A. Age _____(years)

B. What level of courses have you taught or will you teach in 1978 (please answer for each level).

	No	Yes
1. Freshman, sophomore	1	2
2. Junior, senior	1	2
3. Graduate	1	2

C. Have you ever used the following instructional media at the institution where you are currently working? (please answer for each)

	No	Yes
Tape cassettes	1	2
Slides	1	2
Overhead transparancies	1	2
Films and/or video tape	1	2
Demonstrations	1	2

D. Please check the single statement below that best describes your current duties:

primarily teaching ___ (1) teaching & administration ___ (4)
teaching and research ___ (2) primarily administration ___ (5)
primarily research ___ (3)

E. How many years of experience in teaching at the college/university level do you have? _____(years)

F. Have you taught or will you teach the courses below in 1978? (answer for each).

	No	Yes
Introductory physics for science and engineering students	1	2
Introductory physics for non-technical students	1	2

G. If you feel that the REACH* KIT may be appropriate for a course or courses at your institution, would you please write in the title (name) of such course(s)?

REACH* KIT Courses: _____

_____

_____

_____

ANY COMMENTS OR SUGGESTIONS ABOUT THE KIT WOULD BE MOST APPRECIATED:

_____

_____

_____

_____

_____

THANK YOU VERY MUCH! PLEASE PLACE THIS QUESTIONNAIRE IN THE ADDRESSED ENVELOPE AND MAIL IT TODAY.

273 - No Comments.

278 - No Comments.

135 - I congratulate the efforts of physics faculty in its active involvement in this nationally important field. It is a valuable project in encouraging the physics teachers to bring these areas into their teaching arena. I wish more emphasis is given to the 3rd section. Sections one and two are esoteric and voluminous material already exists accept in a qualitative way, it cannot be used in introductory classes.

269 - A lot of people did a lot of good work on this project.

143 - No Comments.

189 - This is a very commendable job. It would be helpful if Alan V. Larson, along with Lieber, Pederson, Richardson, and Salamo would do other Reach*Kit projects, hopefully with NSF funding and make them available to the undergraduate physics teaching community at nominal prices.

137 - It is a good resource material for student preparation of seminar presentations and term papers. That is how I would use it -- as a library resource for individual students to use. The tapes would give them a feeling of closer contact with the originators of the information; and the slides would be useful to them in preparing a presentation of their papers to the seminar or class.

006 - Overall response is positive and excited resource materials very valuable. Some of the materials (particularly laser fusion and solar not too current), too heavy on fusion compared to others.

143 - I think the kit is a very feasible idea. I would like to see some other topics treated in the same manner. The drawings for the overhead projector would be a big help and are very good.

278 - No Comments.

326 - Set publication (& distribution) dates for as soon as possible. Additional questions at the end of each unit would make the material more useful in PSI instruction.

101 - The Reach*Kit was intended for use by the instructor - the instructor reading the text, choosing which slides would be shown and preparing a lecture on it. In the classes I teach I stick mainly to teaching the basic principles along with problem solving. Extra topics like in this Reach*Kit, when they get into a course, are studied by the students outside of class. If students were to be given this material to study (individually), the slides might must be printed and the pages might need to be bound. [I may yet find some parts which are suitable for use in class.] There is much good material in it and appreciate having received a copy.

021 - It appears to be a tremendous achievement. I have taught the above energy course four times, and the kit would have been of tremendous value had it been available. I am going to make as much use of it as I can next spring (1979) when I teach the course again.

326 - The kit is very well done, I am pleased to have a copy. It will also be useful in science talks to civic clubs, etc.

191 - Beautiful! The slides are particularly difficult to prepare individually. How about working this up into a PSI (self-paced) course for non-majors??

335 - Physics deals with principles. Applications should be indicated, but details of applications are for engineering courses. Most of this material is too detailed for use in any course in physics or in general courses on environmental and energy problems of society. The slides seem to be for a popular lecture, but the text for a seminar for engineering seniors. Who are you aiming at?

190 - Our "Energy" course is a freshman level non-technical course. As such, a large part of the KIT material is too advanced. However, many of the slides are appropriate, and the instructor could profitably use much of the material. Our General Physics is rather "tight", and introduction of additional material would require sacrificing some of the "traditional" topics.

010 - I think you underestimated the problems of the LMFBR.

297 - No Comments.

177 - Physicists like to avoid mixed units, for example p. 3.1.04 JOULES/GM!! Material would have to be digested and much modified for presentation in Freshman and introductory courses with our students. This has an engineering-technical flavor which physics majors would find dull. The slides are very well produced. Equations and relations appear "out of the blue." The link to basic physical principles is often not made clear. Cassette audio quality is BAD! You are lucky to get anyone to respond during summer!

137 - The sound quality of the cassettes is generally poor: side one is almost unintelligible, sides two and three are improved in quality but the background noise is high; side four has satisfactory sound quality. One side (four) would be satisfactory for classroom use (on the basis of sound quality alone).

198 - The material is well prepared and organized and can be used in a variety of ways. I need more time to explore further possibilities.

302 - 3.6 seems poorly named and is named differently on this questionnaire. There are some language problems. For just one example: page 3.2.09 "if noise can be limited and if they can be architecturally designed,---wind energy is essentially pollution free." This says that either noise or wind energy can be architecturally designed. The anticedent seems to be "wind machines" in a secondary clause two sentences earlier in a previous paragraph. This makes for inconvenience in reading.

334 - Where is the social impact material? That's my bag and theres a great wealth of thoughtful, highly intellectual material available that isn't even hinted at in here. NSF has even funded efforts in this area. Tapes are very poor - hard to listen to, jargon laden and boring. My students won't sit still for more than a 5-min tape and it should either be a Mike Wallace style interview or be accompanied by slides. Slide quality is excellent and slides would be very useful. Suggestion: Get a non scientist to do the social impact discussions unless you can get an Asimov -- and not a sociologist.

059 - No Comments.

253 - You need a table of abbreviations (PPPL,ATP!!). A more popular writing style is needed. the sound quality of your tapes is very bad. The slides are excellent. I think your basic idea is good, but your writing is not very well adapted to the introductory physics courses I teach.

350 - Well done! Especially pleased to see some simple but adequate derivations and explanations of current interest topics in energy.

186 - Slides very good (some numbered in the wrong corner). Tapes - poor quality (cannot understand anything on tapes 1 and 2). pp. 2.3.02 - 3 para. - 400 K should read 4000 K. Sec. 1 temp. in Kelvin - Sec. 2 has temp. in degrees Kelvin. The REACH*KIT appears to be complete and well done.

286 - The kit I find makes extremely interesting reading. One comes to appreciate the vast amount of work that went into its preparation. The slides are good and instructive; Cassette A (slides 1&2), however, of poor "sonic" quality! P.S. Thank you very much for sending us the Kit.

123 - Titles didn't grab me. After reading - found better than expected.

051 - Topics concentrate on applied physics. There is a vast area of fundamental basic physics that is ignored (search for the quark, tests of general relativity, black holes, etc.). The kit leaves the expression that the excitement of experimental physics is to be found in the applied, environmental area -- quite the contrary!

067 - I have developed a course entitled "Energy Options and the Environment" over the past 7 years, targeted mainly at non-science majors. Your information is either too technical (fusion), not developed enough (solar heating, passive heating), lacking (biomass, LWR), or over emphasized for my opinions on what will be the important long term energy needs (not fusion, I'm afraid, for economic and social reasons, not physical). A good job, however - I'm sure it will assist teachers who have not thought about or developed this necessary material.

341 - Great idea. Why not develop similar kits to cover other areas of interest i.e. I.C. technology/applications.

006 - This is quite an elaborate kit -- one could almost build a complete course around it, and in fact we may choose to do so. I think on the whole its excellent, although I really have not had time for a thorough evaluation. I suggest you ask for evaluations after we and others have used it. Thanks!

334 - I am enthusiastic about the Kit because I see them as an effective way of introducing current research ideas from areas not my own into my classes. I especially appreciate the collections of slides and overheads as they are sometimes time consuming to locate. I will use several segments in two classes in the fall. My audio tapes contain too much bass and are not easy to listen to for over a couple of minutes. Also it would help if the cassettes were indexed more finely. What comments are 3014 "marks" from the beginning...

335 - Spoty - lots of stuff too advanced and detailed in sections 1 and 2. Text jumps from broad platitudes to detailed engineering drawings and back again. Tapes a waste of time and slides ineffective and cluttered (e.g. rooms of equipment outsides of buildings).

900 - We have only a 1 yr. Gen. Physics class for Chem. & Biology majors. In addition to the fact that it is already difficult to cover required topics the students would be turned off by the highly technical material of sec. 1 and 2 especially I can see a use for some of the material in Section 3 as background. Tape Cassette A - side 1 is very poorly done.

149 - Thanks. Fantastic idea with excellent follow-thru.

149 - Questionnaire - part 2 - not clear.

332 - There should be an outline for each section. The material appears overwhelming until it is read. An outline might system this reaction.

274 - The kit will serve as a valuable organizer for certain parts of my physics program and my energy alternatives course. Believe that Reach Kit is an extremely worth while project. What's the purpose of all the anonimity? At least you are attempting to do something!

141 - This is a great idea! Enjoyed reading the text (but lots of typos!) The material presented is in many different sources at present, having it distilled in one source is a time-saver. It is a little heavy in CTR and light in solar and breeder technology, but still very useful. I appreciate the copy and will certainly use the material in my courses. The slide set is a superb idea.

135 - No Comments.

175 - Kit is ideally suited for physics seminars -- parts of it can be used to add interest and excitement to some courses.

327 - No Comments.

117 - Kit can be used only as a non-required supplement, to our existing courses. It will not fit in as the required material in any of our courses.

294 - I feel that there was too little time spent developing the uses of solar energy. The development at times could supplement courses in several areas. In particular, there is little in the photovoltaic section. I can use, and I teach an intro engineering course in this area. The material simply did not get into the detail I could have used (eff. calculations, power output, etc)! Too bad!

067 - No Comments.

321 - Seems like a good concept and a good effort to work out the details. However, I suspect many physics instructors contemplating a "physics of energy" course will feel a strong need for an overall viewpoint -- can you give reference to articles in Am. Journ. Phys., textbooks, etc? Also, it is rather unfortunate that so many of your references are company progress reports (but perhaps this is the nature of the E-blast!)

308 - Appear to be quite useful for a survey or introductory level courses. It obviously was not intended to and does not give a very theoretical (read basic) foundation, but can be a useful teaching help.

310 - The KIT is excellent for the Energy course and sure would have saved one a lot of work! I would also like to use it in the Modern Developments course which is for Jr/Sr High teachers as it certainly would be of benefit to them to have up to data info. on this important topic.

005 - We have a graduate plasma course. The slide collection and some view graphs will be a welcome aid for the instructor, although the general level of the kit is too low for these students.

344 - Too much on fusion. Need material on coal, water power, biomass, oil recovery. Tape cassettes are too noisy - therefore practically worthless. Slides show too much of pieces of equipment and hence many are worthless. Far too many slides on fusion.

066 - The excitement of research is PEOPLE. There are no people in the Kit. Names, yes, but its all institutional and impersonal. The slides are good, but strictly P.R. It is not clear how I'm to use this stuff - is the text meant for me or the class? In order to answer quickly, as you request, I have only gives the Kit a rather brief examination, but the level appears to be rather uneven - Section II is far less demanding than I and II.

277 - Valuable at any school it placed in the audio visual section for use of all science teachers.

288 - In sections 3,2 and 3.6 slide references were not worked into text. Reader had to refer back to slide caption section and do the integration. (Even though in some cases like slide 119 and 120 they were only repeats of the figures 3.2.06 and 3.2.04).

313 - The most difficult task will be to keep the source material current. The loose leaf notebook format is good since additions can be included. Perhaps a yearly update of references could be sent to supplement the present mater 1. Overall, this material will be very useful. It was well researched and organized. I appreciate the opportunity to use the material, and if you wish will be glad to give a more incisive review after I have used the material in class.

321 - Physics level suitable for the U.G. majors. I will use it for 507 (above) but will have to go easy on the math and tough physics for this course, since it is for non-majors, e.g. science education, architecture, etc.

182 - No comments.

147 - No comments.

180 - Great job. This will be very useful to me in teaching the above course. The slides and transparency masters are most appreciated. You have saved me weeks of preparation time!

073 - Good idea! I'm grateful to have this one!

152 - Although I probably would not purchase the kit, since I have a free one I will try to make use of it in my modern physics class and may present one or more science colloquia to our science students and staff based on these materials.

134 - Expand to be more comprehensive, i.e. to include other new energy options. Design a somewhat similar, but perhaps, low level package to allow a somewhat quicker preparation (Albeit superficial). Improve the scope and audio quality of the tapes.

183 - Tape cassettes were unintelligible (bad set). Most of the slides were not of much teaching use. I expect the material would be out-of-date as far as a "current" picture goes, very quickly. For general education,physical science, the material is too complex.

183 - The tape cassettes are inaudible. I could not understand what was being said at all.

183 - No comments.

251 - A good effort. Suggest capsule reviews on slide and tapes for updating physics teachers in new happenings - a rotating library of the Phys. Review in media form.

281 - No comments.

169 - No single course we offer at present coincides exactly with the Kit. However, we are planning a new course and the kit could very well be integrated into such a course. I studied Section I and enjoyed it very much. I feel however, that at least for the course we contemplate, much watering down will be necessary.

199 - I appreciate the excellent selection of slides. They nicely compliment my own collection.

169 - Text and slides are good. Cassettes - marginal quality.

068 - No comments.

171 - Sound quality of cassette A is bad. Simplified summary sections would be very helpful for use in low level courses. As it is, one much wade through a great deal of material which would not be used in such courses (e.g. concepts of physical science). An index of key applications would be helpful, e.g. Bernoulli's equations as applied to the windmill.

333 - Why devote 1/3 of the material to fusion and 1/3 to to Fast Breeder-MHD when other energy related topics especially energy conservation are omitted. There is excessive emphasis on centralized high technologies.

019 - Too much emphasis on fusion relative to the breeder reactor and solar heating. Most of slides too technical. I don't think students get much from looking at a complicated piece of equipment. New more material on solar heating and cooling. Need slides of solar houses.

009 - Nice job -- would be worth extending to other energy topics.

178 - Quality of tapes was very poor.

193 - No comments.

252 - No comments.

018 - This evaluation was based on only a few minutes of looking through the KIT. I will pass it on to the instructor of our energy course.

288 - Very good idea that has been developed and presented exceptionally well.

005 - The tape cassettes are of very poor quality. I can't understand the speakers.

178 - The Kit is a very interesting and certainly most useful teaching device. I will find parts of it useful, not only in the courses listed above, but also in some "enrichment" short courses I will be offering on energy. Besides, the technical references cited, a list of pertinent articles in Journals and Books more usually found in a Physics library would be useful. Of the two tapes sent, the first, sides 1 and 2 were unintelligible. I am sorry that this reply is delayed, but it arrived just as I was leaving for a vacation. And then a summer course preempted my time for the past month.

260 - No comments.

179 - No comments.

106 - We do not offer a course which would be best suited for this kit. I would like to see our Dept. offer such a course in the future.

176 - No administrator has any right to question the teaching material used by qualified faculty. Student feedback usually is on the level of entertainment by the faculty member and material not true of it or its timelines.

010 - This idea was good and appears to have been well done. Actual use of the KIT will show its usefulness. But in any case it is a handy thing to have. Probably a junior level course on enerby could be designed around it.

LATE REACH*KIT COMMENTS

008 - This kit is a good effort to bring current research into the classroom. Thank you.

295 - For applications at freshmen level presentation of many parts of kit might be too technical. Part 2 of this questionnaire may give strange results since some of the statements are not easily answered on the basis of desirability.

062 - An outstanding job! It represents a real time saver.

343 - Very good.

340 - Material suggests use in GPS classes, but first unit has very little content on such an elementary level.

331 - Needs more student activities and/or problems. Excellent background material for teachers and advanced students. Some of the materials in last section could be used in our physical science courses.

351 - We will make use of the kit in our energy education resource center. We will make it available to secondary school teachers who wish to enrich their curriculum.

116 - I appreciate the slides and they will be used. The tapes were garbled. It would help very much if you incorporated illustrations in closer proximity to the text (I know the cost was prohibitive) and refer to the corresponding transparency masters and slides along with these illustrations. You've done the laborious task of compiling a resource for which this is a most critical need. Please...please make it 100% more desirable and understandable by having it rewritten by a first class science interpretor such as Paul Hewitt (2nd choice Issac Asimov). Thank you for your iniative.