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The Basis for the Success of the Potsdam Program

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Based on a visit to Potsdam College, 13-15 April 87
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Much of what distinguishes the program at Potsdam is not what the department "does" so much as the way it "thinks"—it is a matter of attitude. I believe that these points are the fundamentals of the Potsdam model:

1. The department members adopt the view that—contrary to the prevailing belief in this country, but consonant with that in most other industrialized countries—success in mathematics is due much more to hard work than to innate talent. Many can achieve success in mathematics by persevering—it is not limited to an elite class of geniuses. Faculty must personally accept this view, as well as press it on students in both formal and informal ways, e.g., advising, pamphlets, bulletin boards.
2. The faculty must also be willing to "suspend disbelief" with respect to students whose past records have been undistinguished. There have been many success stories by those whose early records were abysmal, starting with Albert Einstein. Who is to say which of those students who have not yet shown promise are incapable of blossoming later? Don't wait for the "good" students. Again, advising, pamphlets, bulletin boards, can press this point of view on the students. Case histories can be assembled to prove this point—preferably alumni of the institution, but others would do also.
3. The secret of getting students to succeed is to keep up morale. Therefore students must constantly be given things they can do. They should be challenged, but each challenge should be at the appropriate level. Once the student's confidence is shot, he's lost to the discipline. The teacher who presides over failure excuses himself by saying the students "didn't work hard

enough." But they didn't because he didn't inspire them to. Avoid all temptation to "inspire" by threats, abuse, competition, impossible problems, guilt trips, invidious comparisons, anything negative—it won't work.

Thus there should be nothing called "remediation" and no placement tests. No one is ever "ready." Let everyone feel the pride of trying a high-prestige subject. Throw them in and let them learn to swim. Believe in them, and they will probably do it. They can be given simple problems at first, so they will succeed and gain confidence, and they can be led on to greater and greater levels of achievement with problems of constantly increasing difficulty.

Every success should be recognized. Every formal and informal method should be employed to see that achievements are publicized and publicly recognized and appreciated.

4. Abandon the traditional lecture format of teaching. It rarely works. In our own experiences as students, we didn't learn from listening. We learn by explaining, or otherwise getting actively involved. Students should be learning in the classroom, which means not just listening passively. They should be solving problems then and there. Helping each other—good for both helper and helpee. There should be formal ways for students to help each other—such as a Math Lab.

Everybody knows the professor can do the proof. No one benefits from him rehearsing it, no one needs to see him do it to believe he can. Students benefit from discovering it themselves and explaining it

to others. An instructor must learn to "bite his tongue." The "lecturer" never penetrates the student's mind, never shares his confusion. And the student is quickly left in the dust.

Some teachers say "I taught them—but they didn't learn it." Imagine a car salesman telling his boss—"I sold it to them—but they didn't buy it."

Some teachers expect the students to learn how they teach. The teacher should teach the way the students learn. (This isn't always the same. It may never be the same. Good teachers are above all flexible.)

5. The important thing in the math curriculum is not racing through a long syllabus that students are largely not going to absorb anyway and leaving them panting and breathless and overwhelmed and discouraged after the final exam; but learning enough of the subject and learning it well enough to understand the point of it, the philosophy, the general strategy, the essential idea. Emphasis should be on maturity and technique, not merely content. Students will enjoy math when they can say "I understand." They can read and learn on their own after that. They will become life-long learners. The mental skills they learn will transfer to any subject they want to learn. They can even become teachers of others. At Potsdam the math major curriculum is an eight-semester megacourse in independent learning, in thinking, in conceptualizing, in intellectualizing. In later life, this sort of skill will be much more valuable than specific knowledge of specific mathematics. If and when the time comes that they need to know some particular mathematics, they will have the capacity to learn it on their own if they have been properly trained to it. The old proverb "Catch fish for a man and he will eat today; teach him to fish and he will eat all his life" has some application here

There can be honors sections for large enrollment courses to challenge those who

can learn faster or have stronger backgrounds. But they should be allowed to take standard tests so they are not penalized for trying the honors level.

For courses which are prerequisites to later courses, a certain minimal syllabus should be established and agreed on; but the emphasis should be on minimal. Some flexibility and good will is necessary between instructors.

6. All courses should be oriented toward pure mathematics, and the joy of doing it and understanding it. There is plenty of chance elsewhere and elsewhen to apply what one learns if and when it is necessary—other courses, or later work experience. This even applies to students other than math majors. There should be no "service courses." A good course for a math major is a good course for anybody else, and vice versa.
7. Most important of all, an atmosphere must be engendered of total support for the student. The function of the educator is to serve the student, to meet him wherever he is and help him grow, help him achieve his goals, help him prepare to flourish in later life however he defines this. The educator must be deeply committed to this task and must constantly convey to the student his direct personal concern for the student's welfare. There must be a loving, supportive, almost familial atmosphere in the department, a sense of community, of mutual support, everyone helping everyone else, everyone proud of everyone else's achievement. What benefits one benefits all; what one achieves is an achievement for all. There is no place for competitiveness, except to the extent that every faculty member and student in the institution are on the same team. (This is very much the way an Eskimo village operates to succeed against the elements.)

Presented to MAA, January 1988, Atlanta

See "A Modern Fairy Tale?" Amer. Math. Monthly Vol. 94 (1987) pp 291-295.