UNDERPERFORMING STUDENTS IN MATHEMATICS: WHAT MAKES GIFTED MATHEMATICS STUDENTS OPT OUT OF UPPER LEVEL MATHEMATICS?

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## Background

- Teacher in upper level mathematics
- Students with talent/college bound students opting out
- □ Why?
- Experience with Belin Blank Center (University of lowa)

#### Gifted Achievers . . .

- Gifted achievers score higher in
- 1. Effort
- 2. Task orientation
- 3. Competition
- Gifted achievers are intrinsically motivated (Albali, 2010)

## **Gifted Underachievers**

- Gifted underachievers respond to
- 1. Grades
- 2. Teacher comments
- 3. Social acceptance
- Underachieving gifted students extrinsically motivated (Albali, 2010).
  - concerned with being like classmates, down play talent
  - Some gifted students have a difficult choice to make. Should they excel academically even if this might mean social rejection? Or should they minimize their abilities to gain peer acceptance? (p.29).

#### For all students . . .

- Previous enrollment in mathematics courses, well as course grades, are a good predictor for success in future courses. (Olszewski-Kubilius, Shaw, Kulieke, Willis, and Krasney, 1990)
- Updegraph (1996): Expectancy-Value Model of Achievement Choices
  - motivational and social factors
  - Iong and short term achievement goals, behaviors, future career plans, course selection decisions, persistence on difficult tasks, effort
  - children most likely take courses they think they will do well in and are valuable to them

# **Course Taking Differences**

- Significant difference in the difficulty level of the courses selected by gifted achievers, compared to their "underachieving" counterparts
- The on-set of academic underachievement for most gifted students began in or around grade 7 (Peterson and Colangelo, 1996)

#### **Research Question**

What makes students scoring in the 95<sup>th</sup> percentile or above on the lowa Test of Educational Development opt out of advanced mathematics coursework?

## Method of Data Collection

Semi-structured interviews

Document review of course scheduling materials

Observation of Algebra II & "favorite" classes

# Identifying Study Participants

- Students identified based on:
- 1. Year in school
- 2. Course taking patterns
- 11<sup>th</sup> grade lowa Test of Educational Development scores



□ 4 students total: 2 females & 2 males

□ All high school seniors

1 not enrolled in mathematics; 3 enrolled in Algebra
 II or Mathematics & Society (dual credit course)

### Data Collection

- 2, tape-recorded interviews
  - Data collection (longest)
  - Member check (check for accuracy and any further information)
  - 4, 45 60 min. classroom observations

## **Excerpts from Research**

- [...] we would get in groups and work together and help each other out and after a test you could go back through it and make corrections on the things you did wrong and you could actually get points back for it [...] what I didn't like was when I would go home and I would just sit there and stare at a problem and I didn't know what to do. I understood it at school but then with every other subject after it, my mind would just totally go blank and I can't think of exactly what we did in class and I think that's just the hardest thing.
- I: Does that happen with any of your other classes?
  01: Not really.

- I: Some people say that they are good at math because they have natural talent for it and other people say its because they work hard. Do you ...
- O2: I definitely have to work hard. I don't like, I mean my dad's really good at math, but its not it's never really been like my strong area. Like I have to work really hard in it to get the grades I do.



- I: Tell me about your favorite course that you're either taking now or have taken.
- O3: Favorite class right now would definitely be 3D animation.
- □ I: Why?
- O3: Because computers. Its fun to learn and its you work on your own. You go at your own pace, you're encouraged, you know you have deadlines to get things done.

03: I took a class offered by [community college] called Survey of Mathematics. It was almost like a history of math and I like it because I can apply it to myself a little bit more rather than just like having a list of problems. I like question problems better because then I can apply it and be like Oh, OK. This is why you need it. Rather then, some questions that are always when I am going to use this?



- □ I just am not a huge math fan. I knew that taking FST [Functions, Statistics, and Trigonometry (UCSMP, 2000)] was going to be very challenging and I thought with Health Careers and, I was going to take a few other [dual credit] classes, it'd be way too stressful with sports and then I thought since I have enough to get in to college and I actually didn't struggle too bad on the ACT's with the math part so I thought OK, I'll be fine. I kind of wish that there was an in between like Algebra II and FST course. And I know, I mean there's that math thing, through [community college], but I just thought I don't want to go through that cause people are just like it's terrible (laughing)
  - --Female student, age 17 explaining her decision to not enroll in mathematics during her senior year

Why would I take a really hard mathematics class for high school credit, when I could take an easy one for college credit?

> --male student, age 18 explaining his reasoning for enrolling in a terminal dual credit mathematics course



- Students preferred classes with certain level of autonomy with the teacher.
- Students identified their favorite courses as courses which used advanced levels of mathematics, but which showed specific applications of this level of mathematics.
- Students identified reasons for not enrolling in mathematics courses that had to do with mathematics coursework, and outside factors; such as sports, recommendations from friends, or other hard classes.

# Findings Cont.

- The research subjects enrolled in variety of dual credit courses.
- Students enrolled in advanced courses in other areas.
- Students were either not counseled or incorrectly counseled in to mathematics courses during their senior year.
  - Parent help with registering for mathematics coursework

#### Conclusions

- Participants were highly aware of the opportunity for dual credit course taking while still in high school.
- Students did not seem particularly worried about the fact that they were taking the minimum amount of mathematics required for admission to college.
- The students were aware of the ways that high school course taking may impact their future in college.

## Conclusions Cont.

- Students may have been underperforming in mathematics, but they were not the typical "underachievers," (future plans for college, none of the students were in danger of not graduating from high school, and very rarely had academic/attendance problems).
- Students could recall a specific occurrence during their high school career when they made the conscious choice to not enroll or to enroll in an easier mathematics class. Based on experience in prior mathematics classes, recommendations of classmates, and friends, and school policies or teacher/school official's/parent coaching.

### **Conclusions Cont**

It appears that at this school, students and school officials could benefit from making sure all parties involved in the decision-making process fully understand the benefits and shortfalls of enrolling in dual-credit, but terminal mathematics coursework while still in high school.

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