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CS194 Project Proposal: Athena

Executive Summary

Athena is an online platform that empowers high school students and teachers by creating an educational experience outside of the classroom by enabling. At its core, Athena connects students and teachers to form online communities centered around various academic subjects. These online communities feature multimedia Q&A forums where students and teachers can discuss and share academic material based on high school classes or national AP curriculum. Athena users will have access to communities for their local high school where they can interact and work on homework with their classmates and teachers at a regional level. All Athena users will be able to interact at a national level on various academic subjects.

In addition to participating in these Q&A forums, Athena users will have the option to join subgroups. Students will be able to form groups where they can share material and work in close circles.

We will use gamification to encourage user engagement in Athena. Students and teachers who are active on the Q&A forums or their subgroups will be awarded with points that translate to a ranking system that will give users various perks within Athena.

Minimum Viable Product Goals

In order to achieve a minimum viable product, we want to reach the following goals:

- Athena users can interact on Q&A forums organized by academic subject
- Athena users can choose to either interact on forums at a national or local (their own high school) level
- During registration, Athena users can distinguish themselves between students and teachers
- Athena users can form subgroups within local or national communities - study groups for students and teacher's lounges for teachers

Need

In spite of major developments in connectivity because of the Internet, high school students and teachers across the nation remain relatively disconnected outside of the classroom. Most students rely solely on teachers, textbooks, and friends. These resources are time-constrained and are not always available; high school students stuck on an algebra problem at home will not receive immediate help despite the connectivity computers provide today. It is possible to instantly connect to our friends and family through social networks such as Facebook, but the same is not true for academic communities. Our web application will provide that community, which will bring together students and more importantly their teachers.

Athena will address a host of problems in the education system. Listed below are reasons why there is a need for this product:

- Students do not have a quick and easy way to find help outside the classroom
- Students lack access to academic community outside the classroom
- Students are not well connected to their teachers, hindering the learning experience
- Teachers cannot easily and consistently answer student's questions outside the classroom
- There is an inequity of academic resources available for students based on their school system

Teachers share a noble and common goal: to teach. Modern technology should be leveraged for them to teach through all mediums, at any time, and to any student. As a consequence of bringing together teachers and learners on such a large scale, we will also see increased educational equity in America's schools. Students will not only have access to their own resources - teachers at their school - outside of class, but to any teacher in the country. Study groups will be formed between students in order to study for nationwide exams, such as AP tests, and these students will be from all backgrounds and high schools.

Potential Audience

Our audience will be any student in high school across the country. There are approximately 4 million students per grade in the K-12 education system, and there are around 16 million students in high school. These users consists of 14-18 year olds who are most likely tech savvy and have experience using computers and mobile devices. Our website will be easily navigable for this audience.

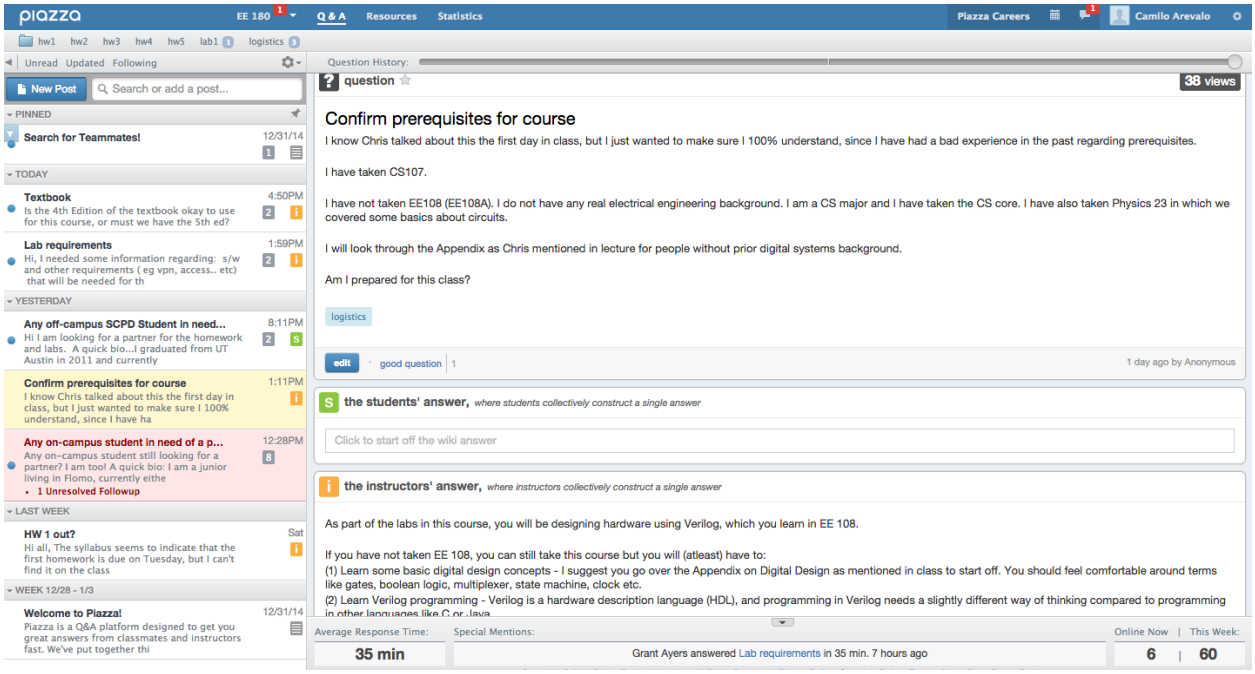
High school students naturally worry about homework and want to succeed - this is why Athena will be of great use to them. In addition to high school students, community and junior college students may also benefit from Athena. Many high school academic topics are covered at the community college level, and so tutoring can very easily be crowdsourced for these students through our web application. The age of these students is definitely higher than 18 by a few years, but they are also expected to know how to navigate a Q&A site on their computer. Younger students, such as those at a middle school, may also be potential users. This age group (10-13) will have far simpler academic questions, and if they're already computer-savvy and can use the internet, then there would be no reason not to include this age group.

Teachers will also be users of Athena. These are the people that will be distinguished as lecturers on the web site and their responses to questions will be held with higher regard. There are approximately 3 million teachers in the United States, and about 250,000 high school teachers total. Teacher age varies widely, and some will be very knowledgeable about mobile devices and desktops, and some will have trouble using one or both. Athena will be a web application that will primarily be used on a desktop, but we must always keep in mind the technical simplicity necessary for some of our users.

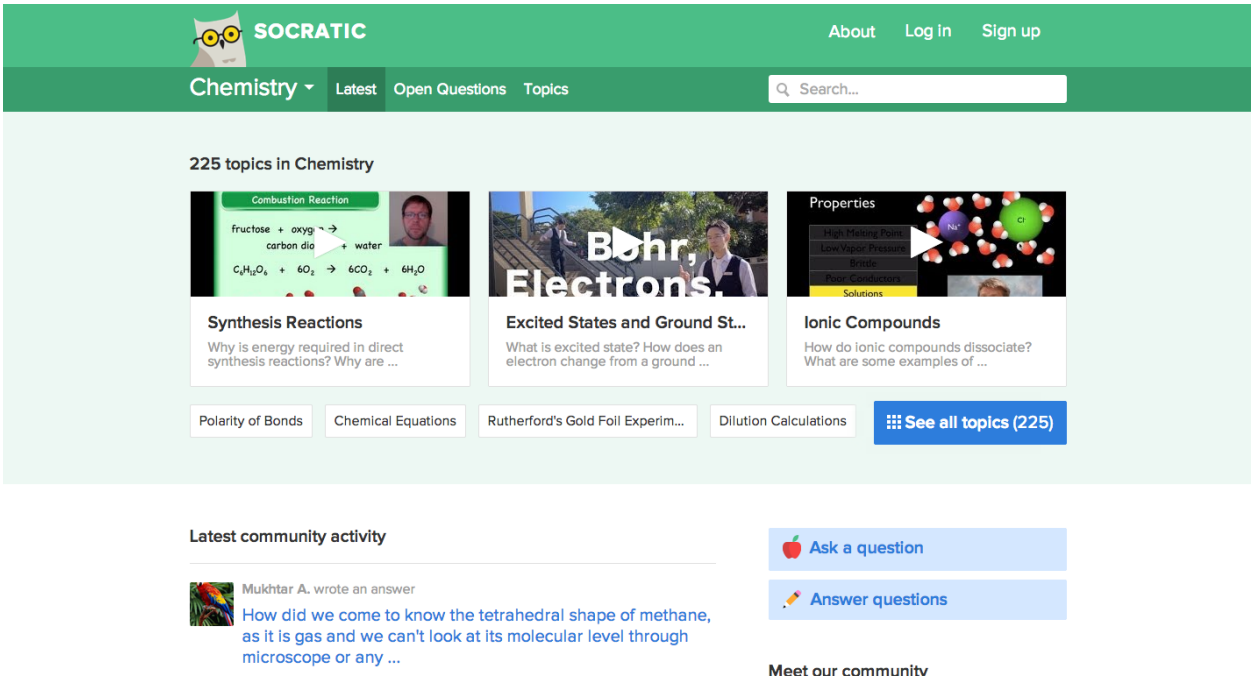
Advantages Over Competing Products

Athena will be entering a field with numerous notable competitors, but will offer a competitive advantage over these other products due to its unique combination of features.

- Piazza (website: https://piazza.com/)



  - **Product Analysis:** Piazza is a Q&A platform designed for college classes where professors, TAs, and students can interact through posting announcements and questions. The typical use case is a student posts a question onto Piazza and receives a response either from a peer or a teaching staff. If the response is deemed adequate, the question is closed; otherwise it is kept open for further comments.
  - **Differentiator:** Unlike Piazza, Athena will not confine a community forum to only a specific class. For instance, teachers and students from different high schools and courses can all interact on the same national calculus forum. This will lead to more enriched discussions and a greater chance that a question will be answered adequately.
- Socratic (https://socratic.org/)



- **Product Analysis:** Socratic is a Q&A platform designed and organized by academic subject. Members can post a question relating to a specific subject, and the question will exist on the forum for that question. The typical use case is a user wanting help on a specific subject can navigate to the page for that subject and browse already existing questions, or post their own.
- **Differentiator:** Athena provides a clear distinction between students and teachers, allowing for greater organizational synergies in the form of subgroups. In addition, it will provide credibility to interactions on forums. A student who asks a question that is answered by a teacher might feel more secure about the validity of the answer that they received.

- Khan Academy (https://www.khanacademy.org/)

  - **Product Analysis:** Khan Academy is a highly structured online learning platform covering a wide range of academic subjects. Khan Academy offers video content to cover topics sequentially in a class-like setting.
  - **Differentiator:** Although Khan Academy is a comprehensive and useful academic resource, its online community is confined to comments sections for specific lessons. In contrast, Athena will prioritize interaction between members and there will be much more emphasis on the question & answer portion of the site.

Technologies Used

We are planning on implementing most of our stack using Python.. We will be using the Django framework since we are building a web application and optimizing for mobile as well as SQLite for our database. On the frontend, we will be using HTML/CSS and specifically using the Bootstrap framework for styling. For version control, we will use Github (and getting private accounts when we start developing) and will host the site on Amazon Web Services.

Resource Requirements

We don't have any unusual requirements for our project. We would appreciate it if we could get a subscription for AWS through Stanford.

Potential Approaches

The main problem we're addressing is a need for students to have more access to help with homework and learning outside the classroom, be it peer-to-peer interaction or a student-teacher interaction. This could be solved several ways other than the global-forum system we've chosen. Though these approaches certainly have there strong points, we feel

our approach better overall fulfills the specific need which we are attempting to serve. Other approaches include:

- An app to help schedule one-on-one tutoring sessions between students, or a student and a teacher: While person-to-person interactions are undoubtedly more productive and informative, they are also more time consuming and specific to a single person. Though maybe lacking in the same depth and quality of instruction or information (due to the knowledge coming from one specific teacher rather than crowdsourced), our approach allows for greater flexibility in both teacher and student schedules, as well as a public record of any question, allowing the information to spread to virtually anyone rather than to only a single student.

- A per-class forum such as Piazza: Although this format is extremely useful and widely successful for college and university courses, high school subjects are much more widely taught than the more specialized university courses. Since questions on our website would presumably be more generalized, our platform would allow teachers from across the country to weigh in on any student's questions. This would be advantageous over a per-classroom style forum due to the crowdsourcing of many teachers instead of one.

- A Khan academy-style video tutorial website: This kind of platform is great for general knowledge and subjects that a student may have trouble with as a whole, but is seriously lacking when it comes to providing one-to-one help with more specific questions. Additionally, there are many sources for learning concepts and theorems online, but many fewer resources which can help with applications and more specific questions. Our platform excels in this area, as students can ask questions about specific applications, while also allowing the flexibility to ask questions, and receive answers, about more generalized topics.

Risk Assessment

- Credibility of Responses- With any large Q&A style websites/apps there lies the problem of incorrect, biased, or otherwise bad responses to legitimate questions. One only has to look to Yahoo Answers to see examples of this problem. This could be overcome with a scoring system which can be applied to answers. Platforms like Quora have a system of upvoting and downvoting which determines quality of responses whereas Yahoo Answers allows the question asker to decide which response was most useful. Piazza on the other hand shows distinguishes instructor answers and allows instructors to endorse student responses.
  Our proposed response to this problem would be to combine upvotes, numbers of answers logged, and instructor endorsement (taking into account whether the answerer is an instructor themselves) into a global score for each response to any given question.

- Confirming Teachers- The inclusion of the distinction of Instructor or Teacher on the project presents the obvious risk of false instructors skewing results. There must be some sort of way to confirm a teachers status. In Piazza, since each forum is on a class by class basis deals with this by simply informing all instructors each time a new instructor joins the class, presumably allowing the actual instructors to identify any instructors that are in fact bots. Having a larger scale forum and presumably allowing users to sign up as an instructor presents a harder problem and requires a more specific bottleneck to filter out fakes. This problem is compounded by different state (or country) regulations on teachers, with different states requiring licenses and some not requiring any.
  One solution may be requiring a National Board Certification (scanning and uploading a copy of the document) but not all teachers have one of these. Our proposed solution would be to require that a person signing up as an instructor submit a copy of their states teaching license (or some equivalent document). No one would actually check if this document is valid, but we assume that such a requirement would be enough to scare away the vast majority of potential trolls.

- Cheating and Plagiarism- Another risk for an academically related website/app is cheating or plagiarizing by the users. Especially when opened to a large scale, a forum for academic questions will almost inevitably result in students posting specific homework questions online simply looking for the answer instead of help with learning or understanding the question itself. Unfortunately on as large a scale as our proposed project, moderation of every question/response is out of the question.
  Our proposed solution would be to allow certified instructors permissions to remove answers which they deem inappropriate, as well as possibly allowing students to flag inappropriate questions and responses. This would have the added bonus of preventing unwanted profanity or inappropriate language on the forum.
  Additionally, in the inevitable event of cheating or plagiarism, to prevent any liability, students and teachers alike will be required to sign some kind of honor-code style user agreement or terms and conditions which will include statements prohibiting cheating and plagiarism by users.

- Copyright Violations- It's possible that in the course of asking and answering academic questions, users might create posts which violate copyright law (perhaps for some textbook or the collegeboard).
  The solution to this possible risk is the same as the previous: to require that users sign a statement in which they agree not to violate copyright or other intellectual protection laws to prevent any liability to our website.

Next Steps

1. Before all else we will need to start prototyping the design and features. This will involve as many iterations of quick, paper-based designs as possible until we find a

general layout that works. At that point, we'll do some user testing to hammer out the details until we've decided on a UI that works.

2. Once we've decided on a UI we can start hacking together the features, all the while testing them on a fake set of data to improve them bit by bit. Of these features we will give first priority will be given to the global forum, working our way down from posting and answering questions, to tags, groups, and different permissions for user types. After this, we'll work on scoring answers and other auxiliary functions.
3. During the previous step we'll be using a preliminary database with undefined columns, but towards the end we'll have to finalize the actual database.
4. Once the website is more or less functional, we can start working on its visual appeal and fixing problems with the UI, we'll continue to test features and reassess as we go to decide whether planned features are useful and if there were some features we initially missed.
5. As the project comes to a close, we'll have some user testing to work out any final bugs in the system or UI and fix these as they come up, ending with a functional and well-designed project.