DOCUMENT RESUME

ED 355 309 UD 029 077

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TITLE	Evaluation of Minority Retention Programs: The Undergraduate Research Opportunities Program at the University of Michigan.
PUB DATE	Aug 92
NOTE	27p.; Paper presented at the Annual Meeting of the American Psychological Association (100th, Washington, DC, August 14-18, 1992).
PUB TYPE	Reports - Research/Technical (143) -- Speeches/Conference Papers (150)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Black Students; *College Freshmen; College Sophomores; Dropout Prevention; Faculty Advisers; Higher Education; Identification (Psychology); *Minority Groups; *Program Evaluation; *Research Assistants; Research Opportunities; School Attitudes; *School Holding Power; Student Characteristics; *Undergraduate Students; White Students
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ABSTRACT

An evaluation was done of the first year of the Undergraduate Research Opportunities Program (UROP) at the University of Michigan (Ann Arbor), which is designed not only to teach students about research and/or certain academic topics, but also to facilitate the identification of minority students with the university. This second aim is based on the current thinking that retention of minority students is significantly influenced by the social factors of identification with the university community. Failure to achieve identification with the institution may particularly plague minority students. The UROP pairs students with faculty advisors on the basis of mutual interests. The students then serve as research assistants to their faculty advisors throughout the course of the academic year, participating in laboratory groups, research discussions, and team meetings. The evaluation surveyed sophomores after their freshman year in the program and used an experimental condition (120 under-represented minority students), a primary control condition (60 African American UROP applicants), and a secondary control condition (146 white dorm residents). Results reveal that sophomores in the UROP were taking significantly more upper level credits than were either their minority student counterparts or the majority control students. Students also showed positive motivational and behavioral changes. Ten figures are included. (JB)

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Evaluation of Minority Retention Programs:

The Undergraduate Research Opportunities Program at the University of Michigan

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This paper was presented at the 100th annual meeting of the American Psychological Association in Washington, D.C., 1992, as part of the symposium, "Psychological Mediators of Academic Underachievement and Intervention Programs". The Undergraduate Research Opportunities Program at the University of Michigan, as well as the evaluation of that program, is supported by grants from the Office of Minority Equity of the State of Michigan and the Fund for the Improvement of Post-Secondary Education. Correspondence concerning the program should be addressed to John Jonides, Undergraduate Research Opportunities Program, University of Michigan, Ann Arbor, MI 48106 (e-mail: john_jonides@um.cc.umich.edu). Correspondence concerning this manuscript should be addressed to William von Hippel, Department of Psychology, Ohio State University, 1827 Neil Avenue, Columbus, OH 43210 (e-mail: vonhippel@osu.edu).

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In today's talk I will be discussing the evaluation of a program that is very much the result of a team effort. The program was designed, implemented, and supervised by John Jonides in his capacity as Associate Dean of Research in the College of Literature, Science, and Arts at the University of Michigan. Jennifer Lerner was the program coordinator, and was responsible for the day-to-day operations of the program. She was also an important contributor to its evaluation. Biren Nagda was a research associate on the program, and facilitated both the operation and the evaluation of the program. My role was simply that of an evaluator of the program, and together we designed and implemented the various conditions and procedures that I will be discussing today.

As I'm sure you are all aware, minority education in the United States is beset by a host of problems. African-American students, for example, are more than twice as likely to drop out of college than Caucasian students. And this trend exists even among African-American students who perform outstandingly in high school. Because African-Americans are unlikely to begin college in the first place, the cumulative effect of these problems of recruitment and retention is that there are deplorably few African-Americans on our college campuses. To illustrate the scope of this problem, there are currently more African-American males in prison than in college.

As you will note over the course of this talk, our orientation to this problem is a social one. We have begun with the perspective that although minority achievement may be beset with problems of remediation (perhaps originating from poorer schools, lower socio-economic status, etc.), social psychological factors are also a major barrier to minority academic achievement. In particular, our perspective has its roots in the research of Ogbu, Steele, Crocker, and their various colleagues, which proposes that minority students are frequently less identified with academic institutions than are their majority-student counterparts.

These researchers have argued that social factors that indicate identification with college are often more important predictors of academic outcomes (such as college retention, choice of major, and GPA) among minority students than are more traditional preparedness factors, such as SES, high school GPA, SAT, etc., which are commonly used to predict success among majority students. In response to their research on the importance of identification processes in the academic success of minority students, we have adapted to our own needs the type of undergraduate research program that is used at many universities to facilitate the matriculation of their students in graduate programs.

In our program, incoming minority students, and minority students who had just finished their first year, were solicited to join an undergraduate research opportunities program, or UROP. The goal of this program is not only to teach these students about research and/or a certain academic topic, but also to facilitate the identification of minority students with the university. This facilitation in identification is expected to emerge through the regular interaction between faculty and student participants in an atmosphere that is focussed on learning, but that is a highly social and personal one as well. In essence, we hope that the students' experience in UROP will personalize, individualize, and humanize the academic institution in a way that classes and tutorials just cannot.

Students in the program participate for either pay or credit, depending on their circumstances, and are paired with a volunteer faculty advisor in the first weeks of the academic year. This pairing of student and advisor is based on mutual interests. The students then serve as research assistants to their faculty advisors throughout the course of the academic year--participating in lab groups, research discussions, team meetings, etc. UROP maintains a small staff of peer counselors, typically previous graduates of the program, who meet regularly with the participants and help with any difficulties that arise. On average, students in the program report that they spend 12 hours per week working on their research activities, of which time 25% was spent working with their academic advisor, 15% was spent with a graduate student assistant, 10% was spent with an undergraduate assistant, and 50% was spent working on their own.

With that brief description of the nature of the students' participation, as well as our perspective and goals, let me turn now to the methods that we are using to create the appropriate control groups, and to collect the appropriate data in order that we might measure the efficacy of the program.

One of the primary difficulties in assessing the effectiveness of intervention programs such as our own lies in the self-selection bias inherent to the participating sample. Students typically volunteer to participate in these programs for idiosyncratic reasons, and thus there are likely to be initial differences between the students who volunteer for the program and the students who do not--before any intervention has taken place. Even if a control sample is created that perfectly matches the intervention sample on all relevant demographic variables, such as SES, GPA, SAT, etc., there may be important psychological differences between the samples (such as differences in motivation, interest, willingness to try something new, etc.) that cannot be appropriately measured or equated. For this reason, when and if the participants out-perform the non-participants on any relevant dimensions, it is impossible to know whether the program facilitated their performance, or whether the participants were so strong to begin with that they would have out-performed the non-participants anyway. Under such circumstances, it is even possible that the intervention program has had a debilitating effect, but that the participants were initially so much stronger than the non-participants that they out-performed them *despite* their participation in the program.

This self-selection problem is not insurmountable, however, and with the appropriate assignment procedures and control groups, relatively strong inferences concerning the efficacy of the intervention program can be made. Since the students who volunteer for a program can *never* be equated with those who do not, the most important procedure that can be enacted is to randomly assign volunteers to participate in the program or to remain in a control group. Without such random assignment of volunteers, causal statements about the efficacy of the program can never be confidently made. Furthermore, it is vital that the students who are and who are not selected for the program be told that the selection process was essentially a lottery. Otherwise, any differences that emerge between samples could be a consequence of the early success experience of being chosen for the program on the part of some students, and the early failure experience of being rejected from the program on the part of other students.

For the evaluation of UROP, we have an experimental condition, a primary control condition, and a secondary control condition. The experimental sample is composed of 120 under-represented minority students, who have applied to the program to participate for either academic credit or pay. These students were drawn from all of the eligible volunteers in the first and second year class, who were solicited during the summer before classes started. The 120 students who compose this condition were selected randomly from all of the eligible students who applied, and the 91 who were not selected served as the primary control sample.

put up figure 1 here

Because the students in the experimental condition were randomly selected from those who applied, they are as similar as possible to their primary control counterparts. The matching of these groups was facilitated through a paired-random assignment, in which students were paired on the basis of their high school GPA and the high school they attended. One member of each pair was then assigned to the experimental condition, and one member was assigned to the control condition. Such paired random assignment is unnecessary with very large intervention programs, but it can substantially reduce the error variance that is typically present in smaller and more moderate sized intervention programs like our own.

A secondary control group was also created, in order to establish an additional, baseline comparison sample of students who are representative of majority students in the incoming freshman class. The primary control group is necessary because it is a perfect match for the students in the program, but a secondary control sample is also helpful in order to compare the psychological and behavioral changes in the experimental and primary control groups with the changes that their Caucasian cohort are simultaneously experiencing. The secondary control group was composed of 146 Caucasian students who live in one of the major undergraduate dormitories. These students were selected at the same time as the UROP sample, and their attitudes and academic outcomes were measured at the same time as well.

To recap, the primary control condition enables us to determine which effects are caused by participation in UROP and which effects are simply a function of the development and maturation of the students who applied to the program. Random assignment to this control condition enables us to partial out the extent to which the students who applied to UROP could be more academically motivated than students who did not apply to UROP. The secondary control condition allows us to compare the development in identification, self-esteem, etc., of the UROP participants with Caucasian students who began college at the same time. The inclusion of this secondary control sample enables us to discern how the students who apply to UROP differ initially and in their development from the Caucasian student population. Furthermore, we can examine the extent to which attitudes and identifications are differentially predictive of academic outcomes for the experimental, primary, and secondary control groups.

All of the students who were selected for participation, whether in the experimental, primary, or secondary control conditions, were administered surveys at the beginning and end of each academic year. The goal of these surveys is to measure the psychological changes that are brought about by participation in UROP, as well as by maturation and experience in college. We are then able to assess the extent to which these psychological changes are important in facilitating or inhibiting positive educational outcomes.

While the control conditions allow meaningful interpretation of our data, we can also conduct mediational analyses that enable us to determine which psychological changes the program brings about. and which of these changes are instrumental in facilitating academic performance. Because we are proposing that students' experiences in UROP should lead to greater identification with college, and that this identification in turn should lead to improved academic performance, our design is focused around mediational measures collected over time. These measures will be collected annually for the next five years. Outcome measures such as grade point average, course selection patterns, etc., will also be measured at the end of each semester. Our goal is to analyze these mediational and outcome data with regression-based causal modelling, as well as structural equations modelling. To this end, we are collecting multiple indicators of all of the primary mediational measures, both in the form of traditional scales, and in the form of newly developed dependent measures.

To give you an example of the mediational model that we have in mind, here is a representative diagram of a path analysis of the effects of UROP, race, and social and academic preparedness on identification with college, the self-concept, and academic performance.

Put up figure 2 here

Such an analysis will allow us to determine the extent to which participation in UROP facilitates academic performance, and importantly, the extent to which this facilitation is mediated by changes in identification with college and the self-concept. Our prediction is that the mediated paths will carry a significant amount of variance, while the direct paths may or may not.

These measures, models, and analyses will enable us to determine not only *whether* UROP facilitates academic performance, but if so, *how* UROP facilitates performance. We will be able to determine whether students in UROP get better grades and take more advanced courses, whether they become more identified with college, and whether this increased identification *causes* the facilitation in academic performance. Only when multiple indicators are measured, over time, with groups that are randomly assigned, can such causal flow be established. Unfortunately, I will not be discussing the results of these mediational analyses in today's talk, as these analyses require data collected over a longer period of time than just the first year of the program in order to determine whether attitudinal changes are leading to positive academic outcomes.

The academic outcome measures that I will be discussing today, and that are of primary importance, are grade point averages and course selection patterns. I will not be discussing retention rates, important though they are, because at this early point in the program, very few students have dropped out of college. It is quite possible that when we examine the return rates this fall, we will begin to see differences in the retention rates of program participants and their primary control group.

The attitudinal and behavioral scales that I will be discussing today are; self-esteem, collective self-esteem, styles of coping with academic challenges, number of university events attended, students' estimated probability of obtaining an advanced degree, and their confidence in their ability to conduct a research project. The justification for these questions and scales is relatively straight-forward, so let me briefly review our ideas behind the administration of each of these scales.

put up figure 3 here

We are giving the Rosenberg self-esteem scale because recent research in social psychology has demonstrated that self-esteem scores are typically just as high among under-represented minority students as they are among majority students. Among minority students, however, self-esteem is not strongly correlated with academic achievement, while it is highly correlated with academic achievement among majority students. The explanation for this difference is that minority students are thought to dis-identify with the academic system, which results in their self-esteem being protected while their performance suffers.

We hope to show that through participation in UROP, minority students begin to develop an increased correlation between their self-esteem and their academic performance. Such an increase in this correlation has the potential to lead to a momentary decrease in self-esteem, as students begin to feel that their academic performance is self-defining. Such a threat to self esteem that is posed by potentially poor academic performance should be offset, however, by the increase in skills and confidence that students gain through their participation in UROP. Consequently, self-esteem may actually rise among participants in the program, even as it becomes more tightly linked to academic performance.

We are giving Crocker's collective self-esteem scale because it has been shown to serve as a buffer against the negative effects of perceptions of prejudice and barriers. Furthermore, it is our hope that UROP will either increase collective self-esteem or at least leave it unchanged. Our concern with collective self-esteem stems in part from recent research in psychology, sociology, and anthropology that has demonstrated that high levels of African-American academic achievement are often associated with a lack of ethnic identification. It is our hope that UROP will facilitate the academic performance of UROP participants while still maintaining high levels of collective self esteem, or esteem in their ethnic identity.

We are also giving some new measures that we have developed with the goal of measuring changes in identification with college, and behaviors that are relevant to this construct. So, we are giving a scale that measure styles of coping with academic challenges. Previous research has indicated that minority students are often less likely to seek help when they are not performing well. Our hope is that participation in the program will make students more likely to seek out the help of their teaching assistants and professors when they do not understand the material, or when they do not do well on an exam or paper (for lack of a better name, I am referring to this concept as academic coping styles). We are also giving a scale that assesses the number of university events that the students attend each month. We reasoned that if minority students are less identified with college than their majority student counterparts, they would probably be less likely to attend university functions that are not required of them. We hoped that by virtue of their participation in the program, minority students would become more identified with college and begin attending more events. This increased attendance, in turn, should lead to even greater levels of identification, as minority students become involved in a variety of collegiate activities--both academic and social. Consequently, this scale measures attendance at both academic and social functions. Finally, because the program is research oriented, we wanted to measure the students' estimated probability of obtaining an advanced degree, and their confidence in their ability to conduct a research project. Both of these estimates should increase as a function of their participation in UROP.

As I stated earlier, all of the attitudinal changes that I've discussed here should be instrumental in facilitating academic outcomes. I will not be presenting any analyses that assess the mediating roles of these attitudes on academic performance, however, as we have only measured the effect of the program on these attitudes and on academic outcomes during a single, end-of-the-year survey. The attitudinal changes that I am reporting today should lead to facilitation in academic performance in the years to come.

Let me turn now to the results from our evaluation of the first year of UROP.

put up figure 4 here

To begin with the attitudinal data, I have here a graph of the different attitudinal and behavioral data that I just described. In order to present these scales in a single graph, I have computed the mean response for each question in the scale, rather than summing the responses to the various questions as is usually done. So, for example, on the self esteem measure, subjects in the minority control condition had an average score of 3.33. Since this is really a ten item questionnaire, this score translates to a 33.3. In the same way, subjects in the UROP condition had an average of 35.2, and subjects in the majority control condition had an average score of 32.2. For all of the scales that you see on this graph, the overall main effect for condition was significant at the .01 level.

As you can easily see in this graph, students in UROP show higher scores on every one of the dimensions than students in either control condition. Although the simple comparisons between conditions were not significant for each variable, the pattern of means across variables is essentially identical. In particular, students in UROP show higher levels of personal and collective self-esteem, they report more confidence in their research abilities and a greater likelihood of seeking an advanced degree, and they state that they are more likely to seek help from faculty and teaching assistants than students in either control group.

If we turn to the number of university events that they attend each month, we again see the positive influence of the program, although the pattern is not quite the same.

put up figure 5 here

Not surprisingly, here you can see that majority students are attending a far greater number of university functions than are minority students. Nevertheless, the pattern of means once again reveals that UROP students are attending more university functions than their minority control counterparts, although in this case the difference is not significant.

Recall that I stated earlier that students in UROP might have lower self esteem than their minority counterparts, as the increased relationship between academic performance and self esteem might momentarily depress their self esteem scores. On the other hand, it was our hope that students in UROP would have equivalent or higher self esteem than their minority counterparts, as their increasing academic confidence, skills, and coping abilities might offset the potentially debilitating impact of their academic performance. Because the earlier results that I showed you (put figure 4 up again) suggest that self-esteem is slightly elevated by participation in UROP, we thought that this latter explanation might in fact prove to be true. So, in order to examine the possibility that UROP provides the students with an attitudinal and behavioral repertoire that protects and strengthens their self esteem, we ran a path analysis in which we examined the impact of the program on the attitudinal and behavioral measures that I just showed you, and the impact of these measures, in turn, on self esteem.

put up figure 6 here

As you can see in Figure 6, the picture that emerged is exactly as we hoped. Participation in UROP has no significant direct impact on self esteem, but it does have an indirect impact, primarily through its influence on the coping strategies and confidence it provides.

So, the attitudinal and behavioral picture after a year in the program looks promising.

Our next goal was to examine the students' academic outcomes, to see if any differences between conditions have yet emerged. There are two possible venues by which UROP might facilitate education: UROP might cause students to receive better grades, and UROP might induce students to take more classes and credits, especially at the more advanced level. An increase in GPA would obviously be desirable, and so long as an increase in the number of credits taken is not associated with a *decrease* in GPA, that would be quite desirable as well.

To turn first to the students' grades, you can see that as of yet there is no unequivocal effect of the program on this variable.

put up figures 7 and 8 here

Students in UROP show functionally equivalent grades to their minority student counterparts, whether those grades are received in lower level or upper level courses. Not surprisingly, the majority control students show the highest grades of these three groups in both lower level and upper level classes. This difference simply mirrors the national trend.

If we then examine the number of credits that students are taking, the picture is more complex.

put up figure 9 here

Here we see that for lower level courses, once again the majority students are taking more credits than either group of minority students. These credits are received in 100 level courses, though, and thus are not of primary interest.

When we turn to the number of upper level credits taken, we start to see a benefit of participation in the program.

put up figure 10 here

Analyses of these results reveals that students in UROP are taking significantly more upper level credits than either their minority student counterparts or the majority control students. This significant difference emerged no matter which variables were analyzed--either the number of classes or as the number of credits taken--and no matter how they were analyzed--either with no covariates, or with high school GPA, SAT, ACT, and previous courses taken as covariates. Importantly, and as you can see in the figure, the locus of this effect was entirely among sophomores. First year students who participated in the program showed no benefit whatsoever in the number of upper level credits taken. However, this interaction is quite probably the result of a floor effect on the part of the first year students (since so few of them take upper level courses), and we are hopeful that the first year students will show the same gains next year that the sophomores showed this year. For this reason, it is not possible to make program recommendations at this point.

More micro analyses of these findings suggested that the increase in the number of credits taken resides primarily in the sciences, and there it resides predominantly in the social sciences (although to a significant degree in the natural sciences as well). Given the fact that most of the research placements in UROP are in the social sciences, it is both gratifying and unsurprising that this would be the primary locus of the effect.

So what can we conclude about all this? First of all, the results I reported today are from just the first year of the program, so it is still too early to make firm conclusions about the efficacy of a program such as UROP. Nevertheless, the early returns are very encouraging. In particular, our data suggest that the program is beneficial in three very important ways.

First, students in the program are showing positive motivational changes. They report that they are more likely to go graduate school than control students, and they have more confidence in their research skills. Furthermore, they show higher levels of self esteem than their minority counterparts. Thus, these changes in goals that the program brings about are not accompanied by the decreases in self esteem that are theorized to accompany a more academic locus of self esteem among minority students. In particular, the results of the path analysis suggest that participation in UROP protects self esteem by providing students with skills and confidence that offset the potential threat posed by their academic performance. Furthermore, the changes in goals brought about by the program are *not* accompanied by decreases in collective self esteem either. Previous research by Ogbu and others has suggested that African-American students who perform well academically, and are highly interested in academics, are often less ethnically identified than students who are uninterested or perform poorly. Our data suggest that African-American students can become more involved in academics without an associated cost in their level of ethnic or racial identification.

Second, students in the program are showing positive behavioral changes. They report that they are more likely to seek help when they perform poorly in class than control students. Since previous research has suggested that minority students are often less likely to seek the help of faculty and teaching assistants than majority students, our data show that participation in a research program has the potential to reverse this debilitating reticence on the part of minority students. Although we cannot be sure why UROP students report an increased likelihood of seeking help when they need it, it seems plausible that participation in UROP personalizes the faculty, demonstrating to minority students that faculty are approachable, interested in, and supportive of the education of their minority students.

Finally, and perhaps most importantly, students in the program are increasing the number of upper level courses that they choose to take. Thus, after only one year, the program is beginning to bring about positive educational outcomes. Once again, the locus of this effect is currently unspecified, but the program was designed to provide students with research experience that would spark their interest in the kinds of topics that are the focus of advanced courses and seminars. To the extent that these minority students increase the number of upper level courses that they take, they are enhancing their opportunities during college and after they graduate. And because this increase in credit load is not associated with a commensurate decrease in grade point average, it suggests that students in UROP are becoming more interested in academics and more dedicated to academics.

Figure 1 conditions

UROP Participants

Total number = 120

**(complete data exist for 81
African-American students)**

Primary Experimental
Sample

UROP Applicants

Total number = 91

**(complete data exist for 60
African-American students)**

Primary Control
Sample

Dorm Residents

Total number = 199

**(complete data exist for 146
Caucasian students)**

Secondary Control
Sample

Figure 2 example of mediational path analysis

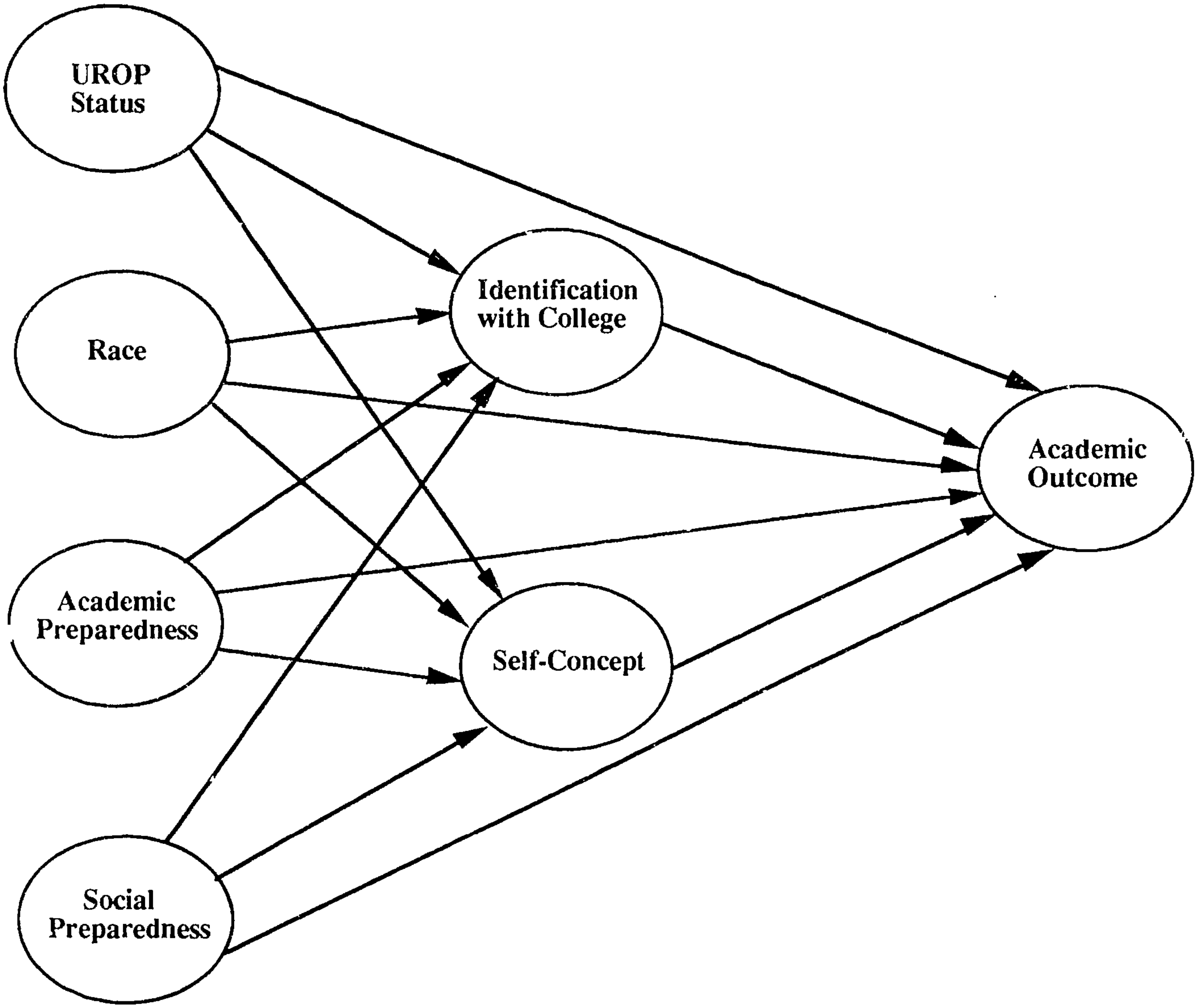

UROP
Status
Race
Academic
Preparedness
Social
Preparedness
Identification
with College
Self-Concept
Academic
Outcome

Figure 3 measures

Self Esteem

Collective Self Esteem

Academic Coping Styles

Probability of Obtaining an Advanced Degree

Confidence in Research Abilities

Attendance at University Events

Figure 4

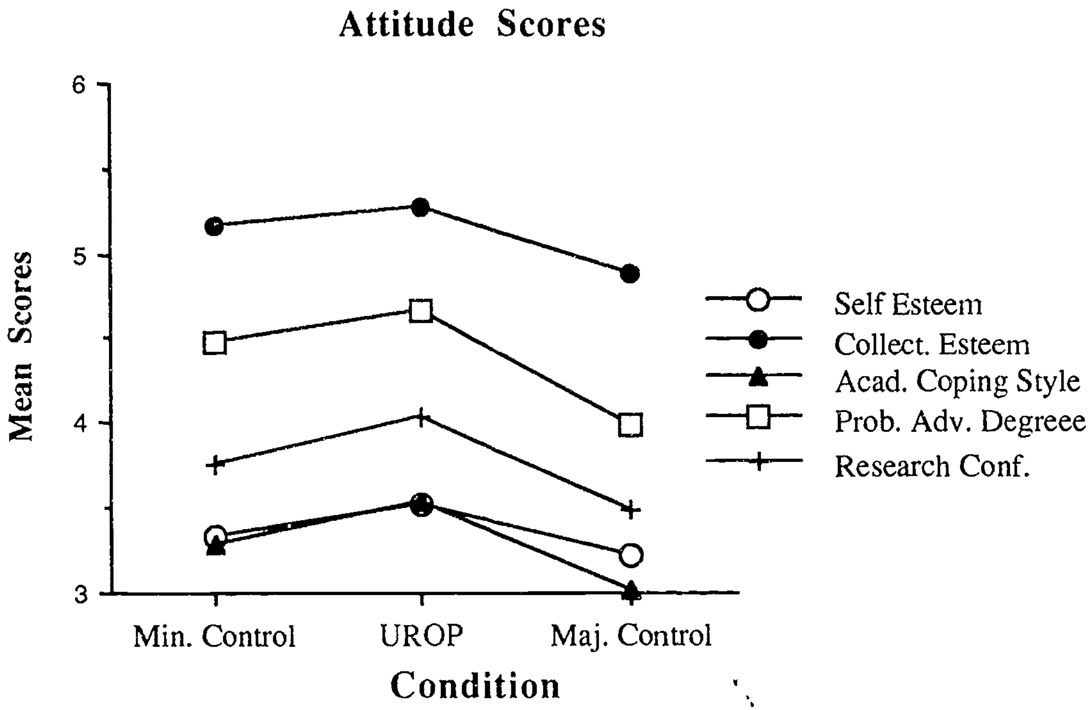

Attitude Scores
6
5
4
3
Mean Scores
Min. Control
UROP
Maj. Control
Condition
Self Esteem
Collect. Esteem
Acad. Coping Style
Prob. Adv. Degreee
Research Conf.

Figure 5

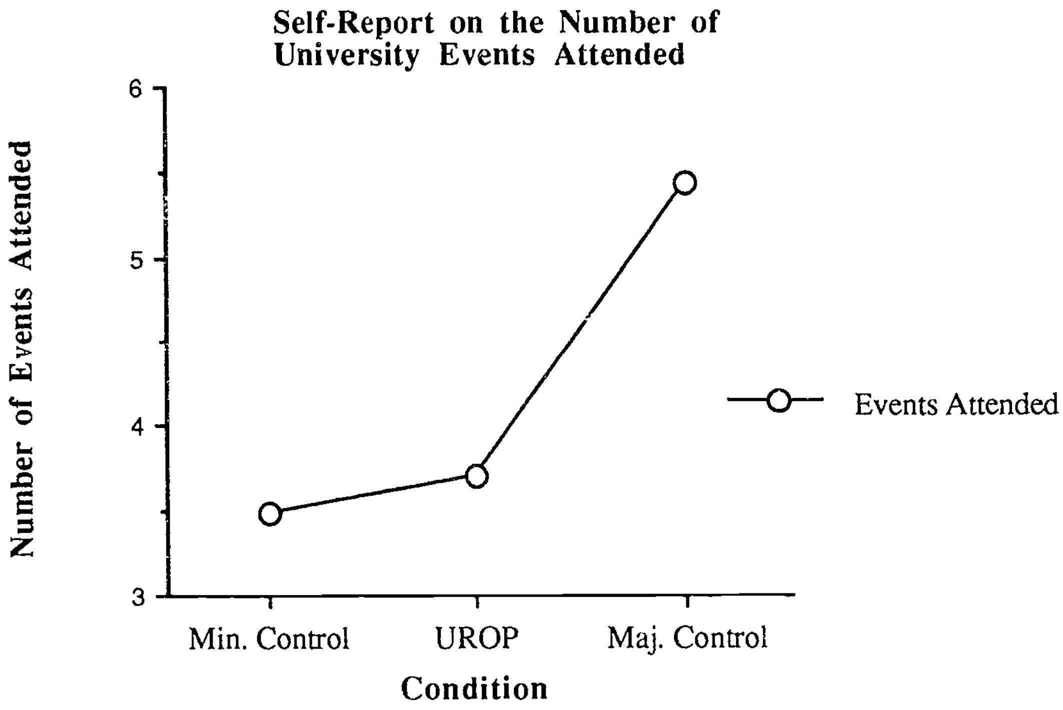
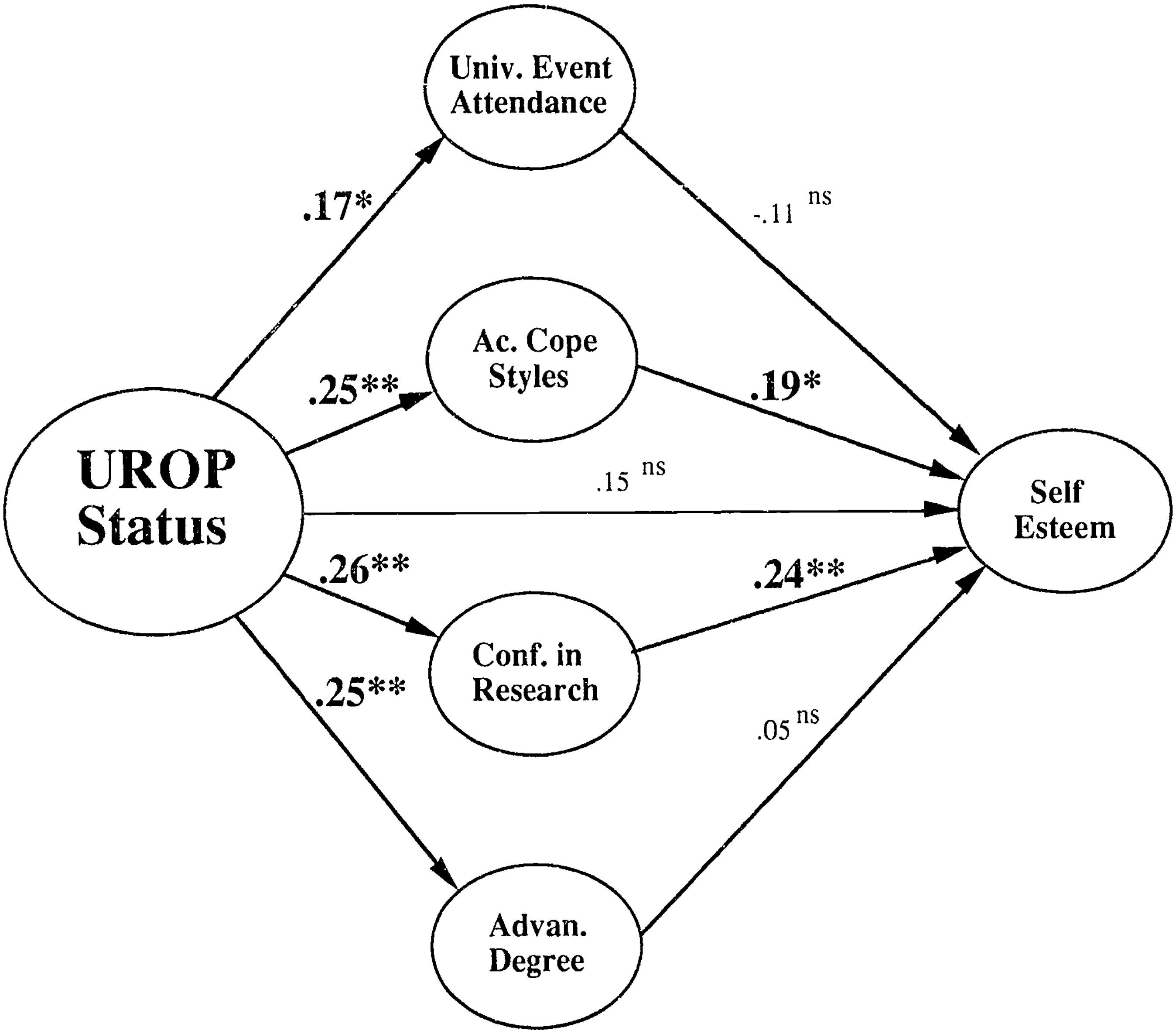

Self-Report on the Number of University Events Attended
Number of Events Attended
6
5
4
3
Min. Control
UROP
Maj. Control
Condition
Events Attended

Figure 6 - path analysis on self esteem


Univ. Event Attendance
Ac. Cope Styles
UROP Status
Conf. in Research
Advan. Degree
Self Esteem
.17*
.25**
.26**
.25**
-.11 ns
.19*
.15 ns
.24**
.05 ns

* p < .05

** p < .01

Figure 7

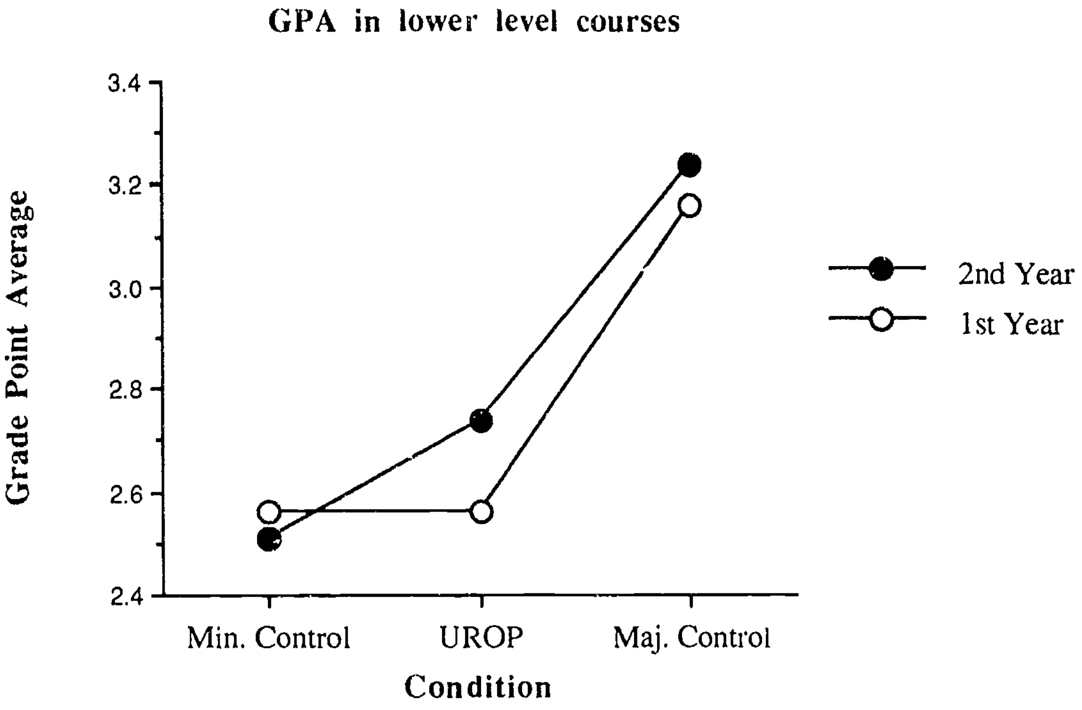

GPA in lower level courses
Grade Point Average
3.4
3.2
3.0
2.8
2.6
2.4
Min. Control
UROP
Maj. Control
Condition
2nd Year
1st Year

Figure 8

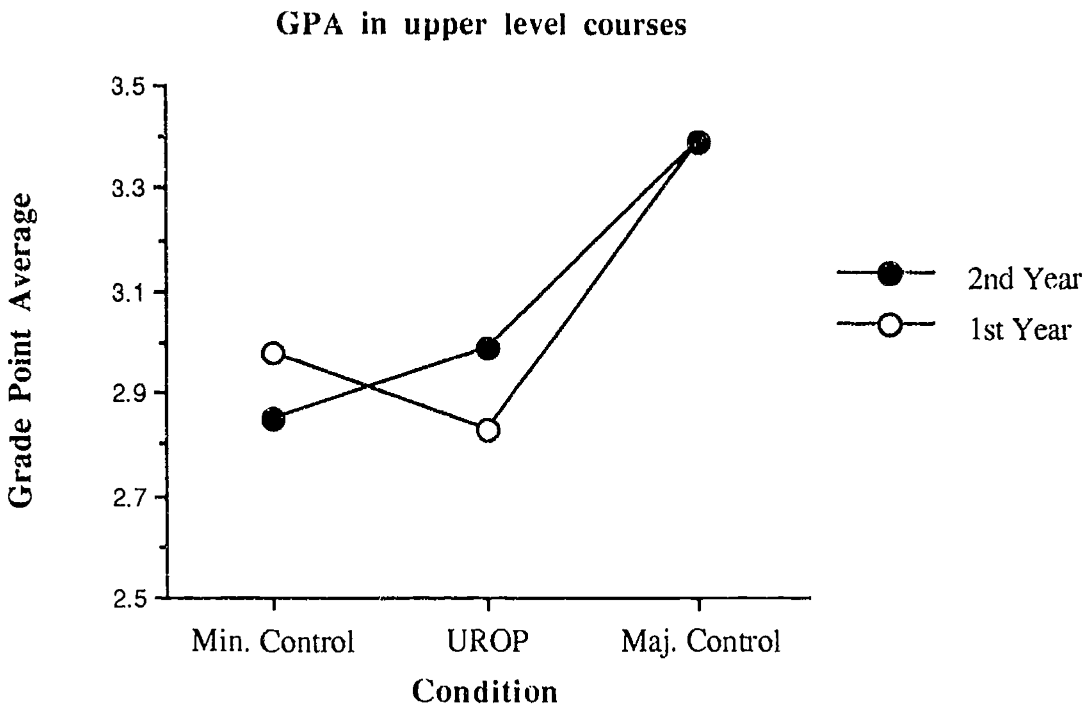

GPA in upper level courses
Grade Point Average
3.5
3.3
3.1
2.9
2.7
2.5
Min. Control
UROP
Maj. Control
Condition
2nd Year
1st Year

Figure 9

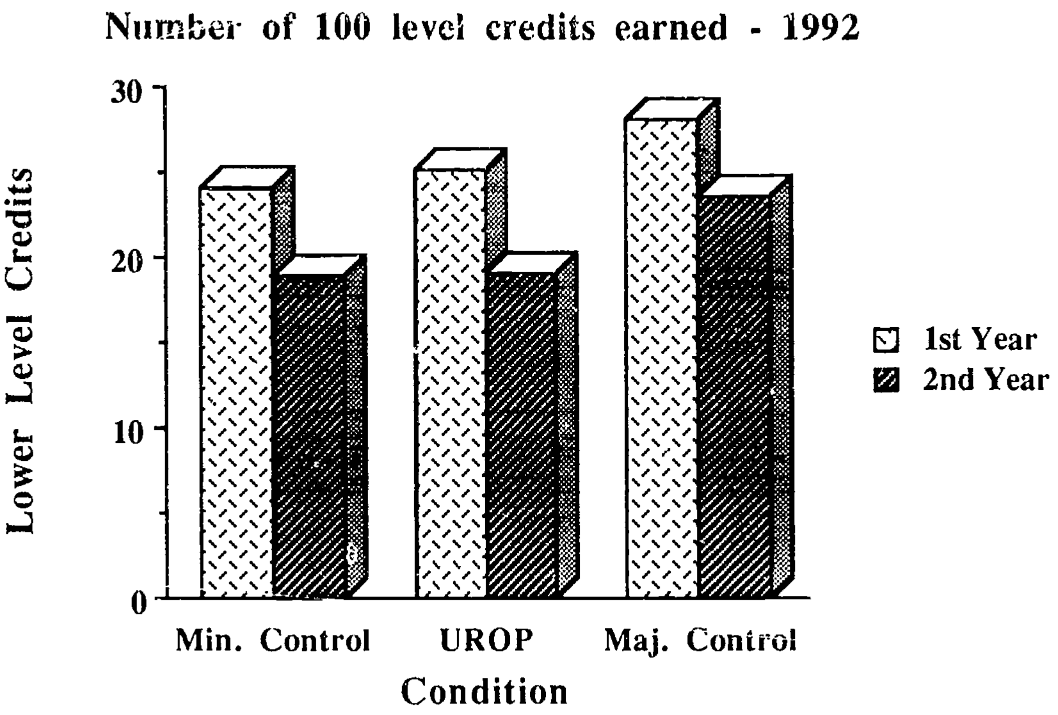
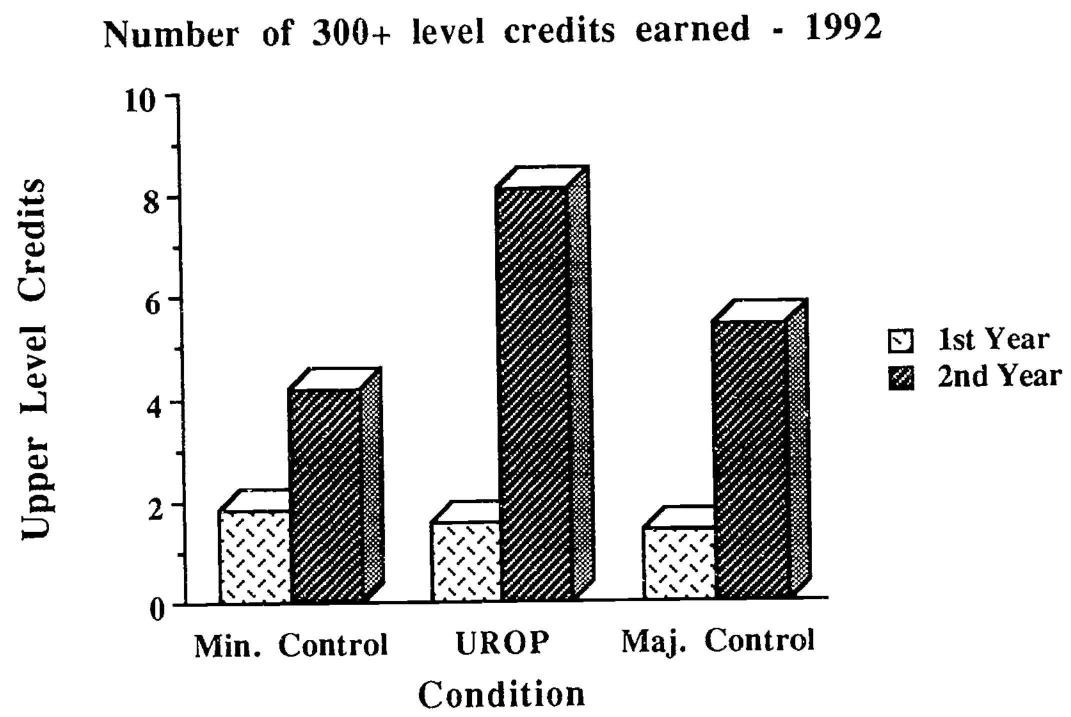

Number of 100 level credits earned - 1992
Lower Level Credits
30
20
10
0
Min. Control
UROP
Maj. Control
Condition
1st Year
2nd Year

Figure 10


Number of 300+ level credits earned - 1992
Upper Level Credits
10
8
6
4
2
0
Min. Control
UROP
Maj. Control
Condition
1st Year
2nd Year