Proposal

**Tutor Matching Algorithm Proposal**

Submitted To:

John Politis, Director of Learning labs at CCP

Community College of Philadelphia IT department

Submitted By:

Andrew O’Drain

**EXECUTIVE SUMMARY**

The Community College of Philadelphia should implement a tutoring matching algorithm to help students and employees achieve maximum satisfaction while studying or working at the college. CCP students need a way to efficiently be coupled with a tutor that will best be able to help with their changing needs. Furthermore, tutors need a quick and effective way to ensure they are being the best resource they can be for the students.

**Quick and effective implementation will yield:**

* Increased student satisfaction with online tutoring
* Improved over-all GPA
* Decreased opportunity costs for both student and tutor
* Increased sense of well-being for student, tutor, and administration
* Better communication between student, tutor, and administration
* Time saved for student, tutor, and administration

This project does not require the hiring of any additional employees and requires no upfront costs to implement. The entire project could be implemented in two to four weeks over the winter break of 2021/2022.

**PROBLEM: STUDENT TUTOR MATCHING CAN BE IMPROVED**

A survey was conducted **(Figure 1)** that received 56 responses and showed that of those surveyed 22% of them between the ages of 18 and 27 who have attended at least some college over the past five years think that the tutoring services offered at their college needed improvement, while 8% thought it was “Not so good**”(Figure 2)**. The primary reasons for student dissatisfaction had to do with communication and competency of the tutor in relevant subject matter **(Figure 3).** When asked if a student-tutor matching algorithm would benefit colleges as a whole, a resounding 91% agreed. What’s more is 91% of students agreed that an algorithm would save time and increase wellbeing **(Figure 4)**, while 85% agreed that it would help improve overall GPA **(Figure 5)**.

Currently the Community College of Philadelphia online tutoring platform offers a scheduling service that uses only availability and qualifications to match students with tutors. This method of matching does not consider other criteria such as personal learning styles or personal interests. Private companies that provide tutoring services, such as *NexGen* and *gooroo*, employ additional criteria for matching. Their research has shown that when students and tutors have multiple things in common, better learning can take place (Access wire, 2020).

When availability and subject area are the only criteria used for matching, an unsatisfactory experience can result. For example, a tutor may not feel confident explaining every topic in a given subject area. This may leave the tutor feeling they haven’t helped the student and the student with a sense that little was learned or accomplished during the session. After the session, the student may begin, through trial and error, to search for a tutor who can best meet their needs. This wastes valuable time and creates additional stress on the student, especially when deadlines need to be met. The tutor may then begin reviewing relevant subject material with the hopes they will be able to help the student in subsequent sessions. This requires significant time and effort and creates additional stress that does not need to be there.

**PROPOSAL: CREATE A STABLE-MATCH ALGORITHM FOR USE AT CCP**

The Community College of Philadelphia should implement the stable-match algorithm. The algorithm is well known in the computer science field and can be tailored to meet the needs of CCP **(Figure 6).** IT will customize the algorithm such that it will assess students and tutors along four dimensions. IT will then develop custom surveys that will be used to collect the pertinent data from both student and tutor **(Figure 7, Figure8)**.

* The student and tutor surveys will assess them along the same four dimensions.

1. Availability
2. Personal interests e.g.,, music, art
3. Preferred learning styles e.g.,, abstract, visual
4. Strengths/weaknesses in subject topics

**Once all information from students and tutors is collected, it will be stored in a database to be referenced when needed.**

**Final matching once implemented will follow these five easy steps:**

1. A student will log onto their existing *wconline* account at least one day before they need tutoring.
2. An option will appear that will offer the student the ability to opt in or opt out of the matching service. If the student opts in, they will be prompted to fill out a survey that will collect the data needed for proper tutor matching. Once the student completes the survey, a day will be required for proper matching to take place.
3. At the end of every day, when all student’s and tutor’s availabilities are known, the algorithm will match all students with tutors who have submitted a request.
4. The day after the student submits the request, they will receive an email that lists their top three matches.

**IMPLEMENTATION PLAN**

The IT will implement the stable match algorithm by the start of the Spring semester of 2022 through the following steps:

* Jan 3– Jan 5: Hold two days of meetings from to review all details of the project and ensure college has appropriate resources
* Jan 6 -Jan 7: Develop the custom surveys that will appear on *wconline* platform
* Jan 10 – Jan 12 : Develop the custom stable-match algorithm for students and tutors
* Jan 13 – Jan 14 : Send a survey to every employed tutor who will be using the *wconline* platform and store it in local databases
* Jan 17 – Jan 18 : Fully integrate project into existing platform and run tests to ensure quality control. After Jan. 18 ongoing assessment and quality control will be performed.

**BUDGET**

Due to CCP having an already well-established IT department, according to Prof. John Politis, there will be no additional upfront costs associated with this project. CCP IT is fully capable of developing and implementing a project of this size and scope.

**BENEFITS OF THE PROPOSAL**

Implementing a matching algorithm will make Community College of Philadelphia a more attractive choice for students and will:

* Increase well-being among students, tutors, and administration
* Reduce the time it takes a student to find an effective tutor
* Allow students to achieve more
* Reduce the amount of time a tutor spends reviewing material
* Help students maintain a positive attitude toward learning (Access wire, 2020)
* Help mitigate the impact of Covid-19 (Access Wire, 2020)
* Improve overall GPA of students
* Increase administration satisfaction when students and employees are more satisfied

**CONCLUSION**

The current online tutoring platform that Community College of Philadelphia uses needs a way to make services more efficient and more effective for the consumers that tutors serve. The implementation of a matching algorithm will not only offer a unique option for students to help them attain their goals through reduced stress and time saved, it will also provide useful information to administration and tutors so they can be confident that they are helping the students in the best way possible.

**REFERENCES**

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**APPENDIX**

**Figure 1**

**Opinion Survey**

1. Are you currently in college or have you attended college in past 5 years?

Yes No

2. Do you attend, or have you attended tutoring that was/is facilitated by the college?

Yes No

3. If you attend or have attended tutoring at your college, how much time per week did you spend with the tutor? (Select zero if you did not attend tutoring).

 0 1hr-2hr 2hr-6hr > 6hr

4. How would you best describe your tutoring experience?

Excellent Ok, but needs improvement Not so good

5. If you answered, "Not so good", or "Ok, but needs improvement" in the previous question, please share in a few words about what you thought needed the most improvement. If you thought no improvement was needed you can skip this question.

6. Do you think colleges would benefit from a computer program that would match student with tutors based on certain criteria?

Yes No

7. Do you think a tutor matching program would increase overall well-being?

Yes No

8. Do you think a tutor matching program would increase overall student GPA?

Yes No

9. Do you think a tutor matching program would save student’s time?

Yes No

10. Do you believe that a tutor matching algorithm should consider personal interests of both students and tutors? Yes No

**Figure 2**

**Question 4 from opinion survey**

Chart, pie chart

Description automatically generated

**Figure 3**

**Question 5 from opinion survey**

If you answered, "Not so good", or "Ok, but needs improvement" in the previous question, please share in a few words about what you thought needed the most improvement. If you thought no improvement was needed you can skip this question.

* They need to explain better.
* I don't know
* It felt like they didn’t know how to help me
* Need more experience
* Not very smart
* I wish it was not student based and had more professors in board.
* Not so good
* How I communicate and need to show more work.
* Some tutors didn’t explain thoroughly or were unsure of topics
* More dedication needed
* I feel as though it wasn’t as focused as I needed it to be. It wasn’t specific enough, and I didn’t leave feeling like I was better prepared.

**Figure 4**

**Question 6 from opinion survey**

Chart, pie chart

Description automatically generated

**Figure 5**

**Question 7 from opinion survey**

**Chart, pie chart

Description automatically generated**

**Figure 6**

**Pseudo-code for matching algorithm**

**function**  stableMatching {

initialize all t € T and s € S to free

**while** ∃ free tutor t who still has a student to be matched with {

**s =** first student on *t’s* list to whom t has not been matched

**if** s is free

(t, s) become matched

**else** some match (t’, s) already exist

**if** s prefers t to t’

t’ becomes unmatched

(t, s) become unmatched

**else**

(t’, s) remain unmatched

}

}

g Program Research

**Figure 7\*\***

**Student example survey**

1. What is your availability for tutoring?

A grid showing days and times will be provided. The student can then choose all days and times that apply.

2. What subject do you need help with?

A drop-down menu will be provided with a listing of all courses for which tutoring is available.

3. What specific topic do you need help with?

A drop-down menu will be provided with a listing of topics for the course chosen in question #1

4. How confident do you feel with this topic currently?

A drop-down menu will appear with the following options: Not Confident, Somewhat Confident, Neutral, Confident

5. How do you feel you learn best?

A drop-down menu will appear with options such as visually: graphs, diagrams, illustrations; supervised: tutor overseeing problem solving.

6. Studies have shown that when tutors and students share interests, better communication can take place. If you would like to be matched along this dimension, choose as many options as apply to you from the following drop-down menu.

A drop-down menu will appear listing potential personal interests such as music, sports, art, chess

**\*\***The student will have the option to opt into questions three, four, five, and six of this survey.

Some students might not want to share details about themselves

**Figure 8\*\***

**Tutor example survey**

1. What is your availability for tutoring?

A grid showing days and times will be provided. The student can then choose all days and times that apply.

2. For what courses are you qualified to provide tutoring?

A drop-down menu will be provided with a listing of all courses for which tutoring is available.

3. For each course that you are qualified to tutor, rate your confidence level for each topic covered in that course?

For each course the tutor will provide answers regarding their confidence in relevant topic areas.

4. How do you feel you teach best?

A drop-down menu will appear with options such as visually: graphs, diagrams, illustrations; supervised: tutor overseeing problem solving.

5. Studies have shown that when tutors and students share interests, better communication can take place. If you would like to be matched along this dimension, choose as many options as apply to you from the following drop-down menu.

A drop-down menu will appear listing potential personal interests such as music, sports, art

**\*\***The tutor version of the survey can be a more in-depth questionnaire and be emailed to them. New tutors will be required to fill them out prior to their first day.