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ABSTRACT

This study reviews literature related to innovative approaches to the teaching of college algebra, and describes the approach to such a course at Lansing (Michigan) Community College. Recommendations concerning that course are presented, based on the experiences of other schools as described in the literature, and analysis of the Lansing situation. Findings indicate a need for a Math Learning Center to augment regular class instruction. Such a center should serve the wide variety of students enrolling for college algebra with different levels of competence, learning speeds, and goals. The report identifies three areas in which decisions must be made concerning instructional mode to be employed in the center: human, printed material, and mechanical. No advice is offered in these areas due to the lack of evidence supporting one method over another. Other recommendations include the need to consider carefully the role of college algebra in various programs, and to examine critically the current course content. (SD)

COLLEGE ALGEBRA AND THE MATH LABORATORY

by

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TABLES

I. Purpose

The purpose of this report is to crystalize the academic factors involved in offering College Algebra and Trigonometry in the Lansing Community College (LCC) Math Lab. The need for such a study became apparent when members of the Math Department expressed some valid concerns over the results that might arise from a lab implementation of College Algebra. These concerns fell basically into two areas.

The first of these were concerns over cognitive achievement. Would students in the lab course be as well prepared for further courses, such as calculus, compared to those in the lecture-discussion class? This is a "cognitive" area.

At least as important in emphasis was a concern over the loss of daily contact with a mathematician, which was seen as a means to develop mathematical thinking. Would students in the lab course miss out on the culture of mathematics? This will be referred to as the affective concern.

In summary, the purpose of this paper is to evaluate concerns over the cognitive and affective effects that the Math Lab might exert on College Algebra students.

II. Current status

College Algebra (MTH 164 and MTH 165) has always been taught at LCC in a traditional lecture-discussion format. The textbook used is Integrated Algebra and Trigonometry, by Fisher and Ziebur and is covered in a two-quarter sequence, MTH 164 and MTH 165. Each section is limited to an enrollment of forty students, and averages about twenty-six (final grade count). The final grade distribution summary for Spring term 1974 through Winter term 1975 is presented in table 1.

TABLE 1: Grade distribution for final grades in College Algebra, Spring 1974 through Winter 1975.

	MTH 164								MTH 165							
	A	B	C	D	N	F	No. Sec.	Tot Stud	A	B	C	D	N	F	No. Sec.	Tot Stud
Spring 1974	12 12%	23 23%	30 30%	11 11%	12 12%	9 9%	4	99	16 23%	16 23%	16 23%	7 10%	5 7%	10 14%	3	70
Summer 1974	11 34%	8 25%	3 9%	4 13%	4 13%	0 0%	1	32	6 29%	5 24%	6 29%	0 0%	1 5%	1 5%	1	21
Fall 1974	23 18%	40 22%	43 23%	19 11%	18 7%	30 10%	7	184	15 26%	15 26%	7 12%	5 9%	9 16%	6 11%	2	57
Winter 1975	42 26%	34 21%	38 23%	18 11%	12 7%	17 10%	6	162	32 30%	36 33%	16 15%	6 6%	14 13%	3 3%	4	108
Year Sp 74-Win75	98 21%	105 22%	114 24%	52 11%	46 10%	56 12%	18	477	69 27%	72 28%	45 18%	18 7%	29 11%	20 8%	10	256

Besides the grades reported, there was an attrition rate of about fifteen to twenty per cent. That is, a full section of forty students at the start of the term might have thirty-two to thirty-four on the final grade count. The factors involved in this attrition rate can only be speculated on, and will be discussed further in Section IV.

In general, all incoming students in MTH 164 are given a placement test to assess their mastery of the prerequisite skills in algebra. Those who receive a score of ten or below on this twenty-five item test are usually counseled to enroll in Intermediate Algebra, though there is no binding choice implied. Many such students do, in fact, remain in the class. The factors and implications involved will be discussed in Section IV.

The type of student enrolling in College Algebra is reflected in the curriculum codes, summarized by each division of LCC, shown in table 2. Note that for many of those in Business, and in Applied Arts and Sciences, College Algebra is the terminal math course, as well as some of those in Arts and Sciences. Even though one-fourth of the students do not have a declared field of study, we can say that about half of those in College Algebra do not need to go on to Calculus.

About a third of the students are evening students, most of whom also work full-time during the day. Our experience has been that many students, day and night, have a poor background in math. Some have tried College Algebra before and failed; some have been out of school for several years; a few have taken prerequisite math courses and either received a low grade or failed completely. Most could benefit from some remedial work, at least to augment their studies in College Algebra.

TABLE 2: Distribution of students in College Algebra by Division of College

Division	MTH 164 Number	MTH 164 %	MTH 165 Number	MTH 165 %
No. Pref (Genreal Curriculum)	132	27.7%	64	25.0%
Arts and Sciences	144	30.2%	92	35.9%
Business	98	20.6%	40	15.6%
Applied Arts & Sciences	101	21.2%	54	21.1%
Total	477	100.0%	256	100.0%

Source: Curriculum codes appearing on final grade class lists, Spring 1974 to Winter 1975, for College Algebra.

In the classroom, teaching techniques vary, but are usually in the lecture-discussion pattern. Evaluation is based on several hour exams and a comprehensive final. The tests vary from instructor to instructor, and from term to term. The grading approximates a criterion cut-off pattern (A = XX - 100 average; B = ..., etc), with a large amount of subjective adjustment ("were my tests extremely hard?", etc). It is hard to say how much variance ("error of grading") is introduced by these grading techniques, but instructor autonomy is certainly an issue.

III. Research

In reviewing the research, only, eight articles (of 32 total in "College Math") specifically concern College Algebra in a non-traditional approach. Of these, three compared a traditional group with a group whose classroom instruction was augmented by programmed instruction, or audio-visual materials, or by computer assisted instruction. The remaining five were strictly case studies; i.e. - they describe an operational system in College Algebra but present no statistical data on comparisons.

This list of titles was obtained by a computer search of the ERIC (Educational Resources Information Center) in March 1975, and updated manually in May 1975. The great majority of publications in education are indexed in ERIC, and these searches include everything published and indexed through early 1975. We can assume this list was at least ninety per cent accurate as of early 1975.

Of the three articles dealing with traditional classes augmented by some other form of instruction, the most complete was that of Banister (1970). The experimental group, in addition to the classroom activities, were allowed access to multimedia lessons, available in the library at all times. The control group received just the traditional classroom instruction. Banister applied a t-test to the common final exam scores and found the experimental group did significantly better, at the 1% level of confidence.

Hennemann and Geiselmann (1969) conducted a study at Cornell, comparing those students who chose to augment their classroom learning with a programmed text, and those who did not. However, the programmed materials involved were not on the course material, but an introduction to calculus.

Another study was that of McMillan and Brown (1971). Both the control and experimental groups attended two large lecture sessions per week, but the experimental group used audio tapes while the controled group attended a smaller discussion group. Statistical analysis of the scores on equivalent forms of the same post test yielded no significant difference.

None of these studies were sound statistically. As noted, the Banister study was the best, but there still are some weaknesses in his study (such as the lack of randomness of the two groups). Because of this scarcity of data, we must attempt to draw valid information from the two other areas the literature can be classified in: case studies in College Algebra, and literature in other areas of college mathematics.

A very impressive, large scale innovative program was described in spearate articles by Matthews (1974) and Waits (1974). At The Ohio State University, the CRIMEL project (Curricular Revision and Instruction in Mathematics at the Elementary Level) was used to augment pre-calculus math. The program employs video-cassettes to reinforce material covered in traditional methods. Sophisticated techniques were used to develop the video tapes, and they were expensive to develop. It is reported that the video tapes are used, and seem effective in their purpose, though no data is presented.

Spangler (1971, 1973, 1975) describes his individualized learning lab, in which serveral other courses are offered in addition to College Algebra. From all appearances, this lab at Tacoma Community college is most similar to ours at LCC in many characteristics. For example, the type of students and the programs involved resemble those at LCC. Using the Keedy-Bittinger texts, Spangler reports good success rates in College Algebra, which is offered in traditional classroom as well as the lab. Calculus instructors remark that often the students from the lab college algebra are better prepared than those from the regular classes. This is attributed to the standardized, complete coverage achieved in the lab, which is not necessarily true of traditional classes. Spangler presents no comparative data; however, there seems little doubt that individualized instruction can succeed in College Algebra, at least in terms of cognitive goals.

Another case-study of interest is that by Palow (1973). The Miami-Dade Community College college algebra courses were modularized and modified for non-science students. The target populations were business and technical students for whom college algebra served as a terminal course. Placement testing, retests, and branching were utilized for the individualized instruction. Though little data and material were presented, Palow indicates satisfaction with the operation and results of the program.

Computer resource units for pre-calculus math were reported by Rockhill (1971). The course was analyzed in terms of specific objectives and grouped into four units. Pretests were developed for each units, and analyzed with an optical test reader and computer. For each student and test, the computer would list a set of about four specific references (text and pages) by objective. The references involved were generally programmed material. Rockhill indicates that student preference was for a single reference and that differing notation did trouble "some" students. Some analysis is presented;[1] however, the bulk of the report is devoted to the development and documentation of the computer resource unit. For any similar course adopting this type of computer usage, this would be a good reference.

Horner (1974) describes his system as a "one room school". Four different college math courses are offered in one room without using programmed instruction or gadgetry (such as audio-tutorial tapes). The emphasis is on the theory of offering a "Non Lab, Non-Programmed, Non-Lecture" course.[2] Horner advocates employing traditional textbooks for introducing and developing a concept, then using programmed materials if it is determined that the student does not have the corresponding skills (manipulative).

In a study related to our consideration of college algebra, Chinn (1973) carried out an extensive study comparing a traditional method and an audio-tutorial method of teaching intermediate college algebra. Three classes of each method were taught, with three different instructors teaching an experimental and a control class. These seven null hypotheses were tested statistically:

[1] Rockhill does present statistical analysis of post test scores, comparing a traditional class with the class using the computer resource units. However, he uses no covariates to adjust for differences in pretest scores or other contaminating variables. The results were significant on only one test; the other three were not significant.

[2] By "Lab", one has to assume he means a room of "gadgetry" and various equipment.

1. There is no significant difference in the mathematics achievement of the audiotutorial and traditionally taught students.
2. Differences between teachers did not significantly affect mathematics achievement.
3. There is no significant difference in the mathematics achievement of male and female students.
4. The interaction of teaching technique and teacher had no significant effect on the mathematics achievement.
5. The interaction of sex of student and teaching technique had no significant effect on the mathematics achievement.
6. There is no significant interaction between teacher and sex of the students for mathematics achievement.
7. The interaction of sex of student, teacher, and treatment had no significant effect on the mathematics achievement. (Chinn, 1973, p. VI)

Only the first hypothesis was rejected (at the .05 level), while the remainder were accepted. The results showed that the students in the audio-tutorial classes had a significantly higher gain score as a result of instruction. Chinn also reports favorable student response from the audio-tutorial groups.

A more unique course is described by Kochen and Dreyfuss (1972). They offered an experimental course for non-mathematicians, both undergraduates and graduate students, which had as goals to:

1. Get students without any prior acquantance with mathematics or a fear thereof to approach their studies more analytically.
2. Acquire orientation to and acquaintance with 25-75 basic concepts and methods covering sets, algebra, logic, computers, analysis, probability, math-statistics and topology in an over-all map of how they logically fit together and how they relate to problems of modern life.
3. Read, with appreciation, mathematical literature previously incomprehensible to them. (Kochen and Dreyfuss, 1972, p. 315)

In order to achieve these goals, the resources employed were: tutors, a resource room (containing a computer terminal and other materials), and a directory for using the material in the room.

The authors report the results of the course regarding the goals which they refer to as "mathematical orientation". On a pre-post attitude questionnaire, ten of twenty-seven items changed significantly in the desired directions. Because the study did not involve any sampling, its value must rest in its goals and approaches to those goals.

While many writers are urging for the importance of interpersonal contact in education, one researcher presents data to question its value for enhancing achievement. McDermott (1973) describes two groups using an audio-tutorial approach to intermediate algebra whose only difference was that one of the groups were not allowed help from any staff member, while the other could seek help from only the student assistant. After holding the effects of initial abilities constant, the group that could seek help did less well than the group that received no staff help on a post test measure. It may be possible that this particular type of help is not always helpful (i.e., student tutors) in intermediate college algebra.

A program employing computer assisted instruction for pre-calculus math is described by Judd, et. al. (1970). The target population is not course restricted, and does not constitute a required part of any course. This was not a comparative methodology paper, but does present some ideas and conclusions concerning computer assisted instruction, in general, for mathematics.

An interesting study is reported by Collagan (1969). A math-for-physical science course was taught by both programmed instruction and traditional lecture methods. This course covered topics from elementary and intermediate algebra, as well as scientific notation and similar areas. Data was collected and analyzed on achievement in the math course as well as the subsequent physical science course. The students from the programmed instruction group did significantly better than those from the traditional group in the math course, as well as in the physical science course, even though the science course was taught by a traditional lecture method. Whether these results are completely valid for other situations or not, this study shows that programmed instruction may be a beneficial instructional method for teaching prerequisite mathematics.

In contrast, programmed instruction (PI) has lost many of its dedicated proponents in recent years. May (1965) authored a report that exposes the lack of magic present in PI. Even though his report appeared ten years ago, May's points are well taken: PI is no wonder cure, but is a valid educational tool to be implemented where it is deemed appropriate and useful.

These are the only items in the research that this author could locate which dealt in a fairly direct or related way to teaching college algebra. The reader is referred to the bibliography for titles of other reports or articles which may have an indirect bearing on instructional methodology and college algebra.

IV: Discussion

The research reviewed in the previous section shows no clear cut advantage that automatically accrues when college algebra is offered in a lab situation. In terms of our original concerns for this study, a lab taught course will not necessarily produce better cognitive (knowledge) or affective (attitude) results. The literature to date shows that this may be the case, dependent upon currently unknown variable(s). What is required at this point for a wise choice is a need analysis, and then an examination of instructional strategies to meet those needs.

At Lansing Community College, the College Algebra courses perform the following purposes:

1. To serve as prerequisite training for further math courses, such as calculus, and statistics.
2. To serve as prerequisite training for other programs within the college, such as business and some science courses.
3. To serve as a terminal math course for some programs, although the skills transmitted are not needed for other courses.

The current content of the course is oriented to fulfill the first purpose; namely, preparation for more complex mathematics. Recently a new course was initiated (MTH 166 - Finite Math) which, together with MTH 164, serves the second purpose more directly. The consideration of the third purpose is a college level topic. Though outside the realm of this study, the author would urge that the current College Algebra be eliminated or replaced by another math course for this purpose.

Besides the needs dictated by the course, we must also consider the needs introduced by the students. As was noted earlier, students beginning the first term of College Algebra are given a placement test to assess their degree of competency in intermediate algebra (see Table 3). Approximately one-fourth fall below the cut-off indicating that taking intermediate algebra would be the best choice. Unfortunately, this student seldom can get into an intermediate algebra class, even though it is offered in the Math Lab every hour. Since college algebra tends to be offered at desirable hours, the corresponding Math Lab is usually filled to capacity and closed for registration. Thus the student is often left with

TABLE 3: PLACEMENT TEST SCORE DISTRIBUTION FOR COLLEGE ALGEBRA (MTH 164)

Total: 25 items

Score	Frequency	Comment
25	1	
24	0	
23	4	
22	9	93 (32%) scored over 15, indicating a
21	5	readiness to proceed in College Algebra.
20	11	
19	12	
18	16	
17	15	
16	17	
15	24	114 (40%) scored between 11 and 15
14	25	inclusive, indicating some need for
13	18	remedial work.
12	23	
11	24	
10	17	80 (28%) scored 10 or less, which in-
9	14	dicates they should be in a lower level
8	13	course. Many stay in College Algebra.
7	11	
6	8	
5	7	
4	2	
3	5	
2	2	
1	0	
0	1	
Total N	287	

just two choices: either drop the credits without adding (which the student doesn't want to do), or stay in the class (which is what the instructor doesn't want).

This problem might be lessened somewhat when and if the Math Lab can expand its capacity. However, the demand for the other courses offered in the Math Lab is growing at such a rate that this expansion would not eliminate the problem.

In addition to those students who should definitely drop back to intermediate algebra, there are those who lack a significant amount of the prerequisite skills for College Algebra. Over one-third of the students receive scores between eleven and fifteen, indicating some degree of marginal mastery of the prerequisites. These students, though they should have some review, are capable of succeeding well in College Algebra <u>if</u> some allowance is made for them.

These two situations indicate a strong need for remedial/referral capabilities on a demand basis, without a change in enrollment. This capability must exist independent of the class hour for College Algebra. A student, especially one with marginal prerequisites, must be able to pick up strength in prerequisite skills without falling behind in the College Algebra class, and without monopolizing the learning environment in the classroom and thus decreasing the efficiency of the learning processes of other students. Since the instructor is not capable of helping any number of such students, we conclude that some form of a learning center is necessary, even if College Algebra continues to be offered in the traditional classroom.

Besides this need to compensate for past learning differences, there are indications that we must also consider differences in the student's current learning patterns. A basic premise of Mastery Learning is that people learn at different rates. That is, the crucial variable is not "intelligence" nor "aptitude" but time. If we accept time as at least a major factor, we must allow for variability in learning time. The most efficient method of allowing for this variability currently known is to employ some form of a learning center, where a student can receive as much instruction (as opposed to drill) as he needs.

There is another need that must be considered: students in College Algebra vary with respect to their interests for taking the course. Some need it for calculus; others, for business; some for statistics, some for engineering; still others for an elective. A classroom instructor does not have the time to work examples that apply college algebra in each of the many areas of interest. Though this need is not crucial, a learning center would allow students to pursue examples in their own interest area. The desired effect would be to increase student motivation in the classroom.

Having established needs for a Learning Center, based on three student variations (input competence, learning speed, and output goal), we must decide what kind of a Math Learning Center (MLC) would best fit our needs.

The major choice to be made is between an augmental or supplantal MLC. That is, shall we use the MLC for support of the classroom (augmental), or shall we offer College Algebra as a separate course in the MLC (supplantal)? The research, as noted earlier, is very thin on this topic. Even though achievement in a Lab College Algebra could be at least as good as is accomplished now, a more prudent and efficient move would be to an augmental MLC.

Reasons against a supplantal MLC.

1. Program development -- very little has been done at other institutions to implement this approach. Much effort would be involved to achieve an unproven end.

2. Space committment -- classroom space is scarce, and it is unknown if a supplantal MLC would be "Space efficient".

3. Course status -- would it transfer as it does now? Will college programs change their curriculum requirements, independently or otherwise? The major cause of status change would be in the testing phase of the course.

4. Instructor autonomy is not immediately challenged.

Reasons for an augmental MLC:

1. Would respond to the needs of the college algebra student without a radical shift in course structure.

2. Requires a minimal space committment beyond current operations.

3. Requires minimal change in current testing patterns in college algebra.

The greatest impediment to a supplantal MLC, besides economic (space), is the problem raised by the standardization of testing. A prerequisite step for this process is a concurrence on the specific course objectives for college algebra. Some crucial issues impeding this are:

1. Should the course emphasize skills or "math orientation" (to use Kochen's term)? Or both?

2. Should the course distinguish between "skills" and "concepts"?

3. Which parts of the course are preparatory for other courses and which are terminal? Should either, or both, be a goal of the course?

These issues all have to do with the question of delineating the purpose(s) of the course. Currently, the course serves several purposes, but only one of these is reflected in the course operation.

Finite Math, MTH 166, does seek to respond to one of the other purposes, being aimed at business students who do not need trigonometry. It is to be hoped that this course will grow in enrollment. However, technology has a great impact on mathematics education. Some of the aspects of the current courses may be outdated and unnecessary with the advent of computers and pocket calculators. Not only do these render teaching methods obsolete, but raise questions as to the usefullness of every student in the course becoming proficient in manual manipulation of functions and polynomials.

This department will have to deal with these questions and issues at some point. However, because of the scope of such a task, it may not be efficient to force a deadline on the process by a decision to implement college algebra in a supplantal MLC.

Beyond the major question of which type of MLC would be most useful, decisions must be made on the mode(s) of instruction to be employed:

human (peer tutors, instructor (tutor), or group)

printed material (programmed instruction(PI), expository, or hybrid)

mechanical (audio-tutorial, video cassettes, or computer assisted (CAI))

These modes of instruction will be considered by major category.

Human resources for instruction in the MLC could be tutorial or group oriented. Though not included in the scope of this study, it is the position of the author that peer (student) tutors would be inefficient at this level. The type of person who can quickly diagnose, correct, and present examples is not likely to be enrolled in a two-year school, but would be an upperclassman at a four-year school. Instructor tutors would, one hopes, be more efficient in their role, but are much more expensive. (Instructors, if used, would have to be compensated for their involvement, since a basic force behind the MLC is that the instructor does not have time to tutor extensively outside of assigned class hours.)

Some mode of group instruction could be a solution to the problem. Basically, groups can be conceived as either undirected or directed by an instructor (or other learning specialist). Each type has advantages and disadvantages, which are summarized in Table 4. Note that these types are simply the extremes of a continuum, with other possibilities in between. It appears that a group somewhat more directed than undirected would maximize desired results. The direction would be supplied best by a learning specialist assigned to the center; since such a person would have to deal with students from several different instructors, there must be no contamination with one instructor's biases on methodologies and priorities.

Printed material definitely has its place in any MLC. However, great difficulties arise when two or more different series of material are used. The largest problem is the difference in notation, although many problems can be caused by differing order of treatment. (Author K might use task x as prerequisite to task y, while Author F might use y as prerequisite to x.) This is a logistics problem, and could be solved by complete research for the reference listings.

Which type of materials to use -- programmed instruction (PI), expository, or a hybrid of the two -- is somewhat indeterminate. At this time, it is generally believed that PI is best suited for skill building, while the expository style is well suited for introducing and integrating new concepts. Currently, there is some pressure developing for the commercial production of a hybrid style book -- one which uses expository methods for introduction and integration, and PI for developing skills.

The choice of which type of printed material to use in the MLC can not be made clearly. It is apparent that, until hybrid style books are developed commercially, both PI and expository books will have to be employed, since in-house development is expensive and impractical.

Mechanical modes of instruction have been, and will continue to be, developed for efficient use in college algebra. The choice of audio-tutorial tapes, video-cassettes, and computer assisted instruction (CAI) is primarily a question of practicality and affordability.

TABLE 4: Summary of the advantages of Directed and Undirected Groups in a Math Learning Center.

Type	Definition	Advantages	Disadvantages
Directed	A group whose learning activities are selected and supervised by a staff member.	control and measurement of process feedback for students and instructors professional direction	cost of personnel tendency to produce one-way communication (no interaction)
Undirected	A group whose learning activities are self-selected, and proceed with minimal supervision from any staff member	little cost for personnel promotes interaction between students promotes group support for students	no control of process initiative left to students

Operational systems in college algebra have been noted earlier: Chinn (audio-tutorial); Waits, and Mathews (CRIMEL - video cassettes); and Palow (CAI). Video cassettes and CAI have been integrated in a system (Pyramid - Bacon) to exploit the advantages of both.

This author places the higher priority on the use of video-cassettes, for the following reasons:

1. Television is a part of our way of life, and requires little adjustment by the student.
2. It has the capability to be presented over cable television, if such a facility were to develop.
3. Development of audio-tutorial programs has been aimed at lower - level math.
4. Computer assisted instruction is a long range goal, but is not feasable in the immediate future.
5. Video-cassettes for College Algebra have been developed and used at other institutions (e.g., CRIMEL at Ohio State)

Though the preference is for video-cassettes, this priority does not rule out the use of other mechanical modes of instruction. A concentrated efforts in this direction, however, would yield more immediate results, because of the reasons listed as well as others.

V. Summary and Recommendations

This report concludes that the evidence to date indicates that a non-traditional laboratory instructional system for College Algebra would not necessarily incur either detrimental or beneficial results. However, there is a need for an augmental Math Learning Center to make more efficient use of the instruction in the College Algebra classrooms, and to facilitate learning and re-learning of both prerequisite and new skills and concepts. This need is based on the large variability of student characteristics (input competence, learning speed, and output goal).

Within the structure of a Math Learning Center, decisions would have to be made on which of the following mode(s) of instruction to employ:

1. Human (peer tutors, instructor (tutor), or group)
2. Printed material (programmed instruction, expository, or hybrid)
3. Mechanical (audio-tutorial, video-cassettes, or computer assisted instruction).

This report has no evidence to present for these decision processes.

There remain issues to be resolved concerning the goals of the College Algebra courses. The Department must evaluate the impact of technology. The College should re-evaluate which programs should require College Algebra, and the Department should critically examine the content of the course to better serve those who are required to take it. The resolution of these questions is a necessary precondition for any implementation of supplantal College Algebra courses in a Math Learning Center, if this is deemed desirable.

This study presents the following specific recommendations for the Lansing Community College Math Department to evaluate:

1. Develop an augmental Math Learning Center to supplement the classroom instruction of college algebra.
2. Evaluate the impact of technology, specifically computers and calculators, on the content and emphasis of college algebra.
3. Designate a committee of three or four members from the department to formulate a specific proposal for a Math Learning Center. This committee should minimally consider:
    a. employing the Math Learning Center for calculus classes in an augmental mode.
    b. the use of video-cassettes as a primary mode of instruction in the Math Learning Center.
    c. the use of computers for eventual instructional use.
    d. the desirability of developing a college algebra course in the Math Learning Center.

e. the structural relationship of the proposed Math Learning Center with the current Math Lab, and with any future computer facilities withing the Department.

These recommendations are made with the hope that they will initiate analysis within the Math Department.

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