IMP to Calculus

* Gloria Kruppstadt (krup@PIONEERPLANET.INFI.NET) on January 7, 1999:

We offer IMP classes and a traditional track at our school, but right now, the top 10% of the kids go the traditional route in Honors Geometry, Algebra, Pre-Calculus, and Calculus. We are considering having a second honors class so that it does not appear that the traditional route is the "best" for the top kids. This is causing conflict in our staff, so I would like to know if other schools have used the IMP curriculum for high-level kids and perhaps done the work in three years instead of 4, so that the students can still take Calculus. I know some people have had kids go right to IMP 2, but the students then need separate instruction (and, in our case, the students are already not in our IMP classes), so I am not worried about bringing down the level of IMP classes. I just think it's such rich material and think it could be very good for the top kids.

* (ChichaL@AOL.COM) on January 8, 1999:

We have an honors program for incoming 8th graders who have already completed Algebra 1. It is referred to as a ramp course that combines IMP 1 and IMP 2 into one year by skimming off the Algebra 1 content, hustling through *Patterns*, and covering all the probability and statistics for the two years. In their sophomore year, the students go on to IMP 3 mixed in with all of the other students. It was designed by Peter Jonnard and is successfully taught by him every year. For more information, contact Peter at PAJJONNARD@aol.com. He is our department head.

* Diana Obstfeld (diana_obstfeld@CEO.CUDENVER.EDU) on January 8, 1999:

Many of our kids who are in the IMP program, but also want to take Calculus, take it after only three years of IMP. Our calculus teacher, using the Harvard Calculus book, has found that the deficiencies of our traditional kids balance any manipulative deficiencies of our IMP kids. Students who want to take Calculus, start IMP as freshmen in IMP 2 and, therefore, are able to complete IMP 2, IMP 3, and IMP 4 before Calculus. I even taught a student who took IMP 2 as an 8th grader, IMP 3 as a 9th grader, and is currently taking Calculus as a sophomore. The student seems to be doing fine (except for his emotional immaturity).

I taught an "honors" level class in IMP 2. Most of these kids were considered "GT" simply for their work ethic. It was nice to have a class where 95% of them did the work, but we were not able to go any faster. Because of the general attitude of the kids, I do not feel they had as much "growth" in their learning as my good students in the heterogeneous class. The discussions were not as diverse, and, therefore, alternative processes did not come out as much.
We give "honors" distinction to kids in the regular class who choose to go deeper into the material through extensions in supplemental problems and/or greater investigation and connections to regular class material. We have set up rubrics for receiving this distinction and have given all students the opportunity to receive this credit. Most students choose not to do the additional work. The "true" GT kids will.

But...having an "honors" IMP class has diffused some political conflicts we had about the nature of the mathematics. It has satisfied most of our parents who want their kids in classrooms with other students with similar "potential." In reality, we know that it is students' attitudes and behaviors, rather than their potential, which tend to group them into these honors classes.

* Sandie Gilliam (gilliam@CRUZIO.COM) on January 10, 1999:

Before we went to an all IMP school, we strategized to get parents of the bright students behind us. One way was to give an IMP 2 qualifying/placement test to incoming ninth graders. This test was made up of questions similar to the IMP 1 final exams for each semester. Thus, ninth graders could enter into IMP 2 and continue with IMP 3, IMP 4, and then Calculus. However, the need for this placement test was eliminated this year when our junior high began teaching IMP 1 to those who previously would have taken Algebra 1 as 8th graders. This has created real continuity in our K-12 district and has tremendously improved our articulation and communication with the junior high math department.

Several years ago, we also added IMP 3 Honors. This is not a separate class. Instead, students are assigned an additional homework assignment per week, attend meetings with the Honors teacher, and complete a separate IMP 3 Honors final. This either prepares students to enter and be successful in Calculus (thus skipping IMP 4) or allows students to take IMP 4 but collect extra grade points for completing an honors class. This, too, has been pleasing to those top-end parents.

* Betsy Adams (sadams@DHVX20.CSUDH.EDU) on January 11, 1999:

Here, all of our students take IMP 1, IMP 2, and IMP 3 regardless of their background (many have had traditional algebra in eighth grade). During IMP 3, the students also do the *High Dive* unit from IMP 4. During the first semester of their senior year, they do *As the Cube Turns* and *The World of Functions*. Second semester, they take the first college calculus class. We would probably get all of the four years completed in three years except that about three weeks of class time is used at each grade level for our interdisciplinary projects.

Many of our students are very bright. All of them are very motivated.

* Donna Dougherty (Donna_Dougherty@wssd.ridleysd.k12.pa.us) on April 8, 1999:

Students selected for the honors program at our school begin the IMP program in the eighth grade. These students are offered the opportunity to begin high school mathematics early. This course enables students to take college level mathematics courses, such as Calculus AB or BC, by their senior year of high school.

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Can IMP 3 students go on to Pre-Calculus or AP Calculus and be successful? We have IMP 3 for the first time this year at our school. Some of our students would like to try a traditional class next year instead of continuing on to IMP 4. They would like to try Pre-Calculus. Our department is wondering if they have the Trigonometry and Algebra 2 skills that will allow them to be successful in Pre-Calculus.

Some teachers think our IMP 3 students should take a Trigonometry or Algebra 2 multiple-choice test. However, the IMP teachers are pretty sure that the students will not score well;

they have not been exposed to everything to which the traditional Trigonometry and Algebra 2 students have been exposed.

My department has another question. If colleges see IMP 1, IMP 2, and IMP 3 as “equivalent” to Algebra, Geometry, and Algebra 2, why wouldn’t we send our students on to Trigonometry/Analytic Geometry?"

* Janice A. Bussey (jbimp@TELIS.ORG) on February 3, 2000:

Absolutely! IMP 3 students can go on to a Pre-Calculus course. At our school, one of the original IMP pilot schools, we have been doing it for years! In fact, IMP students and traditional students come together for the first time in that course. Generally, the traditional students can manipulate symbols faster, but they shy away from word problems. IMP students are not afraid of trying to work with something they have never seen before and always want to know WHY something works. Of course, it is essential that the teacher teaching this Pre-Calculus course be familiar with both the traditional program and IMP. He/she needs to make the connections to past learnings for both sets of kids. In our school, we will not let a non-IMP teacher teach the Pre-Calculus course for this very reason.

* James Brown (JimSB14@AOL.COM) on February 3, 2000:

Our school has only had success stories when our IMP students took Calculus, either in their senior year or in their first year in college.

* JoAnn Vana (gvana@barton.k12.vt.us) on February 3, 2000:

We have had several students go from IMP1, to IMP 2, to Pre-Calculus due to a scheduling problem. An IMP teacher taught the course, and students were quite successful.

* Eddie Izzard AKA Mike Caudill (MCaud@AOL.COM) on February 3, 2000

With computers and numerical methods, calculus just does not sit on top of the math mountain anymore. (Allen Paulos makes a pretty good argument for this in Archimedes Revenge, I think.) I think that we should all consider aiming for AP Statistics instead. This would serve those college-bound students who are destined for the humanities and the math/science majors.

* Wendy Tokumine (wendyt@ALOHA.COM) on February 3, 2000:

I teach in a school with a 4x4-block schedule. I had one student in AP Calculus this year who took IMP 3 and IMP 4 last year. He wanted to take Trigonometry and then Calculus this year, but he was scheduled for Calculus in the first session and Trigonometry in the second session (Calculus is only offered first session). I counseled him, but he chose to remain in the calculus class. He came occasionally for extra help after school (at my insistence) and passed the first term with a C, but he failed the second term. He really got lost when we got into trigonometric integrals. Although he failed, I feel he gained a lot just by being in class.

The majority of our students who take IMP are students who previously would have been assigned to General Math or Pre-Algebra. Many of them enter IMP with very poor arithmetic skills and limited algebraic skills. The 4x4 block schedule (or even a conventional schedule) does not allow time for teachers to teach IMP and do remediation. This is why we suggest students take Pre-Algebra or Algebra instead of Algebra 2/Trigonometry after IMP 1, IMP 2, or IMP 3. This works really well for both the students and the IMP teacher who teaches the next level.

We are very concerned about how well, or not so well, our IMP graduates are faring at the community colleges. Two of our local community colleges report that the IMP students do poorly on the COMPASS math placement test (computerized with no calculators allowed) and in the Pre-Algebra class they then must take due to their low test scores. One instructor said the IMP students are poor in basic math skills (fractions, decimals, and percents). I asked for data to support this, but the college counselor had none. They will consider collecting data (beginning this summer) to provide me with more concrete information.
[For this discussion, see **Concerns**.]

* Donna Yamamoto:

When your IMP 3 students go into Pre-Calculus or Calculus, do you have them "beef up" on their trigonometry? Our department wants them to take home a trigonometry text over the summer, do it on their own, and then come back at the beginning of the year to take a test! Some of us are worried and think we need to give these IMP 3 students extra help sessions and teach them all the trigonometry! If we do that, though, how will we ever really know if IMP 3 students can enter Pre-Calculus without preparation?

* Maureen Burkhart (moe1111gjb@EARTHLINK.NET) February 4, 2000:

Yes, IMP 3 students can go on to Pre-Calculus or AP Calculus and be successful. (Speaking from first-hand knowledge, it needs to be a motivated student.) And, no, there was not much trigonometry for them to learn that they did not already know. Trigonometric identities are not the rage anymore on the AP exam. I taught from the Harvard edition and did hands-on projects.

* Janice A. Bussey (jbimp@TELIS.ORG) on February 4, 2000:

If IMP 3 students go into Pre-Calculus, isn't the trigonometry IN the Pre-Calculus course? What kind of Pre-Calculus course are you teaching?

If IMP 3 students go directly into Calculus without Pre-Calculus or IMP 4, yeah, they will be missing lots of stuff. We tried that one year, and the kids had a hard time. One suggestion would be for them to take Pre-Calculus or IMP 4 concurrently with Calculus. Or, as some other teachers have suggested, your school could offer extra sessions or a summer preparatory course in trigonometry. I think a kid has to be really motivated to go from IMP 3 straight to Calculus!

* Dan Branham (DanLeeannB@AOL.COM) on February 4, 2000:

We have had only one or two students go from IMP 3 to AP Calculus. They were both successful, but they also were exceptional students. One, for example, received a 4-year, $20,000 scholarship for mathematics. That does not happen every year at our site!

Most of our students go from IMP 3 to IMP 4, with only a few moving into a Trigonometry/Pre-Calculus class. Our IMP 4 seniors have been accepted to Stanford, Cal, UCLA, and University of California at Davis, among other places.

* Tara Haller (thaller@FRONTIER.NET) on February 4, 2000:

The students will need to be taught the trigonometry. I teach AP Calculus and currently have 5 of my IMP students in the course. I taught 9 sessions (1 per week) during the last quarter of last school year to help them learn the basics of the trigonometric functions. I used Chapter 5 in Functions Modeling Change from Hughes-Hallett Gleason because the text is efficient and uses the ferris wheel model.

* Ted Slauson (TedSlauson@AOL.COM) on February 6, 2000:

I have taught Calculus to several IMP 3 graduates over the past two years. They always do as well as the traditional students.

* Lynne Alper (alper@MATH.SFSU.EDU) on February 9, 2000:

I cannot remember where, but some schools offered *High Dive* as the Honors Option for IMP 3 in order to prepare those students to take AP Calculus in 12th grade. Another school had IMP 3 students study/take *High Dive* during the summer before taking AP Calculus.

* Betsy Adams (sadams@DHVX20.CSUDH.EDU) on February 9, 2000:

Here, at the end of IMP 3, students complete *High Dive*. This year with our block schedule, I am behind my usual pace, but I still hope to do the long version of *High Dive* before June.

* Diana Obstfeld (diana_obstfeld@CEO.CUDENVER.EDU) on February 10, 2000:

Our calculus teacher uses *High Dive* to begin AP Calculus.

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* Mike Long:

Has anyone had any success with students taking IMP 4 and Calculus concurrently? I know that it is not recommended for students to go directly from IMP 3 to Calculus, so would this offer a support system for those students?

Also, what topics would be necessary for IMP 3 students to cover before heading into Calculus? I know they would need trigonometry, but are there any other concepts?

Is there some supplemental material that may address these topics that could be given in an IMP honors-type situation?

* Betsy Adams (sadams@DHVX20.CSUDH.EDU) on May 3, 2000:

The first year I taught, I had students who were taking IMP 3 and AP Calculus. Their calculus teacher was aware of the situation and worked with it. Now, we hope all of our seniors will take one semester of IMP 4. Some of them do that while they are concurrently taking Calculus. The rest take Calculus after they complete *High Dive* (all of them have that unit as the last unit of their IMP 3 course), *As the Cube Turns*, and *Know How*.

* Elisa Morris (ELMorris51@AOL.COM) on May 3, 2000:

This year, four of my IMP 4 students are taking my class and AB Calculus concurrently. Two are doing extremely well, and two are holding their own (their big problem is not turning in work). They did no additional work outside of the IMP classroom to prepare; three of the students completed IMP 3 and AP Statistics last year.

* Janice A. Bussey (jbimp@TELIS.ORG) on May 4, 2000:

YES, a student who has done reasonably well in IMP 3 can take IMP 4 and Calculus concurrently. Many schools have certainly done it before.

Here are some of the keys to success:

There is a lot of work involved whenever a student doubles up and takes two math classes at once. So, the student has to be highly motivated and hard-working.

The calculus teacher should also be an IMP teacher or have a good knowledge of the IMP curriculum and a thorough understanding of the experience of the IMP student. I actually think that if the calculus teacher knows little of IMP or does not support it, the IMP student is destined to fail. The calculus teacher has to be able to make connections with the content and the past background of the IMP student (just like the teacher would with a traditional student). For example, when the class is doing something with exponents, the teacher might say, “You should remember doing this in Algebra 2 or *Alice*.” Those kinds of connections help. In addition, the calculus teacher cannot get offended when the IMP student asks, "Why does that work?" IMP students are used to learning that. Also, the calculus teacher should not embarrass the IMP student if he/she is slightly slower with some of his symbol manipulation (which he/she may well be) than the traditional students.

Whoever is teaching IMP 4 may have to be available for extra tutoring to fill in some gaps. When I tried to do this, I found the trigonometry the most critical. I could usually get through *High Dive* before the student needed the circular trigonometry in Calculus. But, I could not

always get through all of the trigonometric identities one finds in *As the Cube Turns* before the student needed them. So, be aware of that.

Basically, if the student wants to do this, and I think he/she is a good student, I encourage him/her. What is the worst that could happen? Calculus ends up being too difficult, the student drops it, and then he/she takes it the following year. There are worst things in life!

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* Mike Long:

Has anyone allowed students (in particular, entering freshmen) to skip IMP 1 and go directly into IMP 2? If so, what criteria were used to determine the eligibility of those students? Was it a test, a teacher recommendation, or something else?

If students were allowed to miss the first year, how did they do in the ensuing years? Did it hurt them to have not experienced, for example, normal distribution and standard deviation from *Pit and the Pendulum*, the graphing skills in *Overland Trail*, or the introduction to trigonometry in *Shadows*?

The reason behind these questions is that I would like to offer Calculus as an option to students who complete IMP 4, but to do that requires students either to start earlier or to go to summer school. I have reservations about teaching a year of IMP in a 5- or 6-week summer course, so I am trying to see if the other option can be done. Also, I am not sure about the feasibility of offering IMP 1 in the 8th grade right now because our middle school staff is taking on other new curriculum and do not want to start something else new right away.

* Jason Murphy-Thomas (jmurphy@MUSE.SFUSD.K12.CA.US) on May 3, 2000:

We recently created a new course we are calling IMP Enhanced. We will be offering this course next year to incoming ninth graders who completed Algebra in eighth grade. Therefore, it is designed to be a combination of the first two years with the algebra units (*Patterns*, *Overland Trail*, *Solve It*, and *Alice*) removed. It is presumed that after that year the students will move on to IMP 3 as sophomores and IMP 4 as juniors.

In order to establish with the students the IMP approach to the idea of a function, I am thinking we will need to touch on concepts from *Patterns*. We also can pick out other algebraic notions from the removed units before getting into the other material. We will perhaps combine the statistical units of *Pit and the Pendulum* and *Is There Really a Difference?* and work on *Shadows*, *Bees*, *Pig*, and *Cookies*.

In addition, we are hoping to establish some classes of IMP in the eighth grade so that incoming students can enter our school ready for IMP 2.

The curriculum for our Enhanced class is not set, and the first year will be an adventure. But, we think offering this to our incoming students will provide them an opportunity that previous IMP students did not have.

* Brian Lawler (brlawler@EARTHLINK.NET) on May 4, 2000:

I am sorry for sticking my two cents into this discussion on placing students. However, it disturbs me that there appears to be an acceptance of creating many levels of IMP (or whatever math) at schools.

I thought it was an accepted fact that tracking does no service to our talented, motivated, rich, white, (fill in a descriptor from your school setting) students and that tracking does a disservice to the rest. I believe this disservice is both intellectual and psycho-social. (I think an argument can be made for a psycho-social disservice to those students labeled honors, gifted, etc.)

Instead of tracking or separating, I think there are more equitable options to provide the support our full range of students need. The following is taken from the Equity Principle of the new NCTM Principles and Standards:

"Students with disabilities may need increased time to complete assignments, or they may benefit from the use of oral rather than written assessments. Students who have difficulty in mathematics may need additional resources, such as after-school programs, peer mentoring, or cross-age tutoring. Likewise, students with special interests or exceptional talent in mathematics may need enrichment programs or additional resources to challenge and engage them. The talent and interest of these students must be nurtured and supported so that they have the opportunity and guidance to excel. Schools and school systems must take care to accommodate the special needs of some students without inhibiting the learning of others."

My school intentionally selected the IMP curriculum because it sets out to provide a framework in which all students can learn and make sense of mathematics at the level they are ready to learn and in a manner that makes sense to them. We have not yet fully attained the goals toward which we endeavor (and may never), however we have had many successes and will not go back to what could never be separate but equal.

I can appreciate the social and institutional pressures that make attaining equity and democracy in schools a difficult journey.

* Bill Blatner (cowblat@MASSED.NET) on May 4, 2000:

I really appreciate the spirit of Brian's message here. When I think of IMP Enhanced, I think of ways to provide additional, advanced activities for students who need/want more challenge but who remain in a heterogeneous class setting and complete the same work as everyone else. I agree that tracking IMP is a mistake. We have compromised on this idea by allowing eighth graders to take IMP 1 then to join a heterogeneous IMP 2 class in ninth grade. The benefit of this is that it gives the highly motivated kids a way into IMP. Otherwise, we would lose them to the traditional advanced algebra sequence, and they would be underrepresented in IMP.

* Ted Fischer (tedfischer@mediaone.net) on May 4, 2000:

I believe this attitude denies the existence of the truly gifted, and, in the end, does far more psycho-social harm than tracking ever did. Students certainly have equal RIGHTS and equal VALUE, however they do not have equal ABILITY.

To a certain extent, one can individualize within a heterogeneous class. The weaker students can be encouraged and supported. The stronger students can be offered some challenging extensions after they rapidly complete the original problems. Nonetheless, there is a small (but equally valuable!) percentage at each end of the population that is SO significantly different from the mean that they cannot be accommodated this way.

I do not think anybody would attempt to teach IMP to students with moderate to severe retardation. It is similarly inappropriate to ignore the differences at the other end of the scale. Attempts to treat the most gifted students as if they were no different from their peers often leads to students' self-absorbed isolation and depression. This is hardly "equal" treatment in my book.

I am also very concerned about the restriction of choice that occurs when schools offer IMP as the ONLY option. While the traditional programs certainly do not serve all students well, it is not clear that the IMP program does so either. The principles of equity and democracy require that ALL students be valued, not simply those who happen to fit our pre-conceived notions of "normality."

* Sherry Fraser (fraser@MATH.SFSU.EDU) on May 5, 2000:

IMP was written for the middle 95% of the population. I agree with Ted that the 2.5% at the extremes have special needs and need additional support. However, in our society we decide that 20% or so are "gifted" and set up a tracking system to separate them in mathematics. What does that say to the others? Unfortunately, the problem is compounded because the system sometimes places students in these classes, not necessarily by their talent, but by their last name or the color of their skin.

Personally, I think IMP is for all students, but not for all teachers. If you are going to be concerned about schools that offer only IMP, then you should be just as concerned about schools that offer only the traditional.

* Dan Fendel (fendel@MATH.SFSU.EDU) on May 4, 2000:

I do not read Jason Murphy-Thomas' message about a proposed IMP Enhanced as a recommendation for tracking. Rather, I see it as a way to respond to prior tracking at the middle school level and a way to give students a course that will challenge them in 8th grade.

I assume that the students who complete IMP Enhanced will be in IMP 3 and IMP 4 classes with students who went through "regular" IMP rather than staying segregated in an honors track.

* Janice A. Bussey (jbimp@TELIS.ORG) on May 5, 2000:

From what I read in Jason Murphy-Thomas' proposal about IMP Enhanced, he is doing exactly what Brian quoted from the NCTM Standards. His school is trying to nurture and support those students who had Algebra in the 8th grade. One would be doing a disservice to those students to put them through a course where much of that algebra is redeveloped and retaught. Those

students do not need that. He is giving them the opportunity to move on in their acquisition of higher levels of mathematics at the point that they are "ready." From what I have read about gifted students, that is exactly what they need! And, while a small percentage of students are in this enhanced IMP 1/2 class, there are still "regular" IMP classes which are still pretty much heterogeneously grouped. So, he is not inhibiting the learning of others.

* Bill Blatner (cowblat@MASSED.NET) on May 5, 2000:

It sounds like we all agree, I think. I have found that moving 8th graders, who are ready, into IMP 1 serves them well. There is absolutely no reason to hold them back if they can do the work. The same is true, I suppose, if you have 9th graders who are ready to take IMP 2.

However, I think there is no reason that students skipping a year cannot skip into a heterogeneous class; there is much to be gained from it. The advanced 8th graders in my IMP 1 class are getting all the challenge they can handle. While there are a few truly gifted individuals, most "advanced" students are simply good at being students. Their classmates benefit from their example, and, even though the advanced students are often the stars of the class, they themselves also benefit from the experience. They see their less stellar classmates succeed with regularity, and they hear the unique experiences and insights that these students bring to the table. All students shine together. Nobody gets deprived in this scenario.

This year we, due to construction, the 8th graders were in our high school, and we were able to pull this off. Next year, 8th grade will be back in the middle school, and advanced students will have the choice of IMP or Algebra in their own school setting. It is less than optimal in my view that these students will be in a less heterogeneous setting, but they will join a heterogeneous IMP 2 class as 9th graders when they come to the high school.

* Ted Fischer (tedfischer@mediaone.net) on May 6, 2000:

While reaching the middle 95% is an admirable goal, I am not certain that you have truly succeeded. My IMP 1 class appears to be drawn from approximately the central 70% in our district, based on 8th grade test scores. At that, I find that the strongest student in the class solves almost all of the POWs within ten minutes - generally before the weakest student in the class even understands what the question is asking. With more experience and smaller classes (I have 24), I might be able to better individualize, but I am not 100% satisfied with my current results. Should we ever be?

We should be VERY concerned about our inability to identify/reach talented students who do not fit our preconceptions. We should also be concerned about the multitude of "advantaged" students who mistakenly are labeled "gifted." (Most schools are forced to seriously water down the curriculum due to an excessive number of these students being placed in the honors classes.)

You understand why I opted for a lower pay scale and longer working hours to work in a school that teaches IMP! It is an immensely superior approach to mathematics education for a large number of students. No thinking person can POSSIBLY believe in one-size-fits-all education, however. My own worst experiences in school were with teachers who believed
I needed to be socialized. There is nothing more isolating to a student than being FORCED to

work in a group.

* Carol Caspillo (ccaspill@ALOHA.NET) on May 6, 2000:

Smaller class size is not the solution. I taught IMP 4 to a group of students that dwindled down to four. Dialogue was lacking. Give me a larger group any day.

* Bill Blatner (cowblat@MASSED.NET) on May 6, 2000:

I would like to second this notion about class size. My best class by far is my biggest IMP 1 class with 28. If I could handle reading everything, I would happily take five like that one.

[For more discussion, see **Heterogeneous and Homogeneous Classrooms: Questions, Opinions, and Proposals**.]