

MaxMatch

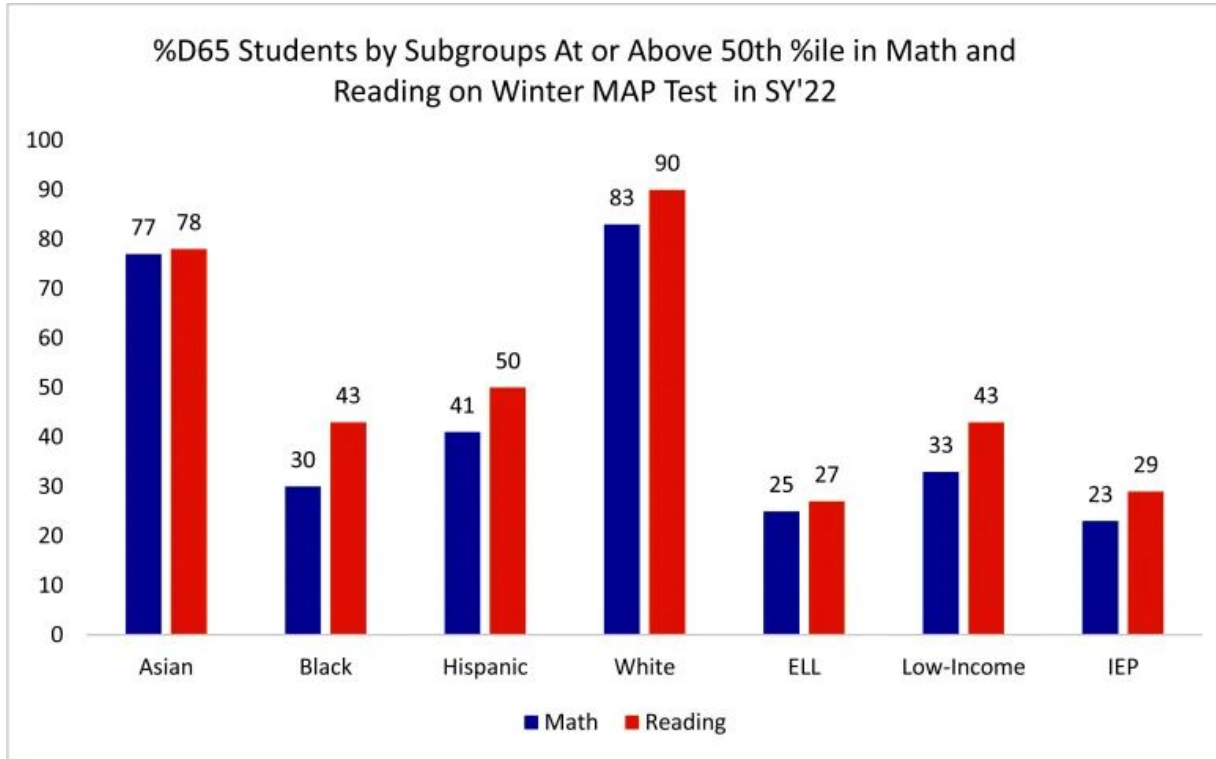


Section 33 Team 3
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What is the problem?

The achievement gap

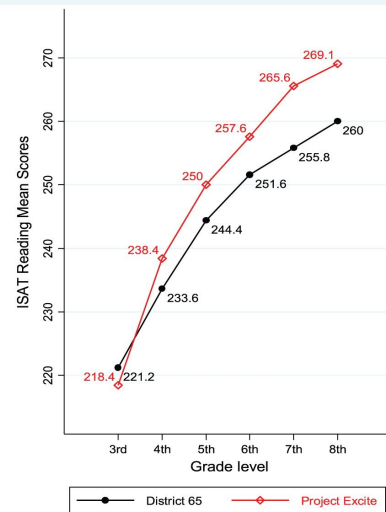
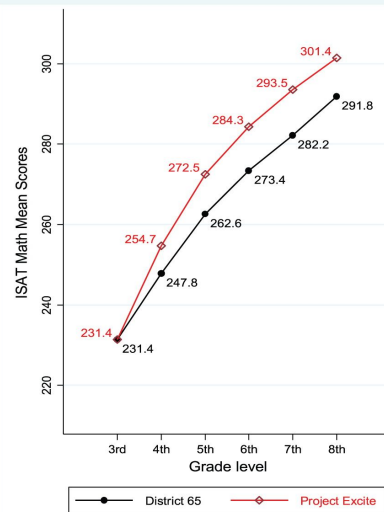



- Figure of Math and Reading Scores for 2022 MAP Test
- Minority students underperform compared to their White and Asian Counterparts
- Achievement gap present and ever-growing

Project Excite




- Created in the early 2000s by Dr. Mark Vondracek
- Supplementary educational program whose mission was to help close the achievement gap between students of color and white students
- Provided academic and social/emotional support to students of color to foster their learning during the program





The Task: Create a program
that fosters academic, social,
and emotional support to
students of color



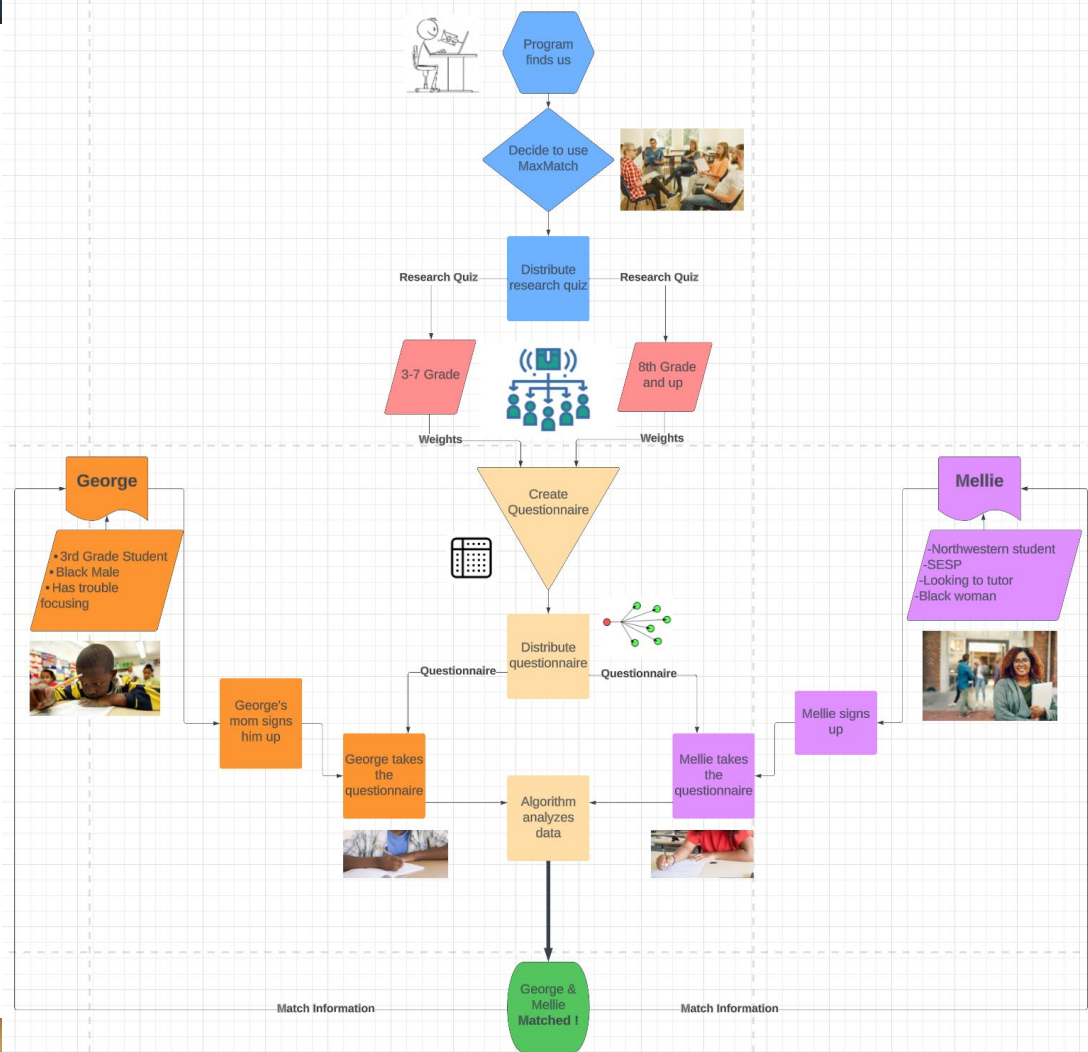


The Solution: MaxMatch

What is MaxMatch?



- Algorithmic tool used by tutoring programs to match students and tutors
- 3 step process
 - Research Quiz
 - Questionnaire
 - Algorithm
- Adaptable to any tutoring program





Program
finds us

Decide to use
MaxMatch



Distribute
research quiz

Research Quiz

Research Quiz

3-7 Grade

8th Grade
and up



Weights

Weights

Create
Questionnaire



Demonstration



George

-3rd Grade Student

-Has Trouble Focusing



Mellie

-Northwestern SESP Student

-Interested in tutoring

Demonstration

George

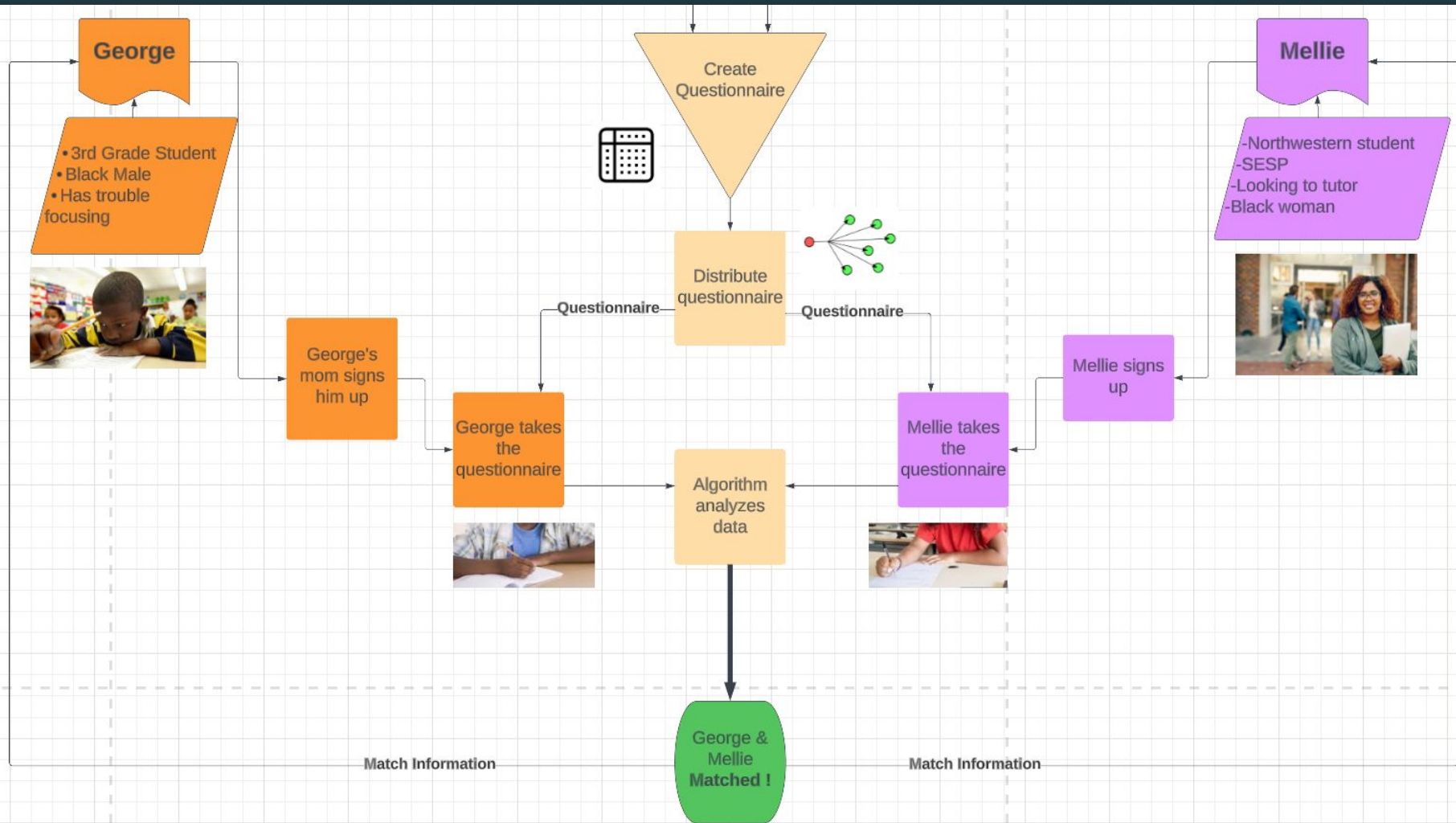


- Struggles with math but excels at reading
- Plays football
- Loves Béyonce
- Prefers to hang out in small groups

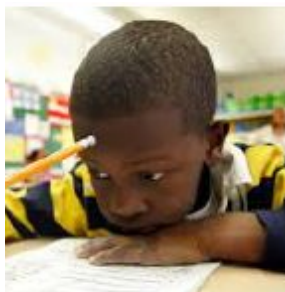
Mellie



- Used to be bad at math but always excelled at reading
- Doesn't play sports
- Loves Béyonce
- Prefers to hang out in small groups



Demonstration



Student 1



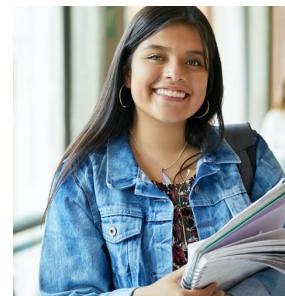
Student 2



Student 3



Student 4



Student 5



Tutor 1



Tutor 2



Tutor 3



Tutor 4



Tutor 5

Demonstration

Matrix containing all Match Scores for our group of students and tutors

		Tutors				
Students	60	72	94	75	80	
	81	87	72	74	83	
	73	85	63	85	91	
	89	71	72	68	75	
	68	65	89	93	72	

Demonstration

Matrix containing all Match Scores for our group of students and tutors

		Tutors				
Students	George	60	72	94	75	80
		81	87	72	74	83
		73	85	63	85	91
		89	71	72	68	75
		68	65	89	93	72
		Mellie				

Demonstration

- Let's use MATLAB to generate a list of matches!!

Comparative Advantages of MaxMatch

- Less biased than manual selection
- Reduces workload on program organizers
- Age-specific quizzes and questionnaires
- Focuses on kids' needs
 - Social/emotional health

Basis of MaxMatch

- Research
 - Observed Chicago classrooms
 - Read Project Excite reports
 - Talked with tutoring and matchmaking professionals
 - Algorithm secondary research
 - Matchmaking secondary research

The Research Quiz Rationale

- Assumption: A tutor-student relationship is not significantly different than a teacher-student relationship
- Primary Research: Students engage more with teachers who they get along with
- Secondary Research: Students of color benefit from being taught by someone that looks like them
- Secondary Research: Language choices

The Research Quiz



- Asks students about their hobbies and values
- Asks them who their favorite teacher is and why
- Attempts to determine what students want in a given area
- Given to a sample size of students within that area
- Two quizzes
 - Kid Quiz
 - Young Adult Quiz

The Research Quiz- Examples

How would you describe yourself? (Mark all bubbles that you identify with)

- ☐ White
- ☐ Hispanic or Latino
- ☐ Black or African American
- ☐ Asian
- ☐ Native American or Alaskan Native
- ☐ Middle Eastern or North African
- ☐ Native Hawaiian or Pacific Islander
- ☐ Other: _____

What are your 3 favorite things to do after class and on the weekends? (For example: play sports, read books, play video games, listen to music)

1. _____
2. _____
3. _____

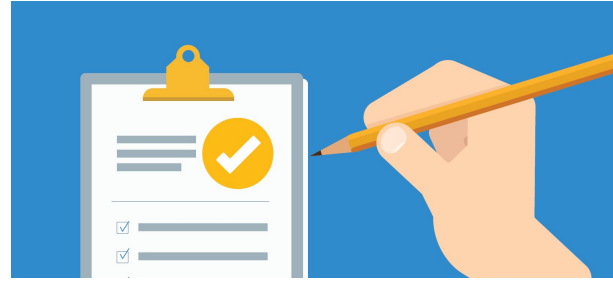
Who is your favorite teacher? _____

What subject does your favorite teacher teach? _____

Does your favorite teacher look like you? _____

If they do, in what way? _____

The Questionnaires



- Mentor and Mentee Questionnaires
- Influenced by research quiz
 - Data is used to assign value to specific questions and answers on questionnaires
- Questionnaires specifically tailored to students in target area

Mentee Questionnaire Highlights

Questions written in kid-friendly language

What country is your family from?

Your answer

How many grownups live in your house?

Your answer

How many kids live in your house?

Your answer

Do you have any pets? If so, what kind and what are their names? What do you like to do with your pets if you have them?

Your answer

What language do you speak at home?

Your answer

Hobbies & Interests

What are some of your favorite things to do in your free time? **You can check all the ones you like to do:**

- ☐ Playing outside with friends
- ☐ Reading
- ☐ Drawing, coloring, or painting pictures
- ☐ Playing board games or card games
- ☐ Playing video games
- ☐ Watching cartoons or movies
- ☐ Riding bikes, roller skating, or skateboarding
- ☐ Playing with toys
- ☐ Arts & crafts
- ☐ Exploring nature
- ☐ Listening to music
- ☐ Cooking and baking
- ☐ Acting
- ☐ Playing sports
- ☐ Building things, like Legos
- ☐ Singing and dancing
- ☐ Other: _____

What is/are your favorite subject(s) at school? **You can check all the subjects you like.**

- ☐ Math
- ☐ Science
- ☐ Reading
- ☐ Social Studies
- ☐ Gym
- ☐ Other: _____

Personality

Which is true for you?

- ☐ I like making new things, like writing my own songs, making up stories, or creating new things
- ☐ I like thinking about new ways to do things, like figuring out math problems or helping littler kids learn
- ☐ I like doing things the way the grownups in my life, like parents or teachers, tell me to

Do you like to solve problems on your own or with others?

- ☐ I like to work with others to solve problems
- ☐ I like to work alone to solve problems

Are you more silly or serious?

- ☐ I'm silly!
- ☐ I'm more serious

Do you enjoy helping friends when they feel stuck?

- ☐ I love helping my friends
- ☐ I don't feel like I know how to help my friends

Do you like to follow the rules or make your own?

- ☐ I'm a rule follower
- ☐ I make my own rules

Do you like to be busy or have a lot of free time?

- ☐ I love having things to do all the time
- ☐ I like to have nothing to do

Feelings and Emotions

Have you ever had a hard time at school or at home?

- ☐ No
- ☐ Yes

If you said yes to the above question, can you explain?

Your answer _____

How do you feel when something is hard and you don't know how to solve it? **You can check all the feelings that you feel when something is hard.**

- ☐ Annoyed - I feel upset when something is hard and I don't know how to solve it.
- ☐ Confused - I feel unsure about what to do or how to proceed
- ☐ Nervous - I feel worried or scared when I don't know what to do.
- ☐ Curious - I feel interested in learning more about a hard problem.
- ☐ Determined - I want to keep trying until I figure out how to solve a hard problem.
- ☐ Excited - I feel happy and energized when I finally figure out how to solve a hard problem.
- ☐ Hopeful - I believe that I can find a solution if I keep trying.
- ☐ Patient - I won't quit until I solve the problem
- ☐ Proud - I feel proud of myself when I solve a hard problem.

Do you go for help when you have a problem?

- ☐ Yes
- ☐ No

For the question above, if you said yes, why? If you said no, why?

Your answer _____



So many questions! Let's
break it up a bit...

Break time! For doing so well, follow these fun steps to refresh your brain!

1. Jump as high as you can five times
2. Now get as low to the floor as you can
3. Now come back up!
4. Spin around three times
5. After you stop feeling dizzy, clap for yourself while taking three deep breaths.
6. Stop clapping and take one more deep breath

Great job! Now, I think it's time to answer a few more questions. You got this!

Quick Break! You're so close to being done, only a few more questions!
But first, try to rub your stomach and pat your head at the same time.
Amazing! Now, let's finish up these last few questions. You're awesome!

Only ONE more question! You got this!

Mentor Questionnaire Highlights

- Use of sophisticated language suitable for high school/college students' comprehension
- 8 sections
 - Personal Information
 - Academics
 - Hobbies & Interests
 - Personal Growth
 - Relationships
 - Family Background
 - Miscellaneous
 - Mentor Relationship with Kids

Example

Personal Growth
What challenges have you faced in high school?
<small>Your answer</small>
How have you handled stress or anxiety in high school?
<small>Your answer</small>
What is something you want to improve about yourself?
<small>Your answer</small>
What have you learned about yourself in the past year?
<small>Your answer</small>
What are your long-term goals for personal growth and development?
<small>Your answer</small>
How do you handle failure or disappointment?
<small>Your answer</small>
How do you like to challenge yourself?
<small>Your answer</small>

The Algorithm

```
19 template<typename T>
20 unsigned int levenshtein(const vector<T> &s1, const vector<T> &s2,
21                          const size_t len1, const size_t len2,
22                          vector<unsigned int> &col) {
23     for (unsigned int i = 0; i < prevCol.size(); i++)
24         prevCol[i] = i;
25     for (unsigned int i = 0; i < len1; i++) {
26         col[0] = i+1;
27         for (unsigned int j = 0; j < len2; j++)
28             col[j+1] = std::min(
29                 prevCol[j] + (s1[i] == s2[j] ? 0 : 1),
30                 col[j] + 1,
31                 prevCol[j+1] + 1);
32     }
33     col.swap(prevCol);
34     return prevCol[len2];
35 }
```

Efficient way to create the most optimal pairings between students and tutors

How does the algorithm work?

1. Incorporate tailored weights from research quizzes.
2. Gather questionnaire responses from students and tutors.
3. Assign scores based on responses for compatibility and proficiency.
4. Use hill climbing optimization for effective tutor-student pairing.

The Algorithm

What is the benefit?

- Prioritize highest overall match rather than individual tutor-student compatibility.
 - Aim for higher average match across all tutor-student pairs.
- Maximize overall effectiveness and satisfaction of tutoring experience.

Future Development

- Plan to use this in other districts
- Mold MaxMatch to specifically uplift under-served students of color
- Further refine the translation from quiz responses to weights
- Expand awareness of our program



Thank you!

Appendix

[Research Quiz 3rd-7th Grade](#)

[Research Quiz 8th Grade](#)

[Mentor Questionnaire](#)

[Mentee Questionnaire](#)