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ABSTRACT

This paper reports on the Virginia Conference on Lower Division Mathematics held on April 21, 1978 in Richmond, Virginia. It was sponsored by the Maryland-District of Columbia-Virginia Section of the Mathematical Association of America in conjuction with the State Council of Higher Education for Virginia. The purpose of the conference was to improve communication and coordination among two-year and four-year college mathematics faculties. The program included a keynote address that focused upon areas of mathematics content suggested as needing reexamination and included several talks on past and present efforts at articulation. Participants met in small groups by content area and by regions of the state for discussions of areas of concern regarding lower division mathematics. (Author/HM)

Report Of The Virginia Conference On Lower Division Mathematics

RICHMOND, VIRGINIA
APRIL 21, 1978

RONALD M. DAVIS
EDITOR

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FORWARD

The Virginia Conference on Lower Division Mathematics began as an idea within the Executive Committee of the Maryland-District of Columbia-Virginia Section of the Mathematical Association of America for increasing the coordination, communication, and collaboration among mathematics departments and faculty of two-year colleges, four-year colleges, and universities. Virginia was chosen as the region of the Section in which to attempt to sponsor such a conference. A program committee from the Maryland-District of Columbia-Virginia Section of the Mathematical Association of America with the support and assistance of the State Council of Higher Education for Virginia developed a conference program which focused upon the lower division mathematics courses.

The program began with a stirring and thought provoking address by Dr. Henry O. Pollak, past president of the Mathematical Association of America, who challenged all participants to pursue a coordinated reexamination and reevaluation of our mathematical course offerings, their content, and the sequencing of that content. Talks by Dr. Charles Houston and Dr. George Crofts provided the participants with insight as to past and present efforts at articulation and communication about mathematics course offerings and course content. Instilled with new thoughts and ideas by these addresses, the participants met in small groups by course content and then by regions to communicate with one another about course content and strategies and to develop plans for further regional coordination and communication.

A paraphrased account of the addresses by the main speakers is included within this Report. The statement by each of the course content meetings and the regional meetings are also included within this Report. A report of the final session on conclusions is also contained herein.

When the State Council of Higher Education for Virginia was approached about assisting with this conference, James McLean of SCHEV remarked that this was the first conference on coordination and communication of a program area that was initiated, organized, and held by faculty of that program area. It is the hope of the Conference Program Committee and the Executive Committee of the Maryland-District of Columbia-Virginia Section of the Mathematical Association of America that the coordination and communication begun at this Conference will ensure that such mathematics conferences will continue to be held.

Ronald M. Davis
Conference Program Committee Chairman

ACKNOWLEDGEMENTS

The Virginia Conference on Lower Division Mathematics wishes to express its gratitude to Virginia Commonwealth University, Richmond, Virginia for serving as most gracious hosts for the conference. Special acknowledgement is also made of the tireless efforts of the Conference Program Committee whose members were Ed Bender, Reuben Farley, Joe Kent, and James McLean. Finally, special thanks are given to the 101 participants from 31 two-year colleges, four-year colleges, and universities of Virginia whose efforts and leadership helped to make this conference a success.

Virginia Conference on Lower Division Mathematics

SESSION I

Presider: Joseph F. Kent, University of Richmond

Welcoming Remarks

Dr. Francis J. Brooke, Provost, Academic Campus, Virginia Commonwealth University
Mr. Barry M. Dorsey, Assistant Director, State Council of Higher Education for Virginia
Mr. Ronald M. Davis, Past Chairman, Maryland-District of Columbia-Virginia Section, Mathematical Association of America

Keyncte Address

Dr. Henry O. Pollak, Director, Mathematical and Statistical Research Center, Bell Laboratories, Murray Hill, N. J. and Past President of the Mathematical Association of America

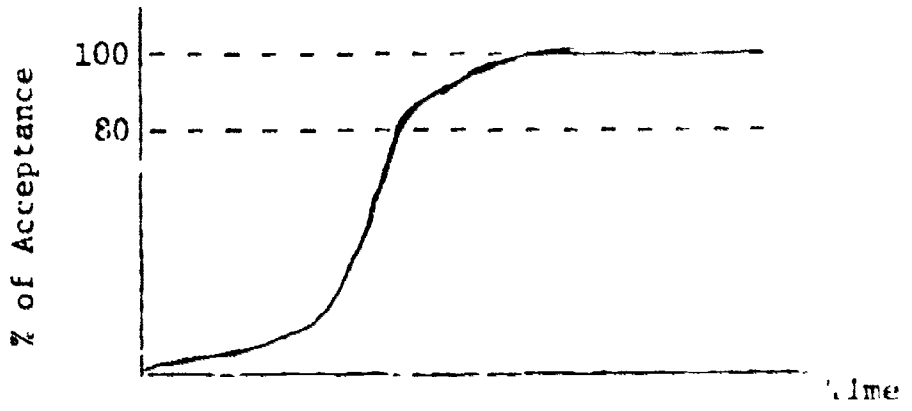
Dr. Pollak began by stating that during his talk he intended to share some opinions relating to the teaching of mathematics at the lower division level. He intended to mention aspects related to pedagogy as well as to curriculum content.

Dr. Pollak shared with the participants several anecdotes to highlight the importance of coordination. He first related his experience as the math specialist on a visitation team to Indonesia for the State Department. They were to work with the Indonesians on a five-year plan in science, technology and education. He noted that at universities there it was often common for entrance exams in mathematics given by the universities to upwards of 50,000 applicants to be passed by only a few hundred of the applicants. Upon further investigation he discovered that the entrance exam covered things which were not covered in the high schools, that there was no structure to coordinate the teachings in high schools and colleges, that there was no communication between these groups, and worst of all that there was no concern over this lack of communication.

Dr. Pollak provided a second anecdote that took place in the Sorbonne. He prefaced it by comparing the process of curriculum change in the United States and in Europe. He noted that in the U.S. we have had long and intense discussions about structure and content. Change here is gradual with all parties going slowly and carefully compromising along the way.

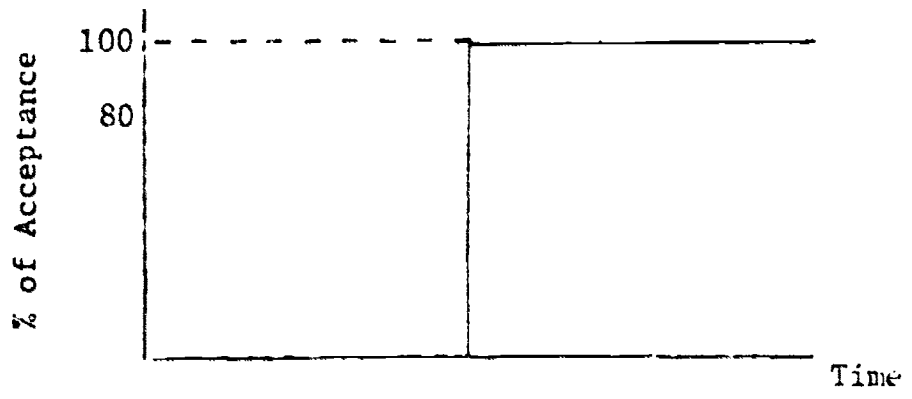
Dr. Pollak then traced the path of curriculum acceptance in the United States. Normally, an idea germinates. It's tried and if it works, some other people try it. Maybe even it succeeds. At that point there is about 80% acceptance. There will always be a small group of teachers

who will never utilize that idea no matter what it has been. He then graphed the percent of acceptance as a function of time.



U.S. APPROACH

In Europe, and most other countries Dr. Pollak noted, the approach is quite different. An idea develops but can't be tried because it's not part of the curriculum. So, it's discussed with the Department of Education. If the idea is agitated sufficiently to the point where the Minister of Education actually appoints a committee to consider reform and if that committee finally gets a majority to desire to implement the idea, then the change is implemented in all schools immediately in all schools in that country. Dr. Pollak then drew the graph of the European approach.



EUROPEAN APPROACH

He noted that the areas under the two curves are the same but that the politics are sure different!

He noted that this last approach among engineers is called a "bang-bang" control system, and this last approach was what had happened in the teaching of calculus in Paris at the Sorbonne. They had a long discussion about what calculus should be like. Finally, the reformists got the upper hand and put into the curriculum a very careful, theoretical, structured calculus course which neglected the engineers and their techniques. The course was taught and resulted in a failure rate in engineering of 97%.

Dr. Pollak then considered how one ought to design a curriculum. He noted that at any one time we have two partial orderings existing, each

contradicting the other. These partial orderings are those of importance and those of prerequisites. He noted that what we try to do is to design a curriculum to follow those. Both of these partial orderings are time variable and location variable. One of the big mistakes particularly in the 1960's was to try to export curriculum from one place to another rather than to rethink it and redesign it locally.

To indicate why the partial ordering importance is time variable, he noted that from about 1900 to the late 1950's the curriculum was constant, trigonometry having been the last course implanted into that curriculum and that having occurred somewhere around 1910. He noted that trigonometry was for the purpose of training surveyors to help open the West. He then related some of the topics of trigonometry that were related to surveying which he felt were not worth very much attention today. Dr. Pollak then stated, "Obviously, the West is now open. So we must rethink trigonometry and its content." He then expressed his own view that what is now most important in trigonometry is that sine is an odd function and cosine is an even function.

Dr. Pollak expressed that all of our courses need to be rethought. Algebra especially is in need of rethinking. There are many things more important than division of polynomials - like probability, for instance. Even factoring is less important than some of the things we should do with our time. He raised the opinion that we should not be spending six years on arithmetic in the elementary schools.

He noted that when he had worked on the SMSC project he had different ideas. He reflected that he had grown older and therefore, he hoped, smarter. But not only that, things have changed since that time, so then his thinking about various topics should also change.

Dr. Pollak noted that our understanding of prerequisites has changed. Expertise with rational numbers is required before going into probability. He suggested this was backwards. Probability, he noted, was an excellent motivator for working with rational numbers. He asked why division of fractions was necessary and answered by noting that one of the few reasons is conditional probability. This he perceived as an excellent motivator for division of fractions. He noted several countries and some programs in the U.S. in which probability is taught in the elementary schools.

Associated with the partial orderings of importance, which changes all the time, and of prerequisites are changes in technology. Programmed instruction, computer-assisted instruction, modular instruction, calculators and computers are on the market. He suggested that we should look at these things in light of asking ourselves two questions, "What are the most difficult pedagogical problems that we have?" and "Will any of these things help solve the problems?" He noted the hand-held calculator was one technological tool that he felt would be beneficial in teaching. He commented that the calculator works well in helping the student intuitively examine the concepts of function and inverse function.

He recalled that in the 1960's there was a large scale uncoordinated effort to make films. The topics, by and large, were those which a teacher could present well on a blackboard. He suggested films would have been utilized if they examined those processes which needed help in visualizing the idea. He noted the example from calculus of visualizing the intersection of three cylinders. He also felt assistance was needed in visualizing motion in a three-dimensional space.

Dr. Pollak, examining the partial ordering of sequence, stressed that we need to start thinking about the curriculum in terms of what is most important and what must precede what. He gave his list of what is most important to know. He stressed the calculus sequence, linear algebra (worked in with the calculus), probability, statistics, computing, and modeling as well as modern algebra analysis, and geometry or topology.

He stated that he felt calculus was impossible to teach. While working with SMSG he thought elementary algebra was impossible but calculus is worse. He commented that in algebra the problem is that you have a half dozen basic concepts, each of which you need to do first before you do any others. You want to talk about negative numbers, variables, the multiplicative structure equations, patterns, and word problems. He talked about the difficulty that algebra students have with word problems. He suggested beginning by asking the students questions such as, "Give me a problem whose answer is 14," and "Give me a story expressed by $2x + 3$." Then discuss what leads you to write down various patterns with appropriate stories given. These should help to bring out all the tricky little traps such as "exceeds", "is greater than", etc. He felt that this open-ended discovery approach would help the student to grasp what the various words are meaning.

Dr. Pollak explained that in calculus there are three very different things you're trying to do. This problem is not just at the beginning but rather is throughout the course. He commented that we are trying to provide a collection of very practical and useful techniques, we are attempting to show that calculus is one of the great inventions of the human mind (consider some of the methods by which Archimedes and others tried to solve problems that our students now do in three or four lines), and we want to teach something that is mathematically correct. He felt these points are irreconcilable. Each point could be used as the basis for a whole course.

He then discussed the calculus course for business students. He said that the first aspect he learns about such a course is that trigonometry is left out. He felt that that was a weakness since these students need a familiarity with the mathematics of a business cycle and of seasonal trends.

Dr. Pollak stated that probability and statistics are most important. These should be considered as distinct courses. He felt that students need an elementary statistics course independent of probability, and that such a course should stress exploratory data analysis.

He then stressed the need for applications and applied mathematics. He noted that this is more than calculus including statistics and much

more. Dr. Pollak noted the need for model building courses in which the students start with a problem and attempt to examine the various approaches to solving the problem. He felt that such a course would help students in determining how to relate their mathematics to other areas. He stressed the importance of mathematics teachers going out to industry and giving to industry the desired math training at their facilities using examples from their field.

Dr. Pollak referred to the preliminary results of a nationwide survey of two-year college faculty. In these results faculty displayed a strong interest in short continuing education courses. He stressed that math teachers should participate in such seminars. Further, he noted a need for college and university seminars on how to teach to help prepare mathematicians who will become teachers. He expressed a belief in the benefit of organized review of textbooks. He noted a statewide sharing of such reviews would be beneficial.

He referred to changes in instruction suggested by the hand-held calculators. He stated that he hoped the calculator would cause change in what is referred to as remedial math. In such courses we tend to take what the student had before, and we give it again, only louder. We need to use different approaches in our remedial courses. The calculator, he felt, was a tool to assist in this. Without the calculator many students tend to not even try problems. They feel that even if they could set the problem up, they couldn't perform the arithmetic accurately to solve it correctly. The calculator provides such students with an assist.

Dr. Pollak suggested that the calculator ought to be used to redesign the curriculum itself. He stated that a fair amount of what we teach in algebra is out of date. He gave as an extreme example, "Simplify $\frac{1}{x} + \frac{1}{y} + \frac{2}{z}$". The answer normally desired is $\frac{yz + xz + 2xy}{xyz}$ but he questioned whether that was in fact simpler. He noted that the long used meaning of "simplify" meant to reduce to as few divisions as possible. Calculation by hand using division is extremely difficult, thus the need to reduce to as few divisions as possible. He suggested that with calculators division is no more difficult that any other operation. He also noted that this "simplify" concept must be unlearned when a student enters calculus. Should a student wish to integrate, he would need to undo $\frac{yz + xz + 2xy}{xyz}$ before integration could be performed. He suggested that there are many other concepts throughout mathematics which are out-of-date.

Dr. Pollak concluded his talk by noting that he welcomed the spirit of cooperation displayed by this conference. He cautioned, however, that it is one of the hardest things to hold on to. The late fifties and early sixties was the hayday of cooperation because of massive infusions of government money. Noting, however, that this conference was not generated by government grants but rather by individual interest displayed by mathematics teachers, Dr. Pollak praised those present for their desire to open channels of communication and cooperation and wished the participants a successful conference.

Previous Studies on Coordination

Dr. Charles Houston, Director of Institutional Research,
Virginia Western Community College

Dr. Houston reported on studies by Robert Hoyer and himself at Virginia Polytechnic Institute and State University done in the fall of 1972 and 1975. The study examined the courses at the thirteen state four-year colleges and universities which were considered by those colleges to be equivalent to the courses offered at the Virginia Community Colleges. He stressed the problem of keeping such a list up-to-date with frequently changing course numbers and periodic content changes.

Dr. Houston stressed that the major problem in articulation is that most of the articulation is not done by mathematics faculty but is done by directors of admission. He noted that real articulation will occur only when mathematics faculties among the colleges actively communicate and coordinate with one another.

Dr. Houston noted that the textbooks used by community colleges were also surveyed. He indicated that by examining textbooks a college could quickly determine the real content of the course that the student had had. The textbook survey results indicated that the community colleges themselves often had differing views as to the appropriate content for courses described in Courses of Study of the Virginia Community College System. He did indicate complete agreement on the 141 freshman calculus sequence but noted some differences among community colleges in the 161 and 241 series. The 181 series had the most diverse interpretations of its content.

Dr. Houston concluded by stressing the importance and benefit of the duplication of these studies.

A College's Approach to Coordination

Dr. Charles Crofts, Virginia Polytechnic Institute and State University

Dr. Crofts noted that coordination does not have easy answers, but indicates that at Virginia Polytechnic Institute and State University they have tried to lessen the difficulties as much as possible. There, transcripts are received by the Admissions Office which farms them out to the colleges where they are often evaluated by the deans or their representatives. Occasionally, they are given to academic departments. The sources used for these evaluations are most often the course descriptions in college catalogs, occasionally guidelines developed and articulated at conferences, and periodically an interview by a faculty member with the student. These interviews are often facilitated by sharing of course outlines and by using the telephone to communicate with the student's former college.

One reason for coordination is that there are non-experts attempting to evaluate transcripts.

Dr. Crofts noted the problems with students transferring in the middle of a course sequence and stressed the importance of students transferring complete course sequences rather than partial sequences. He encouraged that neither the community colleges nor the four-year colleges and universities should dictate to one another. Rather, he felt each should work closely to keep one another accurately informed. He concluded by noting the value to the student and to the person attempting to place that student of the former instructor clearly relating through a syllabus what content has been achieved and relating to the student what content the student would need extra work on prior to attempting more advanced courses or programs upon transferring.

SESSION II

MATHEMATICS CONTENT MEETINGS

Subsession A

I. Precalculus - Evelyn Roane, Presider

The precalculus content meeting consisted of people from four- and two-year institutions. Three main points were discussed.

1. Actual content in the 161 series. The content of Math 163 varied from college to college. Many colleges offered no calculus in the course. It was agreed that the courses should provide the material required by the majority of transfer colleges of students.

2. Placement Tests. Most colleges seem to have the same problems with entering students. One of the most prevailing problems was how to insure that students will be prepared for the course. Placement tests and two years of high school algebra were the prerequisites stated by individuals. One person suggested the introduction of a new course which would serve as review of the topics students saw in algebra might remove the problem of lack of preparation by entering students.

3. Modes of Instruction. Thomas Nelson Community College had experimented with a different mode of instruction other than lecture which uses Swokowski's Precalculus as a programmed text.

II. Finite Mathematics - Art Charlesworth, Presider

Participants in the meeting represented five two-year colleges and three four-year colleges. The only one of the two-year colleges which regularly offers Finite Mathematics is Northern Virginia Community College. The main reason given by the other two-year colleges for not offering Finite Mathematics is the statewide community college requirement that students must have three years of high school math prior to taking the course. Northern Virginia offers a three-term sequence in Finite Math covering essentially all standard topics.

Each of the four-year colleges offers Finite Math courses. Christopher Newport will offer two separate courses beginning next year: Linear Mathematics, covering linear equations and linear programming, and Finite Math, covering math of finance, graph theory, and probability. Mary Baldwin's one semester course gives equal attention to linear topics and probability-statistics. The University of Richmond offers two semesters of Finite Math, including computer programming, math of finance, linear programming, networks, probability, and game theory.

Participants generally agreed that a Finite Math course is a valuable addition to the curriculum since it is a subject which can be attractive to business and social science students and which is different from what these students learned in high school.

III. Statistics (Noncalculus Based) - Ron Davis, Presider

Approximately 20 people were in attendance at the Statistics content meeting. The group was in general agreement that most students entering this course had poor math backgrounds and often within the course exhibited problems with reading and decision making. Several representatives indicated entry requirements and placement testing were used to screen entering students.

Two distinct courses arose in our discussion. One was a one semester statistics course covering descriptive statistics and the basic hypothesis test methods of inferential statistics. The other was a year course which extended the one semester course by including experimental design and nonparametric statistics. The representatives were in agreement on the content within each of these two approaches. Thus, transfer of the course was considered to be quite good.

Many of the representatives stated that statistics was approached from a computational viewpoint with less emphasis on mathematical probability. Calculators were used extensively, but computers were used less frequently. Access to computer statistics programs was considered to be a problem.

The meeting concluded with several representatives indicating that their courses focused upon business and social science majors. They indicated differences in the use of notation within these groups and various texts as being a problem.

IV. Liberal Arts Mathematics - Zauquel H. Chowdhury, Presider

No Report

V. Calculus - Reuben Farley, Presider

This session was attended by representatives from fourteen schools. Some discussion was held concerning which texts were being used at the various schools. Discussion then ensued concerning problems of transferring courses in terms of difficulty in matching syllabi. Methods of dealing with these

problems range from awarding credit by examination, or credit for independent study (sometimes for 1 or 2 credits) to trial placement in a particular course. The group agreed to strive to coordinate syllabi to the extent that single variable calculus would be covered during the first one-year sequence. In addition, the group agreed to solicit the aid of the MAA in designating a person to head a clearing house for distribution of syllabi used for the calculus sequence at various schools in the state.

VI. Remediation - Roland E. Moore, Presider

Main Points

1. "Remediation" sometimes carries a negative connotation - lack of exposure is often the reason for students' assignment to developmental studies programs.
2. Agreement was reached on courses considered in developmental studies: (a) Basic Arithmetic, (b) Algebra I, (c) Algebra II, (d) Geometry, (e) Trigonometry.
3. Lecture and self-paced methods are used.
   Problem:
   (a) Discipline in the Math Lab.
   (b) Rate of success in the lab method is dependent on the low faculty-student ratio - with help of lab assistants.
4. Mini-lectures are used in conjunction with lab techniques.
5. Most schools represented operate with a self-paced program. (Only 3 schools represented operate on a lecture basis.)

Facts Gathered

1. Statistically, one school found no significant difference in success in lecture method and self-paced method.
2. One school is reducing self-paced sections in favor of lecture sections.
3. One school is reducing lecture sections.
4. Some schools reported using computer assisted instruction.

Subsession B

I. Precalculus - Vincent E. Daniel, Presider

The session was very well attended with approximately 25 participants. The consensus of the group was that the emphasis in a precalculus course should be on (1) the elementary functions and (2) developing the necessary skill in algebraic manipulation.

Most "precalculus" courses were not solely for that purpose. Generally, they appeared to be an algebra/trigonometry sequence with the option of breaking off after algebra into finite math or some other one semester course. Courses identified as precalculus were of one semester duration.

Problems discussed included declining student motivation, placement testing, increasing need for developmental (remedial) courses, use of labs or tutorial sessions, increasing difficulty in covering the course outline.

Course credit appeared to be uniformly 3 semester hours (or the equivalent quarter hours) or 6 hours for the algebra/trigonometry sequence.

II. Finite Mathematics - Beth Barnwell, Presider

This subsession was attended by ten participants - eight from community colleges, one from a four-year college, and one from a university. The content in finite mathematics courses seemed to vary widely. Among the topics commonly included in such a course were computing, theory of graphs, linear programming, probability, Markov chains, game theory, logic and statistics. In some schools, the finite mathematics courses have been offered in sequence with a business mathematics course. The question of prerequisites for a finite mathematics course was discussed. Most participants felt that two or three units of high school mathematics would be sufficient. Most also felt that a course in finite mathematics would be easier for a student with a weak background to enter than a course in elementary functions. No one seemed to feel that transferring credit from one school to another would cause any difficulty.

III. Technical Mathematics - Harry Ellis, Presider

No Report

IV. Liberal Arts Mathematics - Eleanor Jones, Presider

Liberal Arts Mathematics was defined as the mathematics taught to students not specializing in mathematics, natural science, business, or teacher training. The course content among the different colleges was quite varied with the course consisting of very practical consumer remedial topics at one institution and consisting of mostly purely theoretical and cultural topics at another. Professor Sanders gave a particularly interesting description of a two-semester cultural mathematics course taught at James Madison University as a mathematics appreciation course for highly motivated majors in Foreign Language, Art, History, and Music.

The group discussed whether the courses should emphasize mathematics appreciation or the practical applications with the general consensus being that to some extent both appreciation and relevance should be considered. All agreed that Sets, Logic, Probability and Statistics should be included in the course.

Most of the institutions made use of placement tests - standardized and otherwise. Some used them along with transcripts for the determination of the appropriate courses for students to enter. At James Madison, the student's academic advisor selected the program in which the student would meet the six-hour mathematics requirement.

The traditional method of instruction was used at all of the institutions with a couple also using self-paced instruction. Representatives of seven colleges were in attendance.

V. Calculus - Shirley Johnson, Presider

Approximately 25 persons representing 8 to 10 four-year colleges and about the same number of community colleges were in attendance.

In this session it was generally agreed that the problems encountered in the transfer of calculus courses are relatively few. Participants indicated that their introductory calculus courses covered basically the same material in approximately the same time frames. The lengths of time spent on linear algebra and differential equations in the second year varied. The only real problem identified seemed to be that of a student transferring into an engineering school after the first year. In some cases he would not have received the instruction in vectors necessary for certain sophomore-level engineering courses.

In an informal survey of textbooks being used, Swokowski was most frequently named.

VI. Remediation - Betty Shores, Presider

The discussion in the remediation section focused on various modes of instruction for developmental courses. Some members of the group reported that they used only a lecture/discussion approach; others reported that they used only a self-paced approach; others reported that they used a combination of these two approaches. The sharing of ideas about and experiences with these various approaches seemed to be of interest and help to the participants.

Although time did not permit in-depth discussions of many topics, there seemed to be consensus that there are several things worthy of discussion in groups of this kind - for instance, content of developmental courses, use of calculators in developmental courses, ways of evaluating developmental studies programs, ways of evaluating placement tests and testing procedures.

The combined attendance lists of the two remediation sections will be compiled by Betty Shores and sent to each participant. The group agreed that this might serve as a step toward continued communication among persons interested in and involved in developmental studies.

SESSION III

REGIONAL MATHEMATICS MEETINGS

I. Northern Virginia Area - George Lowerre, Presider

Only faculty from Northern Virginia Community College attended the Northern Virginia regional meeting. Four campuses, excluding Manassas, were represented. Everyone seemed to value this time we had to speak with faculty members from other campuses. However, we all regretted that no other schools, in particular George Mason University, were represented.

This led to a discussion of the need for better communication between NVCC and GMU. We felt that it would be advantageous if the Math faculties

and both schools could meet and discuss any questions or problems that they had. We decided the best time for such a meeting would be during one of the in-service days preceding the Fall term. Although we discussed the arrangements that would have to be made with NVCC and GMU, to my knowledge no one took on the responsibility for organizing this meeting.

During the rest of the time, we discussed, either together or in small groups, questions we had regarding the mathematics courses taught at NVCC. The topics discussed included: the status of TICCIT, placement procedures and pretests, the course content as dictated by the State Curriculum Guide, and textbooks currently used. Several people also expressed a desire to know more about the computer facilities that were available for use by the NVCC faculty.

Everyone seemed to feel that the opportunity to meet with the other faculties was worthwhile.

II. Capital Area - William Haver, Presider

It was a concern that four-year colleges and two-year colleges have not had encugh communication on course content and on which courses would transfer into the various departments, especially when changes on what is acceptable have been made. We wondered what to do about it and made no real conclusions. It was suggested that faculty or students call the Mathematics Department of the school to which transfer is anticipated when problems arise.

Our group decided to have Ed Bender, J. Sargeant Reynold Community College, to call a group of us together again next year to discuss topics of interest.

III. Tidewater Area - Mark Lesley, Presider

The institutions represented were Christopher Newport College, Norfolk State College, Old Dominion University, Thomas Nelson Community College and Tidewater Community College.

The discussion began with an exchange of information regarding the content of lower division courses given by the institutions represented. Representatives from the community colleges expressed the feeling that the Community College State Curriculum Guide was in need of revision and updating. In view of statewide cooperation required to bring this about, it was felt that SCHEV would be needed to lead and coordinate the project.

Some members expressed interest in developing clinics, of the sort mentioned by Dr. Pollak in his keynote address, for local industries.

Many members felt that meetings of the regional mathematics teachers would be valuable to exhange information about courses and settle transfer difficulties, and to get to know who to call on when problems arise.

IV. Piedmont Area

No Meeting

V. Northern Valley Area - William Sanders, Presider

No Report

VI. Southern Valley Area - George Crofts, Presider

The fifteen plus participants at this meeting agreed on two suggestions in the specific area of course coordination: (1) an annual report similar to the Houston/Hoyer study, listing courses and textbooks, would be useful; and (2) VPI should attempt to send out notice of course changes as early in the process of the change as possible.

Four general issues which generated active discussion were: placement tests, coordination with high schools, hand-held calculators, and justification of what we teach.

There has been no uniform procedure or policy regarding advanced placement tests. Some schools used locally prepared tests, some used SAT scores, some used high school records, and most combined parts of these three. It was mentioned that the MAA now has some placement tests which may be purchased.

The second issue was addressed from the view of informing high schools of their students' deficiencies, and of whether high school students with sufficient background should be advised to take calculus at a community college. The group felt that an effective way to inform high schools of deficiencies was to encourage their alumni now in college to report these deficiencies to their former schools. The problem with having high schools take college mathematics courses has not been in the colleges, which welcome these students, but rather in the high schools, because "after grooming the best students for three years, the high school teachers want to teach them calculus, no matter how small the class."

The question of how, whether and when to use hand-held calculators were of great interest to the group, but no firm conclusions were agreed upon. There did seem to be agreement that the most important question has been when to use them. Connected with this problem has been the issue of whether the use of a calculator promotes "number sense and estimation". If the calculator was used just "to punch some buttons so that a number answer can be recorded", they are obviously bad. But when a calculator has been used to allow students to complete many more problems in the same amount of time as without calculators, they were very helpful.

The last issue centered around service courses. There was some agreement that it may be desirable to sacrifice some mathematical niceties for more examples. This shift might create more student interest and generate support from disciplines using the course. It was understood, however, that such a shift is easier to propose than to accomplish.

SESSION IV

CONCLUSIONS

Presider: Ed Bender, J. Sargeant Reynolds Community College

At the concluding session, participants commented enthusiastically on the value of each session held during the day.

It was expressed that ongoing statewide articulation needed to be coordinated in the course content areas covered in the program. Some of the session groups in the program collected names of attending faculty and their institutions for distribution and continued communication on programs and ideas.

Based on previous mathematics articulation work done in Virginia, it was suggested that an instrument of continued mathematics coordination be established for all two-year and four-year colleges and universities, both participating in this conference and among others not having the opportunity to actively do so.

Representatives in attendance agreed to submit information on mathematics textbooks used to a central coordinator who would make this information available at Mathematical Association of America Section meetings.

A suggestion was made to investigate the feasibility of holding a similar mathematics articulation meeting among all high school districts and colleges in Virginia and to seek support from the MAA Section, the Virginia Council of Teachers of Mathematics, and the State Department of Education.

Mr. James McLean, who attended the entire session as a representative of the Virginia State Council of Higher Education, expressed his appreciation and endorsement for continuance of the articulation brought about in this conference.

The community college student preparing to transfer to the four-year college or university has the right to expect adequate preparation in mathematics to pursue a course of study leading to the baccalaureate degree. Therefore, articulation and coordination of mathematics programs is both desirable and necessary. Flexibility in programs is needed for a smooth transition between colleges.

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