difference between the means for the two cases, that is, speed without bicycles present versus speed with bicycles present for each sample. The hypothesis test was conducted at a 10 percent level of significance for the null hypothesis in which the true difference between the population means is zero. The Student's t-statistic was used because of the small size of the samples. As given in Table 1, there was a significant difference in only two of the samples.

There is a decrease in the mean speed differences as the vehicular average hour volume (AHV) increases. A mean speed difference of 4.83 km/h (3.0 mph) for the bicycle present versus the bicycle not present cases is found when the AHV is 340 vehicles. When the volume increases to 890 and 914 vehicles/h, the speed differences of 2.25 km/h (1.4 mph) and 2.42 km/h (1.5 mph) respectively are smaller.

The test to determine whether there is a significant difference between the vehicle speeds on a rainy and a nonrainy day is given in Table 1. There is a significant difference at the 10 percent level with no bicycle present between speeds on rainy days and speeds on nonrainy days. However, in the second case with bicycles present, the difference in mean speeds on rainy days versus mean speeds on nonrainy days is not significant at the 10 percent level. Thus, data from the second case tend to support the fact that the difference in speed between the two cases was greater on dry days than on rainy days.

RESULTS AND CONCLUSIONS

The purpose of this study was to investigate the effect of bicycle lanes on the level of service on urban street systems. A model of capacity effects based on reductions in vehicle speeds was suggested. A large cross section of bicycle lanes across the nation must be sampled to get sufficient data for this purpose. There are five main results from this study, and they are as follows:

1. There appears to be a small decrease in mean vehicle speed as a result of the presence of bicycles.
2. During rainy weather, the mean speed of vehicles is reduced because of the climatic conditions; therefore, the presence of bicycles does not noticeably affect mean speed.
3. The amount of reduction tends to decrease slightly; i.e., it is inversely proportional to an increase in vehicle AHV. This may be a result of drivers having less freedom to respond to outside influences.
4. There is less reduction in speed on wider streets since there is more room for lateral movement. Thus, if there is sufficient room, motorists will move away from the lane, and the decrease in speed will not be noticeable.
5. The reduction in capacity may be a function of the frequency of bicycle-vehicle interactions and speed of operation. Further data collection and analysis are needed to quantify this relation.

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An Experimental Study of the Defensive Driving Course

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This study employed the systems concept that the overall success of a social product results from a combination of adoption rate and effectiveness and that product design improvement involves the generation of an attractive alternate product design, which is evaluated and compared with the conventional design on the basis of appropriate adoption rate and effectiveness measures. Group interviews and preliminary marketing research that involved actual and potential consumers of a defensive driving course were used to identify a number of salient course characteristics. The scope of the study was limited by confining the investigation to a single important course di-

mension—program context. Based on further marketing research combined with the judgment of experts in the driver education field, an alternate defensive driving course was formulated that included three new content items and fuel economy training. Subsequent experimental administration and testing of the alternate and conventional programs revealed that the alternate program was responsible for male drivers exhibiting a significant improvement on two of the three intermediate measures of effectiveness, i.e., fuel consumption and behind-the-wheel tests, and for female drivers exhibiting an improvement on the fuel consumption test. Following the laboratory experiment to measure program effectiveness, the programs were subjected to a field adoption experiment in a suburban community setting. Comparison of the resulting course registrations revealed a significantly higher rate of adoption for the alternate program.

Social marketing has been defined as "the design, implementation, and control of programs calculated to influence the acceptability of social ideas and involving consideration of product planning, pricing, communication, distribution, and marketing research" (1). Thus, social marketing is an implicit part of the broadened marketing concept in which marketing is not limited to commercial organizations but is crucial to nonprofit and social organizations as well. However, since that concept is similar to that of marketing traditional commercial products, the social marketer must design and package his or her social idea in such a manner that the target audience will find the idea attractive and worthy of purchase.

For many social products, which include the driver improvement program explored here, strategic decisions regarding which of the several potential product designs to employ can be aided through the use of experimental studies that rely on measuring program adoption and effectiveness. The overall success of a social product may be expressed as follows:

Overall success = (adoption rate) x (effectiveness on adopters)

In addition to the separate contributions of adoption and effectiveness to the overall success of a social product, these measures can interact with each other in a number of important ways:

1. Despite the potential effectiveness of a social program it will not be effective unless it is adopted by individuals.
2. The overall success of an ineffective program will be null regardless of the number of adopters.
3. If a program is effective or if variant designs of the program are especially effective on various market segments, adoption can be enhanced by directing it to the members of the segments involved and by increasing the attractiveness to third parties or intermediaries who are influential and have an interest in seeing that the program is adopted by certain individuals. This statement is especially true for the social program considered in this study.

Similar to marketing commercial products, laboratory and field testing can contribute to the decision regarding the design of the social product as it relates to the adoption and effectiveness components for the overall success of the program. In the case of some social products such as charitable contributions or blood donations, measures of both adoption and effectiveness are readily available. For others such as an antilitter campaign, measures of the overall success—for example, the observation of the weekly amount of litter collected along a designated section of highway—are available, even though adoption and effectiveness components may defy meaningful definition and measurement.

In the case of some social products, field measures of effectiveness (MOEs) may be made over an extended time span during which exposure to unwanted outside forces is extended and strategic product design decisions are unnecessarily delayed. The defensive driving cource (DDC) and other driver improvement programs are examples of this type of social product. The ultimate field MOEs of these programs are not only confounded by numerous extraneous variables, but are also observable only over an extended period of time. Under such circumstances, a well-conceived intermediate laboratory MOE can not only lend convergent validity to field study results, but the laboratory MOE can also contribute to the timely development of program designs that are best suited for various segments of the target market.

The systems concept that provides for the overall success of a social product by using a combination of adoption rate and effectiveness is central to this study. This approach for improving the DDC first involves the generation of an attractive alternate design. This design is then evaluated and compared with the conventional design on the bases of appropriate adoption rate and effectiveness measures. This study has three principal components as follows:

1. Analysis of the conventional DDC design and the application of marketing research techniques toward formulating an alternate design,
2. Experimental measurement of the safety and fuel economy effectiveness of the conventional design versus the alternate design, and
3. A field adoption experiment to measure the relative attractiveness of the conventional design versus the alternate design by drawing students from the general driving population.

MARKETING RESEARCH AND FORMULATION OF ALTERNATE DDC PROGRAM DESIGN

Exploratory Phase

A variety of viewpoints regarding the DDC and its design were examined by using group interviews and questionnaires. These methods were used to obtain information from judgment samples that consisted of (a) 9 DDC graduates employed by a major Pittsburgh corporation, (b) 10 potential DDC students who decided not to enroll in the program when it was made available to them at the same corporation, and (c) 5 DDC instructors who were responsible for teaching the DDC through the assistance of another Pittsburgh-based firm in cooperation with the Western Pennsylvania Safety Council. In addition, the potential-student questionnaire was administered to a judgment sample of 77 drivers, and the DDC-graduate questionnaire was administered to 26 individuals who had taken the DDC either at their places of employment or through other means.

Results

Non-DDC Responses

The results of both the questionnaire responses and group interviews reflected some of the widely held beliefs regarding the DDC. Many respondents expressed the feeling that the DDC is a corrective program for those who either do not know how to drive or have had excessive violations or accidents. These respondents also expressed the view that the course was a boring repetition of facts they already knew or that the course was unnecessary. The negative connotation of the word defensive in the course title was an item frequently mentioned in both

the group interviews and questionnaires. In the DDC instructor group interview, the point was made that those who take the course to become better drivers suffer because of guilt by association with those who are forced to attend the course for corrective reasons such as violation point reduction.

One questionnaire response revealed one image of the DDC. In projecting the stick figure's nonparticipation response in one question, the respondent simply filled in the words, "No, I gave at the office." This response was not intended to be comical; it represented the respondent's feeling that the DDC resembles a charitable undertaking in which one gives but does not receive. Such attitudes are unwittingly encouraged by the National Safety Council itself. For example, after the program is completed, the DDC graduate is awarded a certificate of appreciation to thank the student for his or her personal effort toward helping reduce the severity of our nation's traffic accident problem. For both DDC graduates and potential students, the zero or minimal monetary cost of the course may serve to reinforce this impression of DDC attendance as a charitable effort.

DDC Graduates

DDC graduates generally expressed the desire to have some form of individualized or behind-the-wheel instruction included in the current, strictly classroom program. DDC graduates tended to agree with potential students that the name of the course was a negative selling point, and, for them, not fully descriptive of the benefits they obtained from the DDC experience.

DDC Instructors

The majority of the DDC instructors in the group interview felt that the course was too long. Most instructors believed that the subject matter could be adequately covered in 6 h rather than the current 8 h of instruction. However, besides representing a classroom variable, the time length of the course was also relevant to the instructor's ability to sell department managers on providing employee person-hours for class attendance during company time. Currently, the instructor's main argument to reluctant managers' concerns is the promise of money saved by reducing accidents that involve company cars and trucks. The managers were especially attentive during a late-interview discussion concerning the possibility that the DDC, in conventional or alternate design, might be taken to improve driver fuel economy as well as safety.

Conclusions and Implications

It had been expected that program content would be a dimension of major interest to both past and potential DDC students. This expectation was fulfilled because many written responses, both structured and unstructured, were oriented toward the content of the course. The group interviews also revealed a number of course content items that past and potential students deemed desirable for inclusion into the program. In addition, the exploratory marketing research supported the potential attractiveness of four new topics that were felt to be of possible interest. At this point, it was decided to limit the scope of the investigation to course content, and an alternate program was designed and experimentally evaluated. Inherent in this decision was the recognition that limited resources constrained the level of experimentation to one that was capable of incorporating and measuring the effect of major program revisions within one dimension of the program.

PROGRAM CONTENT RESEARCH PHASE

During the research phase, additional marketing research was undertaken to measure the degree of the potential students' intensity toward a broader selection of DDC topics. The expanded list contained 10 new course content items and was based on the results of the questionnaires and group interviews of the exploratory research phase. The telephone interview and telephone precontact plus mail-questionnaire techniques were then used to collect further course content preference information. A systematic sample of 116 persons from the Indiana, Pennsylvania, telephone directory was used.

Survey results indicate that there were four topics that consistently possessed the highest level of preferred emphasis. The acceptability of these items was further analyzed by using the following coding scale to numerically represent survey responses.

Degree of emphasis you would prefer:

NONE MODERATE HEAVY

☐ ☐ ☐ ☐ ☐ ☐ ☐

0 1 2 3 4 5 6

The leading content items and the percentage of mail-questionnaire respondents selecting each on a level corresponding to numbers 5 or 6 were as follows:

Content Item	Percent
Driving techniques for winter, wet, and other adverse conditions	90
Driving techniques to get the most kilometers per liter from your car	63
Review of traffic laws and enforcement policies in your state	62
Behind-the-wheel driving instruction	60

Based on the consistently high and widely held ratings that were accorded these leading topics and the apparent feasibility of their incorporation into what the exploratory research had indicated would be an attractive alternate DDC program, the marketing research was culminated, and the findings were subjected to the judgment of experts in the safety field.

A convenience sample of safety educators and DDC instructors were consulted, and these individuals were asked to assess the practicality of including the four leading content items in an alternate DDC program. With the exception of behind-the-wheel instruction, which was held to be unworkable in a course of relatively short duration attended by 20 to 30 drivers and taught by a single instructor, the three other topics were felt to be feasible for inclusion into such a program.

Alteration of the conventional course to allow time to treat the three remaining new content items was carried out by (a) reducing the attention afforded the numerous case examples in the course, (b) reducing the amount of class discussion encouraged by the instructor, and (c) proceeding directly whenever possible to the presentation of the major points of a topic instead of relying on introductory instructor questions that are intended to encourage student participation. Further reduction in program duration was achieved by omitting DDC session 7, which deals with drugs, drinking, and driving. Although this session is an important safety topic, it is less oriented toward driving techniques and was judged to be dispensable for purposes of the effectiveness experiment.

EXPERIMENTAL MEASUREMENT OF EFFECTIVENESS OF CONVENTIONAL AND ALTERNATE DDC DESIGNS

The effectivness of the conventional and and alternate DDC designs was measured by a laboratory experiment that involved the administration of each course accompanied by three performance measures: driving simulator, test-drive fuel consumption, and safety checklist, which was recorded by an on-board observer.

The main body of subjects were randomly assigned into three groups as described below:

R	Group 1	0	X_1	0
R	Group 2	0	X_2	0
R	Group 3	0		0

where

R = random assignment to groups,
O = before and after performance measurements,
X_1 = administration of the conventional DDC, and
X_2 = administration of the alternate DDC.

The driving simulator used in the experiment was located at the Greater Latrobe High School in Pennsylvania. The fuel economy MOE involved a test drive over a 6.87-km (4.27-mile) route in the vicinity of the Greater Latrobe High School and included four-lane, two-lane, and urban conditions. The test vehicle, a 1975 Ford Torino, was equipped with automatic transmission and power steering and brakes. Special instrumentation included a fuel consumption meter that registered each 0.04 L (0.01 gal) of fuel entering the carburetor and a trip recorder that measured each 0.02 km (0.01 mile) traveled.

A behind-the-wheel test was developed to measure and compare student performance before and after the instructional programs. The test items were developed in cooperation with the program instructors and were judged to relate to the safety instructional content of the programs and to be logically related to accident-free driving. The test contained 18 yes or no performance items that contributed to a simple additive score for each test drive. The items, unique in order and combination to the 6.87-km (4.27-mile) route, were pretested during preexperimental test drives to ascertain the observer's ability for adequately rating the student's performance on each item.

Subjects

Similar to the marketing research phase, the broad potential applicability of the social product under investigation and the desire for maximum external validity of the study results led to the decision for procuring experimental subjects from the general driving population. The Greater Latrobe Chamber of Commerce identified officers from a variety of civic, social, and fraternal organizations in the area. These organizations were contacted with the proposal that monetary compensation would be provided for each licensed driver who was referred by the organization to the experiment. The participant would have the option of either personally accepting the payment or choosing to contribute it to the organization. A balanced sample of subjects was obtained by stratification according to age and sex. These criteria were used to guide the organizational contacts for accenting subjects into the experiment.

As a result of these efforts, six organizations provided a total of 66 subjects who fit the age-sex stratification that had been determined for the sample. This total was then randomly divided into three groups of 22 each, which, within the limits of divisibility, approximated the age-sex distribution of the U.S. driving population. The subjects were telephoned to confirm their participation and to arrange times for scheduling the pretests and posttests. Additional incentive for individuals who signed up to complete the experiment was provided by informing the subjects that payment for their participation would be forthcoming during the measurement session that followed the instructional program.

Program Administration

The program was conducted from May 15 through May 23, 1976, and used the following schedule:

Day	Time	Activity
Saturday or Sunday	—	Driving simulator pretest and test drive in specially instrumented vehicle
Monday	6 to 8:15 p.m.	Class
Wednesday	6 to 8:15 p.m.	Class
Friday	6 to 8:15 p.m.	Class
Saturday or Sunday	—	Driving simulator posttest and test drive in specially instrumented vehicle

During the first weekend, each student made a single appearance and was pretested on both the driving simulator and on the test drive in the instrumented vehicle. Each student also received an information sheet that contained the research coordinator's telephone number and a reminder of the student's scheduled day and time for the postprogram testing. In addition, members in the experimental groups received written confirmation about their assigned classrooms for the three class sessions. The possible effects of daily traffic density and personal response patterns were compensated for by scheduling students for the same day and time for the pretest and posttest.

The conventional DDC class generally received DDC training as outlined in the fourth edition of the instructor's manual of the National Safety Council. However, the slightly less than 7-h class length was compensated for by omitting DDC session 7, which is largely oriented toward the dangers of drinking, drugs, and driving. It had been judged earlier that, although this subject matter was important, it had little relevance to the conditions involved in the experiment and that its omission would help reduce the time required of the students. The alternate DDC class received its DDC-based training during the first two evenings. The topics were recommended by earlier marketing research that was covered during the Friday evening session. The illustrated DDC student workbooks (seventh edition) were supplied by the National Safety Council and used by members of both classes.

Data Collection

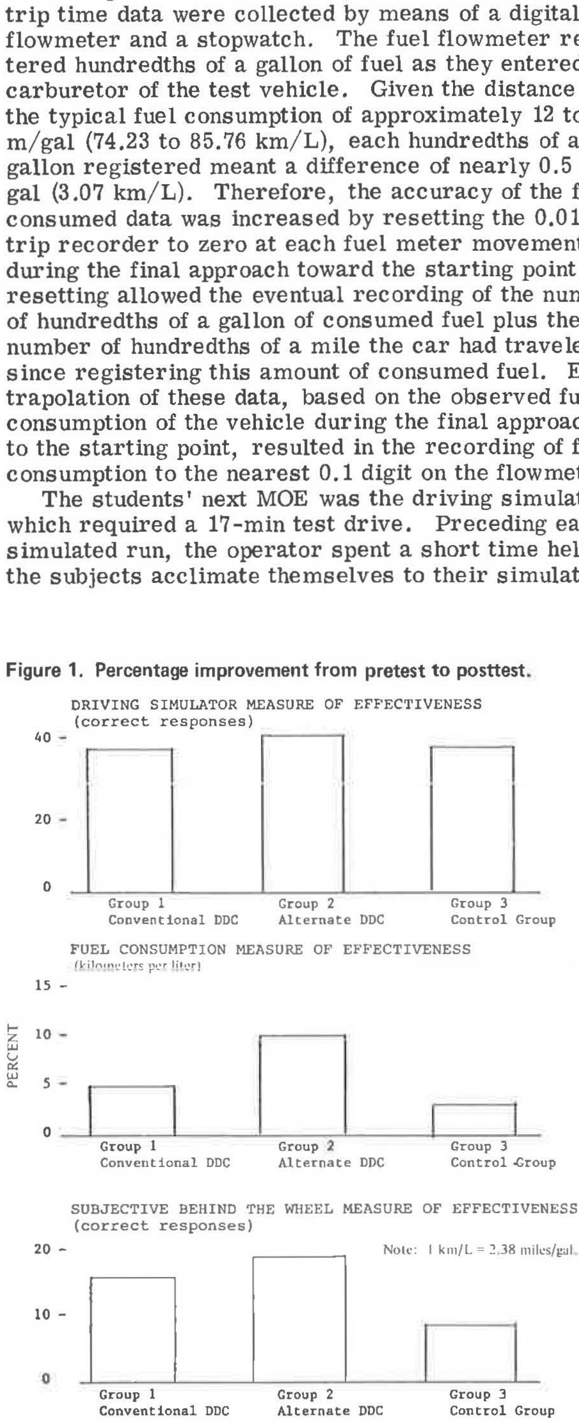
Collection of simulator and driving performance data took place on the weekends that immediately preceded and followed the instructional programs. The students' time involvement was minimized by taking the measurements during a single visit to the high school simulator facility and training course. The students were scheduled to drive the test vehicle at 15-min intervals throughout the day, and the driving simulator was run for 17 min once every hour. Efficient use of the students' time thus necessitated a less efficient operating mode for the simulator installation (one-half of its eight-person capacity). The first MOE was the student's test drive, during which the fuel consumption and on-board observer safety-checklist data were obtained. Because of the need for one observer to occupy the front seat to reset and monitor

the fuel consumption meter and trip recorder, it was necessary for the safety observer to sit in the rear seat. However, this vantage point proved satisfactory for the observer, an experienced driver-education instructor, since it afforded him or her an improved view of the driver's eye movements via the rear-view mirror. During the 6.87-km (4.27-mile) test drive, the safety observer noted correct and incorrect responses on the safety-checklist data sheet. Before the test drive, the student was directed to simply drive around the route as safely as possible. This instruction was repeated for each student during the posttest. Depending on the student's degree of familiarity with the route, various levels of on-course instruction were required and provided well in advance of all decision points.

During the same test drive, fuel consumption and trip time data were collected by means of a digital flowmeter and a stopwatch. The fuel flowmeter registered hundredths of a gallon of fuel as they entered the carburetor of the test vehicle. Given the distance and the typical fuel consumption of approximately 12 to 14 m/gal (74.23 to 85.76 km/L), each hundredths of a gallon registered meant a difference of nearly 0.5 mile/gal (3.07 km/L). Therefore, the accuracy of the fuel-consumed data was increased by resetting the 0.01 mile trip recorder to zero at each fuel meter movement during the final approach toward the starting point. This resetting allowed the eventual recording of the number of hundredths of a gallon of consumed fuel plus the number of hundredths of a mile the car had traveled since registering this amount of consumed fuel. Extrapolation of these data, based on the observed fuel consumption of the vehicle during the final approach to the starting point, resulted in the recording of fuel consumption to the nearest 0.1 digit on the flowmeter.

The students' next MOE was the driving simulator, which required a 17-min test drive. Preceding each simulated run, the operator spent a short time helping the subjects acclimate themselves to their simulator units and controls and directed them to drive to the best of their ability in response to the traffic events depicted on the screen. The operator also used the monitoring capability of the installation to identify and correct any drivers who may have neglected to start or restart their vehicles before and during the test trip. Possible contamination of the simulator results was avoided by asking the students who arrived a few minutes early for their test drive on the highway, to remain outside the simulator facility while the film was being shown.

Figure 1. Percentage improvement from pretest to posttest.



Results

A summary of each group's performance on the various measures of program effectiveness is shown in Figure 1. Based on the percentage improvement for each measure, all groups improved from pretest to posttest. The percentage improvement was greater for the driving simulator measure than for the other measures because, as expected, the students were generally unfamiliar with the existence and the operation of such a device when the experiment began. Table 1 gives a summary of the mean improvements for each group on the measures of program effectiveness. Although the group mean improvements do not differ significantly on the driving simulator measure, the improvements are significantly different for the fuel consumption (0.001 level) and checklist (0.072 level) for behind-the-wheel tests. As expected, the greatest improvement on the fuel consumption MOE was shown by the group exposed to the alternate DDC, which contained a segment devoted to economical driving techniques.

Table 2 gives the statistical levels of significance between the mean improvements of pairs of groups and among all three groups on the three measures of program effectiveness. For male students, the alternate DDC resulted in significantly greater fuel economy performance ($p < 0.001$) along with an increased mean number of correct responses in the behind-the-wheel test ($p < 0.026$). Although directional improvements were observed for each measure of program effectiveness, the conventional DDC group did not differ significantly from the control group on any of the three improvement measures. Female students did not improve as much as male students did from the instructional program exposure, although directional improvements that were compared to the control group suggest that there was some degree of effectiveness from both programs. Female students who had taken the alternate DDC showed significant improvement (0.<0.024) on the fuel consumption MOE.

The results of the effectiveness experiment indicate that both the conventional and alternate versions of the DDC are capable of improving the performance of adult drivers in a laboratory setting. In 11 of the 12 possible comparisons between the instructed group and the control group, the instructed group showed greater improvement on the performance measure used. A summary of the statistically significant mean improvement differences between instructed and control groups by sex and effectiveness measure appears below:

Sex	Effectiveness Measure Driving Simulator	Fuel Consumption	Behind-the-Wheel Test
Male	—	Alternate DDC	Alternate DDC
Female	—	Alternate DDC	—

The possibility of female students not benefiting from either instructional program to the same degree as male students do is worthy of further study. It appears conceivable that female students, for some reason,

Table 1. Summary of data for measures of program effectiveness.

	Improvement								
	DDC		Alternate DDC		Control		ANOVA		
Effectiveness Measure	$\overline{X}$	S	$\overline{X}$	S	$\overline{X}$	S	d.f.	f	p
Driving simulator, increase in correct responses	14.68	9.85	14.77	10.57	13.32	7.88	2, 63	0.162	<0.851
Fuel consumption, increase in kilometers per liter	0.57	0.55	1.20	0.48	0.30	0.42	2, 63	19.970	<0.001
Subjective behind-the-wheel test, increase in correct responses	2.14	1.94	2.36	1.92	1.18	1.44	2, 63	2.740	<0.072

Table 2. Program effectiveness hypothesis tests.

		ANOVA			
		Male		Female	
Effectiveness Measure	Hypothesis	f	p	f	p
Driving simulator	$\mu_1 = \mu_2$	0.286	<0.598	0.632	<0.438
	$\mu_1 = \mu_3$	0.224	<0.641	0.076	<0.785
	$\mu_2 = \mu_3$	0.017	<0.896	0.765	<0.395
	$\mu_1 = \mu_2 = \mu_3$	0.194	<0.824	0.569	<0.573
Fuel consumption	$\mu_1 = \mu_2$	14.871	<0.001	2.811	<0.112
	$\mu_1 = \mu_3$	1.004	<0.327	2.276	<0.150
	$\mu_2 = \mu_3$	36.699	<0.001	10.820	<0.005
	$\mu_1 = \mu_2 = \mu_3$	16.249	<0.001	4.986	<0.015
Behind-the-wheel test	$\mu_1 = \mu_2$	2.567	<0.123	0.632	<0.438
	$\mu_1 = \mu_3$	0.485	<0.493	3.140	<0.094
	$\mu_2 = \mu_3$	4.753	<0.039	1.196	<0.290
	$\mu_1 = \mu_2 = \mu_3$	2.889	<0.069	1.656	<0.211

Note: Group 1 = conventional DDC, group 2 = alternate DDC, and group 3 = control.

may have simply acquired a lesser degree of additional driving knowledge than the male students who had taken the same course. However, the results of a DDC study by Crowe and Loft (2) include the finding that neither age nor sex was related to the degree of knowledge that students gained from exposure to the program. Although it may be that the female students were more affected by anxiety during the test drives and therefore did not fully exhibit their improved knowledge, this explanation is not supported by Planek's (3) finding that female DDC graduates improved less than male graduates with regard to the number of accidents experienced in the year following the course. A rewarding subsequent effort to the research reported here would be a similarly designed study that was entirely aimed at female drivers. Such a study could lead to an alternate design of the same content taught by a female instructor and incorporate the same MOEs used here.

Because the students in this experiment generally seemed to be on their best behavior during both the pretest and posttest drives, it might be informative to conduct a similar experiment that uses unobtrusive measures of performance, which correspond to those discussed by Webb (4) that are used in various social sciences. One such possibility would involve each subject taking the test drive without the presence of on-board observers. The difficulty of setting up and adequately controlling such a solo test drive might be handled by assigning the subject to complete a portion of the testing session at one location. Then the subject would be directed to drive to a second location where the testing requirements would presumably be completed. Along the actual test route between the two locations, observers would be stationed at strategic points to record each subject's reactions to traffic conditions. This recording would be similar to that of the on-board safety checklist used in this experiment. In addition, the test could introduce a special traffic condition such as a slow vehicle in which the driver would be assigned to pull in front of each driver to allow the subject an opportunity to exhibit the courteous and safe responses that the instructional program encourages. Although the use of such an unobtrusive measure of safety performance would add additional staff and expenses and necessitate the use of a citizen's band radio or other suitable communications equipment, it would allow the experimenter to measure subjects' performance in a way that would have externally valid advantages over the current procedure.

FIELD ADOPTION EXPERIMENT

Methodology

The experiment was cross sectional and involved the cooperation of the Monroeville Pennsylvania Department of Recreation and Parks, an agency that offers a variety of evening instructional programs for community residents. The design of the experiment is as follows:

R Group A X_1 0

R Group B X_2 0

where

- R = random assignment of a sample of community residents to each experimental group;
- X_1 = mailing of course announcement that includes title and brief description of content and orientation (this treatment consists of the alternate product design that includes state law and enforcement policy review, driving under adverse weather conditions, driving techniques to obtain increased fuel economy, and the conventional safety topics of the DDC);
- X_2 = mailing similar to X_1 in all respects except for substituting the conventional DDC design and describing the alternate design in X_1; and
- O = proportion of sample adopting the course that is evidenced by completion and return of course registration form attached to announcement.

The course announcements were sent to a systematic sample of 1980 residents listed in the Monroeville telephone directory. Each addressee also received a single program announcement. The alternate design, treatment X_1, was divided into two treatments: one course description that mentioned the 10 percent fuel economy improvement observed in the effectiveness experiment and one that did not mention the fuel economy improvement. It was felt that a sponsoring agency, by offering a program that had as one of its content items the improvement of students' fuel economy performance, would wish to use actual research results that supported the likelihood of such an improvement on the part of the potential student. On the other hand, such a numerical promise of course value could constitute an unfair advantage as well as a deviation from the alternate program that had resulted from the earlier marketing research. In that research a specific percentage improvement was not mentioned in presenting the potential content item

that dealt with driving techniques for improved fuel economy. Therefore, it was decided to divide the alternate program treatment into two treatments. Each treatment was administered to one-fourth of the addressees along with the administration of the conventional treatment to the remaining one-half.

Because the alternate program design, with its fuel economy and other new content items, could not properly be designated as the DDC and because the lack of such designation might provide the course with a disadvantage compared to the conventional program that is identified as such, it was decided to use course titles judged to be innocuous, yet descriptive of the content of the two programs. A pretest of the two course titles involved the interviewing of a small convenience sample of adult drivers and resulted in the consensus that Driving Defensively was comparable to Defensive Driving Course and that Driving for Economy and Self-Defense was an appropriate title for a program that included techniques for driving economically as well as safely.

Descriptions of both programs were based on a DDC information sheet that was prepared by the National Safety Council. An extra paragraph of length comparable to that describing the new content items of the alternate course was inserted into the corresponding segment of the conventional program description to compensate for what would have been a slightly longer description for the more inclusive alternate design.

Findings and Implications

Examination of the registration rates for the treatment groups revealed the following: (a) the alternate program without quantitative mention of fuel economy improvement had three registrations (1.1 percent return), (b) the alternate program with quantitative mention of fuel economy improvement had four registrations (1.5 percent return), and (c) the conventional program had two registrations for the alternate program compared to two for the conventional, which yielded proportions of 1.3 and 0.4 percent respectively. Analysis of the difference between these two proportions revealed a significant difference at the 0.046 level of significance for a one-sided test.

As anticipated from the size of this mailing and the registration rate experience reported in previous DDC direct-mail efforts (5), the levels of enrollment for both programs were low on an absolute basis. However, the relative enrollments observed for the alternate and conventional programs do suggest that the alternate program, in addition to demonstrating certain effectiveness advantages over the conventional program, possesses a marketability advantage as well.

CONCLUSIONS AND IMPLICATIONS

As a general conclusion, the research results were judged to support the initial perception of the potential benefits to be gained from the application of marketing research and experimental procedures to a social product such as the DDC.

A number of research results indicate the desirability of the National Safety Council's investigating the adoption of a strategy of differentiated marketing in which the heterogeneity of the market would be recognized and met with more than a single driver improvement program. One finding of the group interviews was that some respondents tended to perceive taking the DDC as a penalty for having received a traffic citation rather than as a positive experience of self-improvement and personal benefit. This observation would tend to support the supplementation, instead of replacement of the conventional DDC program with one or more courses that did not suffer from the stigma of association with a form of punishment. The alternate program formulated in this study, with its revised content and promise of fuel economy improvement, could be such a course.

Since only the alternate program yielded significant improvements in comparison with the control group, there is directional support for the possibility that both the conventional and alternate DDC tested here may help to improve the fuel economy performance as well as the safety performance of DDC graduates. The promise of fuel economy improvement on the part of the alternate DDC would appear to be especially helpful in marketing the program to big business and other potential students. Group interviews with DDC instructors suggested the difficulty faced in obtaining employees on company time for a program that could be justified on only a single economic basis, i.e., reduction of the company's accident costs. With an alternate DDC that is capable of bringing about significant reductions in fuel consumption through its graduates, the marketability of a company-sponsored training plan would be enhanced by energy savings and accompanying favorable publicity of the company's involvement in the national effort to extend scarce energy resources.

The results indicated here should be noted by public policy makers as an example of the potential effectiveness of a voluntary program that could contribute to the solution of national problems such as energy and safety. However, it is not improbable that the National Highway Traffic Safety Administration will someday successfully encourage the conformity of the various states to a national requirement for the completion of an approved driver training program before the issuance of an operator's license. If such a mandatory program is instituted, it should, based on this research, include instruction of the techniques of driving economically as well as safely. Hence this instruction would contribute simultaneously to the reduction of two national problems.

In a larger perspective, the present study could assist a variety of social marketers to better recognize the marketing nature of their respective social causes and ideas and lead to the enhancement of their social marketing proficiency by providing an example of the application of marketing research and experimental techniques to the generation and evaluation of improved social product designs.

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