**“What’s your problem?”: Design a problem solving system for first-generation college student**

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**ABSTRACT**

In order to help first-generation college students to solve their problems they usually encounter in college, we wanted to design a problem solving system for them. We first conducted an interview study to gain the understanding of four first-generation college students’ problems they wanted to solve in college. Then according to interview results, we adopted a iterative design method to build a prototype of the system. Till now, we finished two versions of prototype design and two user testing. Based on our current progress, we proposed the next steps for our design.

**BACKGROUND**  
  
In order to have a better sense of what kind of problems college students might face and gain inspirations for designing our interview syllabus, we observed the wall data posted on the second floor in Hornbake Library at University of Maryland, College park very carefully. These data came from projects of Karen Holtzblatt’s company, Incontext. We were especially interested in interview results on college students’ study and life among those data. We gathered all issues we think may relate to first-generation college students. The types of issues included study, job, time management, finance, transportation, housing, social network, family, personal skills and culture adaption. Then we tried brainstorming to provide suggestions and create design ideas to solve these problems. This procedure is more like a rehearsal of our latter design to me. It was useful for us to gain a general idea of how the whole procedure of understanding users’ problems and designing would be and prepare better for collecting our own users’ data and design. However, the issues we pulled out from the wall data were far from a comprehensive list. Our interview questions cannot be restricted by them. They were minnow we throw out to catch a whale. Then we wanted to find the intersection of users’ problems and focus on design for the common problems.     
   
**INITIRAL USERS’ PROBLEMS**  
  
Understanding our users, first-generation college students, is the most important precondition of design a useful and meaningful system for them. Although there has been many studies indicating the challenges and problems first-generation students encounter, we wanted to confirm whether our users have same or similar problems or whether they have new problems, if yes, what are they? In order to understand our users and gain their initial problems, we collected and analysis users’ data by conducting an interview study.   
  
**Method**   
  
We conducted 4 semi-structured interviews with 4 different interviewees in order to understand our users and comprehend their problems. Based on the issues we identified from the wall data, we all created interview syllabuses. After we reviewed each other’s syllabus, we combined re-edited questions into one final interview questions list. We chose to conduct a semi-structured interview for many reasons. Among them are one most important reason, that is we want to provide more flexible space for interviewees to share their experience with us by their intentions and preference so that we can explore deeper for each interview question and get more out of interview questions [1].   
  
The interview included demographic information questions, nine general questions and twenty-six detailed questions. Nine general questions covered the topics from the first-generation college students’ general study and living condition, challenges, needs, motivations, and self-reflection. Twenty-six detailed questions were about twelve sub topics (course work, housing, financial, work while study, role model, find job, time management, family issue, personal skills, transportation, technologies and others). Only if interviewees mention they had problems relate to these twelve sub topics, they need to answered those correspondent questions. We recorded the interviews if interviewees gave us permission. Interviews lasted from around 25 to 45 minutes.     
  
**Participants**  
  
We recruited four participants based on our personal social network. All of them were first-generation college students in their family, spent four years finishing college study and got bachelor degree. We did not recruit participants who have already graduated on purpose. However, we realized that the advantage of recruiting these participants is that they have gone through an entire four-year college life. Compared with college students, they can provide information from relative comprehensive aspects.

Table 1. Interviewees’ demographic information

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Participant | age | gender | Major | Status |
| 1 | 26 | male | Software engineering | Got bachelor degree three years ago and has been worked for three years. |
| 2 | 23 | male | Fine Arts | Recently graduated from college. |
| 3 | 23 | male | Mechanical engineering | First year graduate student. |
| 4 | 24 | female | Education/school counseling | Recently graduated from collge. |

**Data analysis**   
  
Each of us first analyzed our own interview records (could be both paper-based and radio records) and summarized interviewees’ answers into several key points mainly focusing on problems they encountered and wanted to solve in college. We identified those problems and categorized detailed interviewees’ answers into different problems. Second, we gathered all key points together, discussed details of each point and categorized them again into different types of problems. Although we did not adopt contextual inquiry, we inspired by the way how Karen Holtzblatt and her colleagues analyzed their interview data on the wall data. It is a bottom-up analysis.   
  
**Users’ problems**  
  
All of four interviewees had strong motivation of pursuing study and gaining bachelor degree successfully in college. I presented our interview findings below within key themes of interviewees’ problems they encountered and wanted t solve in college we identified together during the analysis.   
  
*Financial issue*  
Financial issue is the only intersection of all our four interviewees’ problems they had when they were in college. Although only one interviewee considered financial problem as his main issue, other three interviewees mentioned that they had encountered financial problem more or less in college. Their family cannot financially support them is the common reason. However, when we dug deeper, we found two things. First, there were different reasons causing their family did not have enough money. For example my interviewee said his dad  had cancer when he was Sophomore, his family had to spend all money on his dad’s medical treatment, while anther interviewees said their family’s income was low. Second, besides their family cannot give them enough money, there were others reasons lead to their financial issue. For example one interviewee said he cannot manage his money very well.  
  
When our interviewees encountered financial problems, they tried different solutions, such as finding part-time job and apply funding. However, unfortunately, these solutions did not seem to be that helpful especially when they created more new problems and challenges for  interviewees, such as how to find a job, how to manage time to work while study, where to find financial resources and how to apply and get those money. Therefore, I think that interviewees’ problems are not all independent with each other; some of them might correlate to others to some degree.   
  
*Time management*   
Interviewees’ time management problem include two types. One type caused by external causes, for example they had to work while they study. The other type caused by  internal causes, for example one interviewee said that he was always lack of self-control and easily distracted by many things therefore he felt he had no enough time to do some important things.   
  
*Difficulty with specific skills*  
Although there are no same specific skills all our interviewees felt difficulty shared with, all of them felt difficulty with some skills. They were either unsatisfied with some of their skills (e.g. language, writing, learning and testing skills, inadequately prepared for college level studies), or felt lack some useful skills (e.g. doing research). The solutions they adopted or needed included finding role model or big brother, finding resources of tutoring, attending some mentoring programs, finding some opportunity to exercise specific skills and so on. Similar with what I found in financial issue part, these solutions cause new problems again, where to find all these useful resources of training and exercise, who they should turn to when they have no experience on doing something at all?   
  
*Housing*   
Two interviewees encountered housing related problem in college. One complained that having good roommates was difficult. His criteria of good roommates were they have similar life habits, attitudes and goals. However, it is very hard for him to know all these kinds of information when he choose roommates. Another interviewee complained his terrible living situation and he really wanted to find some nice place with affordable rent.   
  
*Internships/jobs*  
Two interviewees had problem of how to find internships/jobs and get the offer. In terms of solutions, having good resources of job opportunity and nice CV and resume are very important. These solutions related with the problems of difficulty with specific skills.   
  
*Romantic relationships*  
One interviewee said that one of his biggest challenges in college is finding a girlfriend. He did not overcome this challenge in college because he did not have any help and also did not where to find help.

*Summary*  
After analyzing interview data, we identified that four interviewees, our potential users, had encountered financial, time management, difficulty with specific skills*,* housing, internship/job, and romantic relationships problems and challenges in college. Financial issue is the most common issue among interviewees. Besides financial issues, most of the problems we found are similar with issues we collected from the wall data. However, four interviewees are limited. We cannot assume that we found all the problems our potential users could have.   
  
Although our initial purpose is to narrow our design scope to a specific common problem shared by all our interviewees. However, according to above results, the financial problem is not independent of other problems. Many problems twisted together. Only solving one problem without considering other problems at all seems not the best choice for us anymore. I proposed a rouge plan that we should design a problem solving system in which help first-generation students can first identify their problems and then solve problems. We together developed this rough plan into our new design plan: we wanted to build a website in which first-generation college student can find their problems, solve their problems and help other users to solve problems within a social network background. Furthermore, we do not want this system only limit to first-generation college student. We hope all college students can use it. Because of the function of helping others in our system, the more users join the system, the more help first-generation college students can get from their peers.

**Persona**  
  
Those problems we identified from interview, combined with other interview details we did not categorize into problems but reflecting interviewees’ college life, helped us to build a persona. This persona not only represented our four different interviewees, but also represented a major type of potential users who might use our website in a similar way. These users are just like George in our persona, have motivation and desire of successfully finishing college study to have a better life, but also have lots of problems which make them feel overwhelmed and cannot come up with good solutions.

**George is a freshman and a first-generation college student. He is very motivated and wants to succeed in college, but he does not feel adequately prepared for college level studies. He is encountering many other problems, including financial issues and trouble with managing his time. These problems are making it hard for him to come up with solutions, since he is feeling overwhelmed.**

George’s father works in a insurance company and his mom is a cashier in a supermarket. They have two kids. George’s little brother is studying in a high school. They don’t have much money left after they paid their living expense and the mortgage payment on their home. George’s college tuition is a big problem for them. So that, George has to look for some part-time job information on website frequently. George’s parents have to work hard to earn money to support this family, so they don’t have enough time to communicate with kids. That makes George feel lack of care and family support sometimes.

George’s high school advisor did not provide enough direction for George in planning for his academic pursuits. He was not counseled to take challenging coursework that would support his goals.  He was also not made aware of the wide range of academic programs he would be able to pursue in college and was not offered the opportunity to take Advanced Placement coursework.  George didn’t have to work very hard to succeed in high school so the challenges of multiple demands in college overwhelmed him, because of his inadequate time management skills.   
  
George has trouble focusing and is easily distracted by the new environment and social activities on his college campus. His college courses are more difficult than he was used to in high school and he is struggling.    
  
George doesn’t really like the amount of people in the classroom. He feels ashamed when he doesn’t know or understand information, because he doesn’t know if that is socially acceptable or not. However, he likes studying with others (in small groups) because he feels less ashamed to ask specifics. Furthermore, George finds the social interaction is a motivating factor. George uses Facebook a lot to connect to his family and friends back home.

He lives with 4 other people in a small house, but he isn’t friends with them. He wishes he could have roommates with similar interests so they could be friends and help each other out with college.

**Motivations**

* + George’s family put lots of expectation on him.
  + George needs a college degree to get a good job and financially support his family.
  + No one talked about the personal development to George before, so he is confused about what he likes and which major he wants to choose.
  + His friends perform well in their new environment. This peer pressure is motivating him to be outstanding.

**Financial**

* + The main problem in George’s life is finances.
  + He is lacking skills relevant to managing his finances.
  + He has to work so much that he doesn’t really have any time left.
  + George doesn’t really know where to look for funding.
  + His family is also financially challenged, so they’re not contributing

**Inadequate preparation**

* + George feels he lacks information about potential academic programs.
  + He feels that Advanced Placement courses or more challenging coursework would have better prepared him for college.
  + George has difficulty with time management and is easily distracted, often failing to get homework completed and missing or falling asleep in class.
  + More information about and access to tutoring and mentoring programs would be helpful for George’s success in college.
  + Early advising and direction would assist George in setting goals and taking appropriate coursework

**George, Confused Student**

**19 years old, male, First year College student, Undecided Major**



Table 2. George’s persona.

**THE DESIGN**

According to an interview four first-generation college students, we understood the general condition of their college life, problems they encountered and wanted to solve in college, and how they coped with them. These problems are very similar with previous finding. However, we found that problems did not stand alone. They either caused by other problems, or caused other problems. When all these problems exist during the same period, users may be less likely to identify what exactly their problems are and which solutions are better and therefore feel overwhelmed. In our first prototype, we want to build a system that can help users identify their problems, find solutions of problems and manage their problems. We want to add social network into this system because we think peers’ influences and suggestions on solving problems are also important.

**Method**

Out design method belongs to user-centered design which focuses on the end users’ needs and wishes for what functions a product should have [2]. We focus on iterative design method. This method includes a cyclic process of completing an initial design prototype, user testing, analyzing testing results, finding problems, refining prototyping to fix the problems, repeating these process except the first step until designers solve user interface problems [3].

**The first Prototype**

The name of our system is “what is your problem?” The first prototype is paper-based [4]. We drew the initial design prototype on A4 paper by pencil. We divided the prototype into four components: homepage and login, my account, identify problems, solutions resources. We first designed a prototype draft. Every component got two-pages design. Then we reviewed all eight pages, collected comments from each of us and reached a consensus on all functions of the first prototype. Based on our comments, we revised the rough prototype and built the first prototype.

*User interface and architecture draft*

Homepage looks like a search engine. In this page, users can input their problems and see the most frequently asked problems and how others solve these problems. Users can login with their facebook account or create an anonymous account. If use facebook account, users can take advantage of social network resources on Facebook. For example they can know how many their facebook friends also use this system and help each other solve problems. We decided to design an anonymous login because we concerned that some users need to ask and manage some private problems they do not want let other know their problems.

However, although we have design of login, users who do not have an account can still use our system to searching solutions for their problems. The differences between login and not login are users who have no account or do not log in cannot manage their problems and help others. Manage their problems means our system can automatically track users’ problem solving progress. Users can check the information of their problems. Helping others means other users can see your problem solving progress and you can give other users’ problems solving progress feedback. If users do not have account or have account but do not log in, they will have no record of problem solving progress and therefore cannot help others.

After user input the problem on the home page and click go, users come to the page of identifying problem. The purpose of this page was asking users to provide more details of their problems (when, where, what and how important) to help them identify their problem better and filter resources of possible solutions. We also provided a problem visualization page to allow users to drag problems in and identify the degrees of importance and emergency for each problem.

After users provide detailed information of their problem and click solve my problem, users go to the page of resources of solutions. The resources include both external links (e.g. any useful links from other websites) and internal peers’ suggestions. Users can evaluate whether they think these resources are useful or not for solving their problems.

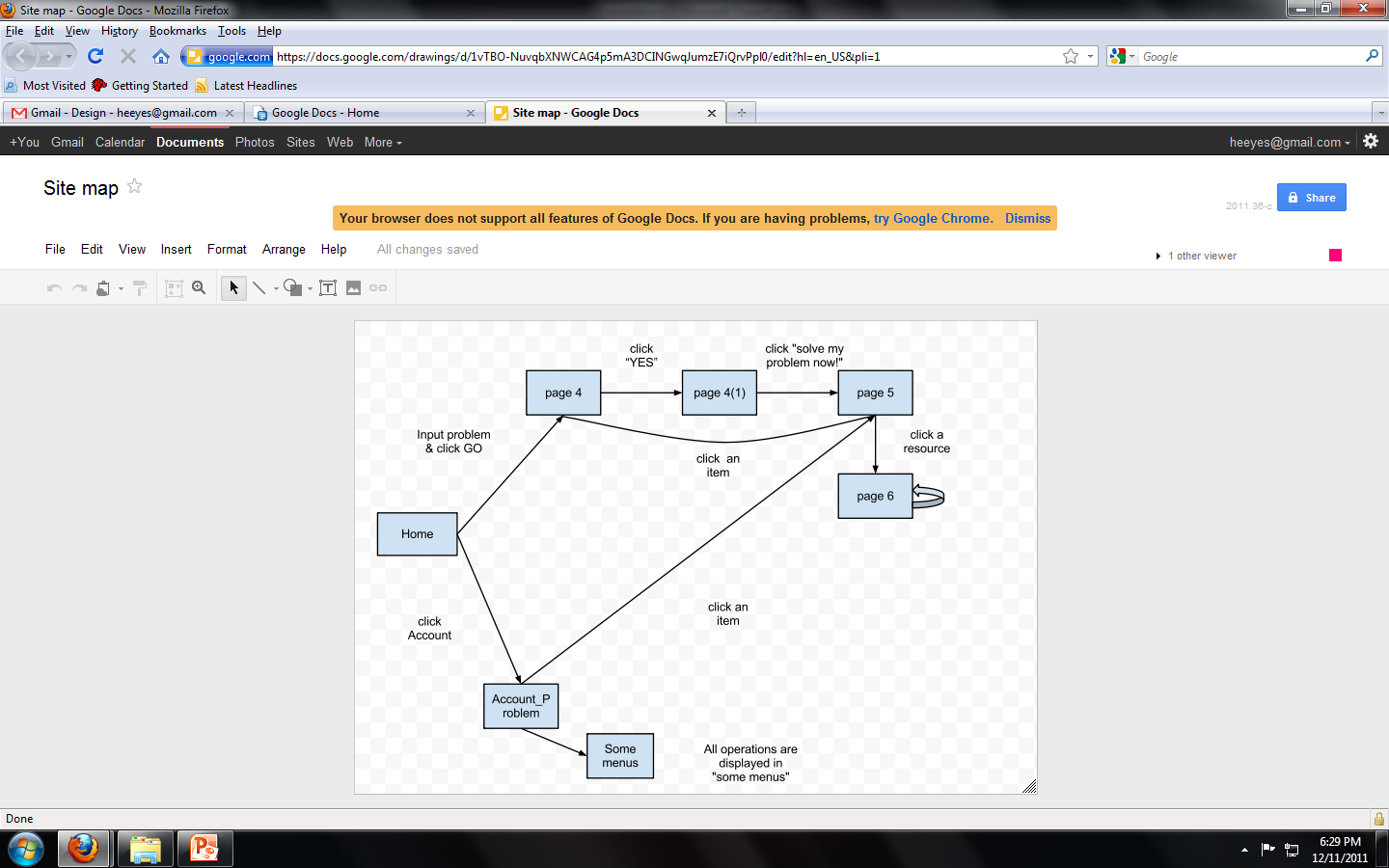
*Teammates’ comments*

The prototype draft included the fundamental functions we wanted to design in our system. However, we all felt that first, this system looked like Google search too much, but it obviously cannot provide as comprehensive search results as Google. Second, forcing users to provide details of the problem made this system seem not very easy to use. We needed to help users to identify their problems. However, we cannot assume that all the users need this help, some of them may already have very clear mind what problem they want solve. This function could be optional. Third, we should to keep same visual design style.

The problem I concerned most was if we cannot tell the essential difference between our system and Google search, how we can help our users to find their answers better than Google. I thought if our purpose is to help users solve problems, we should provide them solutions rather than just related information that have similar key words with our users’ problem. Therefore, we need to assume that our system was super smart. It can understand better our users’ problems and find most effective solutions adopted by others solve similar problems. For example, in our case, one user’s problem was “I don’t have money for tuition”, the search results of our system would be possible solutions, such as apply scholarship, find a job or get donation. If users are interested in one of these solutions, they click the solution and they will see resources of that specific solution.

*User interface and architecture*

Based on our comments to prototype draft, we built a site map and the first prototype.



**Home page**

**Solutions**

**Identify problem**

**Specific resources**

**Specific resources**

**My account**

**Some menus**

Table 3. Site map of the first prototype.

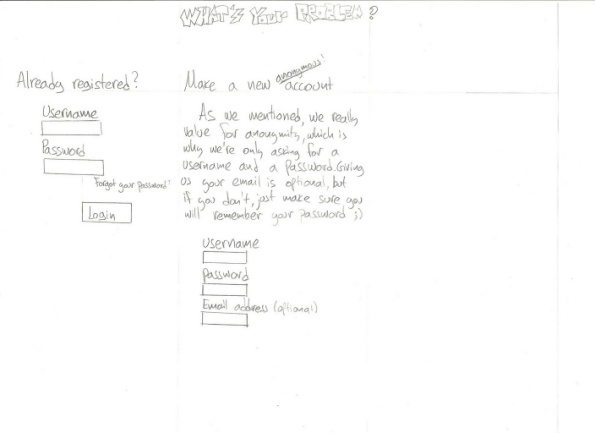
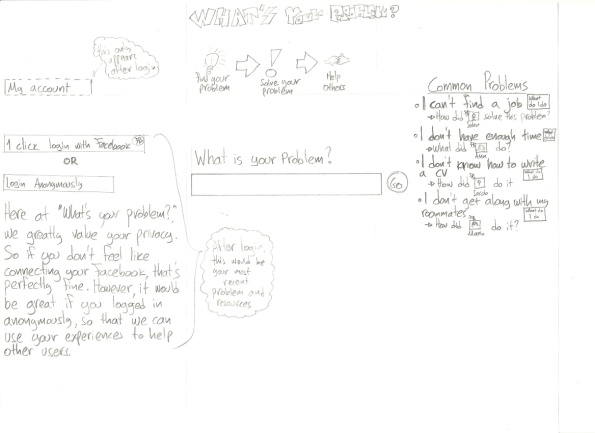


Table 4.Homepage Table 5. Login page.

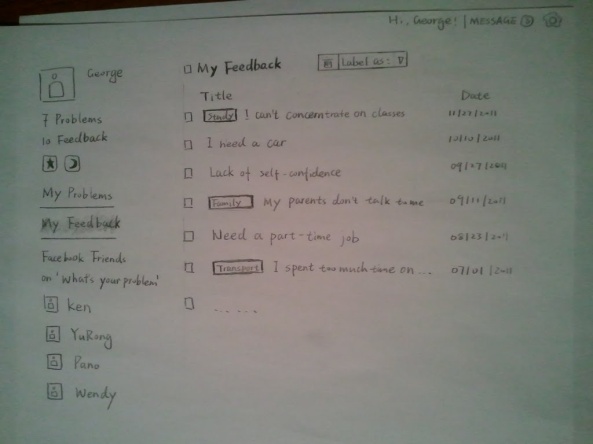
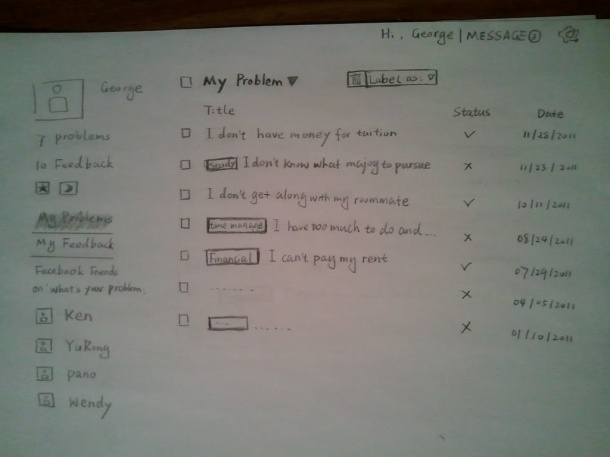
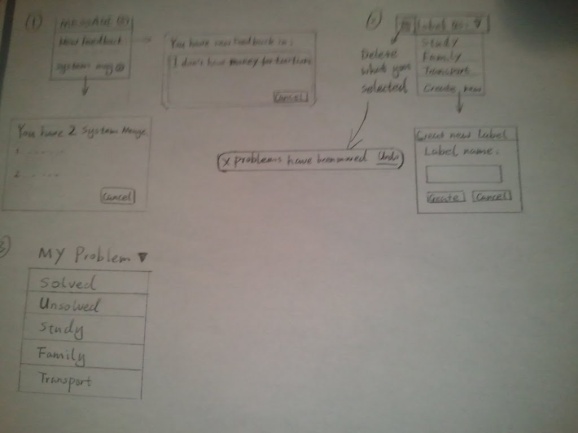


Table 6. Account problem page. Table 7. Account feedback page.

 Table 8. Account menu page.

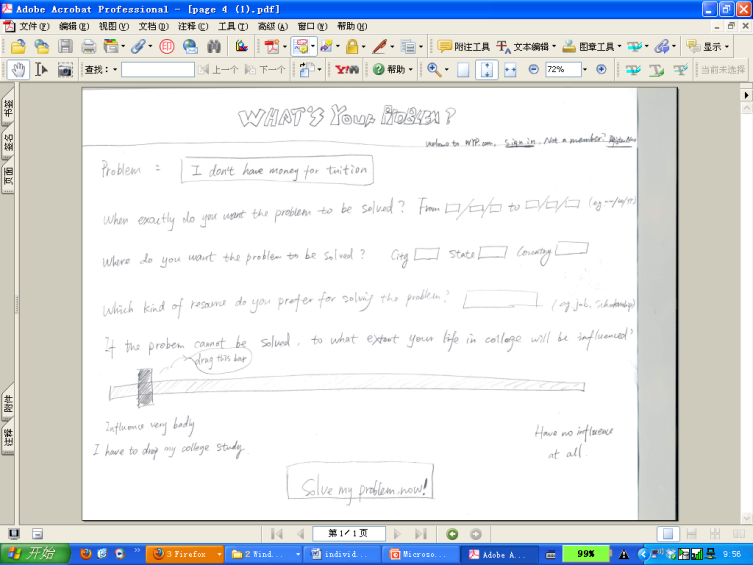
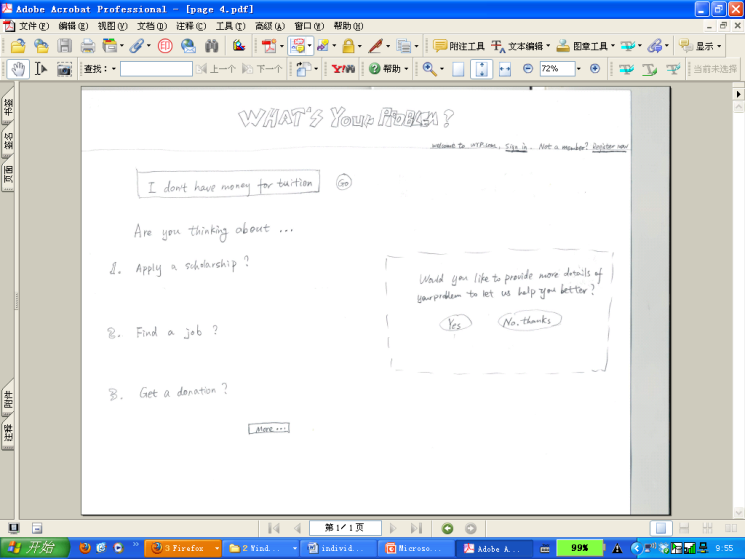
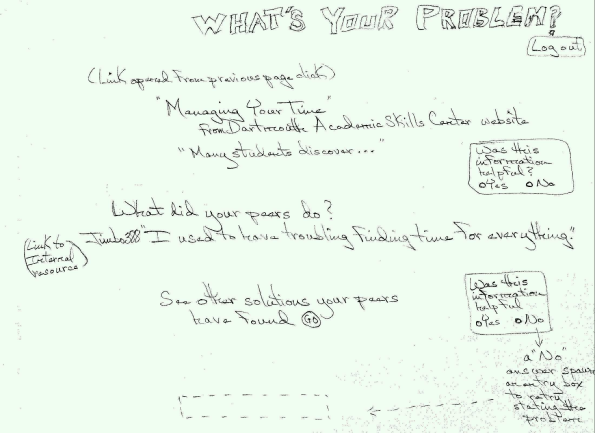
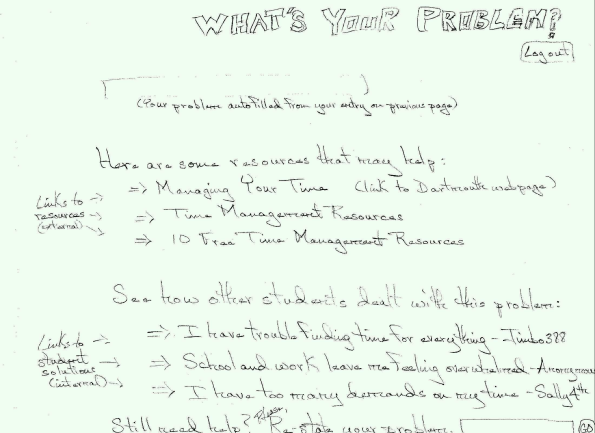


Table 9. Solution page. Table 10. Identify problem page.

Table 11. Resource list page. Table 12. Resource page.

*User testing*

We tested the first prototype on four users who had participated previous interview and collected their feedback for the first prototype. We asked them to assume that this is a real website and pretend they were using this website. When they were using it, we encouraged them to think loudly and provide comments and requirements anytime and anyplace they want.

For homepage, one user wanted to see some descriptions or tips of the site on the homepage, because it was unclear for them at the beginning what this website is about. A mouse over or pop up tips would be helpful. Second, another user wondered why there is no register but only have login. The third user said he did not like the long description under login button. There is too much text. And the fourth user also pointed out image was easier to read, understand and remember.

For login page, one user said he wanted the word “anonymous” to be bigger. The second user wanted to put the login bar in the center, make new account to the left and felt he wanted a “confirm passward”. The third users did not understand what the differences between facebook login and anonymous login were.

For solution results page, one user want to add “none of these” following solutions provided by the system because it was possible he did not find any useful solutions. Another user thought the different login position between different pages was confusing to him. The third user wanted to know how many more possible solutions the website could provide. And it was too trouble to click “more” page, he just wanted to stay in the first page results.

For identify problem page, one user felt confused about “when and where” questions and hard to answer. The second user did not understand how these questions could help him. The third user thought these questions might be useful, but too limited. He wanted to have more open space to input his thoughts about his problems. The forth users said he preferred choosing rather than typing, for example he like drop down menu more than text box. He did not understand the importance evaluation bar and whether he needed to answer all the questions in order to go to next page.

For resources pages, users felt that there were too many words on the same page. It was difficult to read. One user felt these results like Google search results. And users felt confused about peers’ solution. Another user felt it was difficult for him to say whether the resource was useful or not with limit understanding of these resources and limit time.

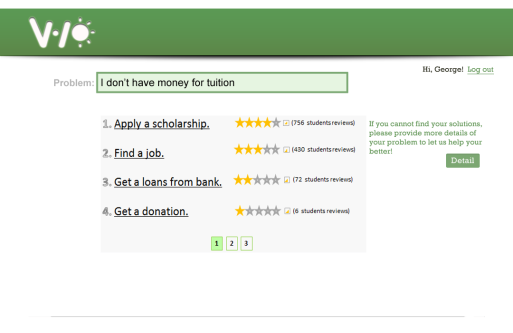
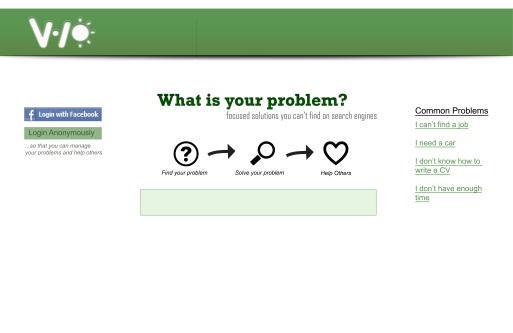
For account pages, all users felt very confused about “Feedback” and did not understand where these feedbacks came from. One user pointed out the account page looked like Gmail. He did not like the idea of sorting because it was restricting. He also felt confusing about message and did not know what it was used for. Another user did not like the design of problem solving status. He liked green or red or text. He did not understand how his problem be saved because he never pressed “save this problem”. The third user didn’t know whether it's starting date or complete date. And he wanted to add a function,"invite your friend join discussion of xxx problem", which means that users click on a problem and select several friends and send them an invitation.

**The second prototype**

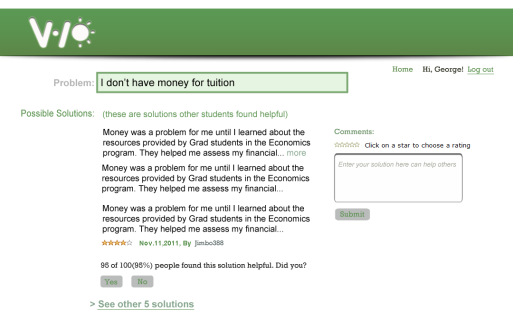
We gained our users’ rich feedback from the user testing of the first prototype. We found that users were more likely to feel lost in identify problem page and account page. After carefully reviewing interview results and user testing results times, I found although I noticed that users’ problems were not independent when I designed the first prototype, I just understood this point in a relative superficial level and did not use it very well in the design. The purpose I wanted to help users to identify their problems better was because the problems were always related to other problems. Sometimes, the key of solving one problem is solving another problem first. There are relationships between problems. According to user testing results, in the first prototype, the way of asking users provide more detail did not work was because it did not reflect the relationships between problems very well and cannot help users explore deeper what the key problem they need to solve are or what other related problems might be helpful for solving their initial problems are. Also, those questions were confusing and too limit. Inspired by the smart Siri system of iPhone 4s, I decided to design a smart chatting robot to help users explore the relationships between users’ problem and provide much more potential solutions for users.

The results of user testing also pushed us to think more clearly about our user interface and architecture. Add some important assumption and pages in the second prototype would be helpful. For example, in order to help our users to better understand the peers’ solutions, suggestions and comments in resources pages, we needed to add a new assumption that before we build the real website, we have already done lots of work on collecting data of how first-generation students solve their problems effectively and built a database of problem solutions. When users start to use this website, they will first saw many solutions in database. And when they provide more comments and solved more problems, the system will add their record into the database. It is a machine learning progress.

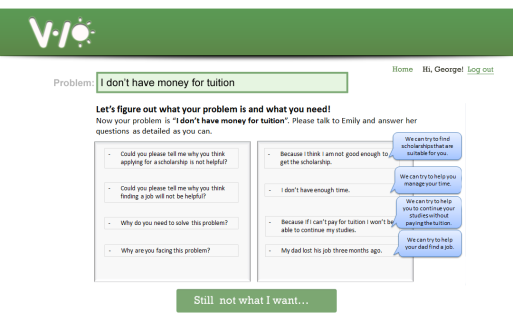
*User interface and architecture*  
Based on the user testing results, we built a site map and the second prototype.



**Input problem and enter**



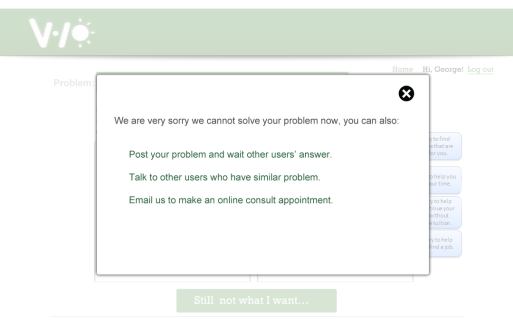
**Click solution**



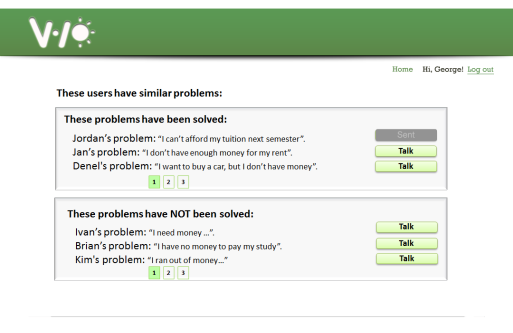
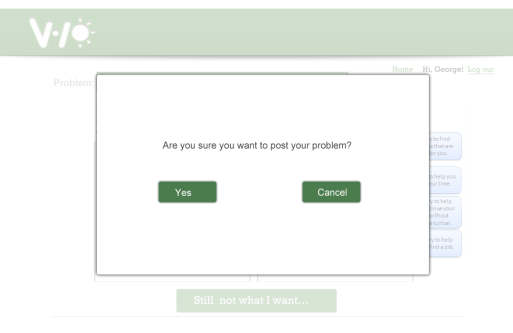
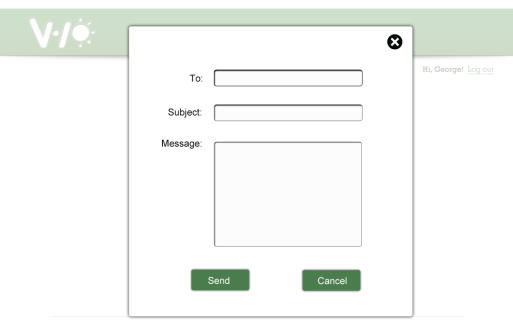
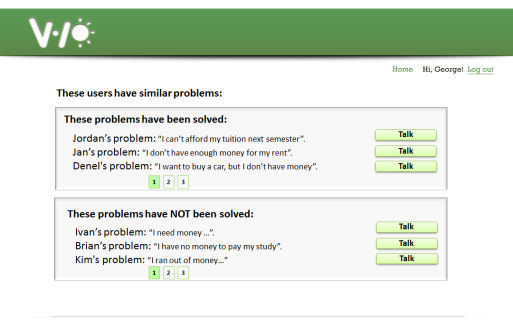
**Click cannot find solution**

**Click other solutions**

**Click solution**



**Click cannot find solution**



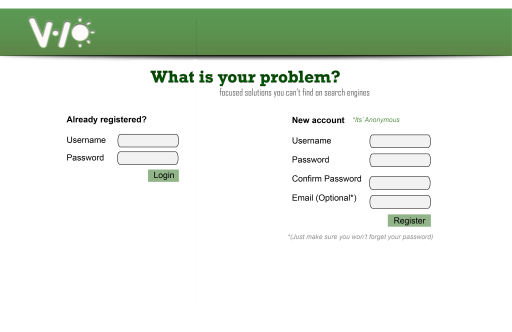
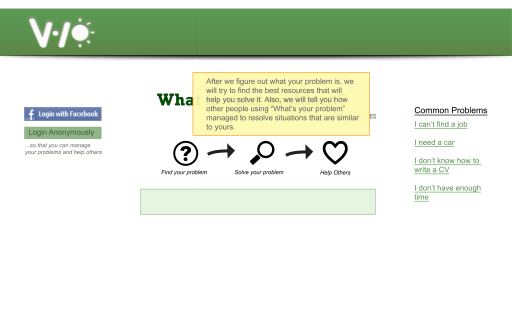
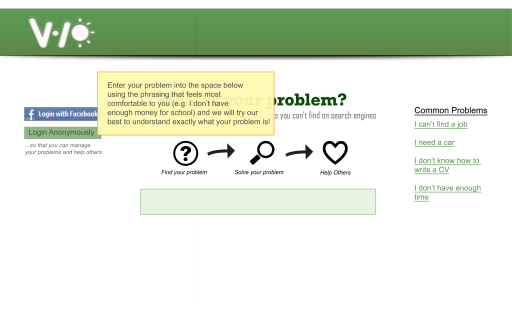
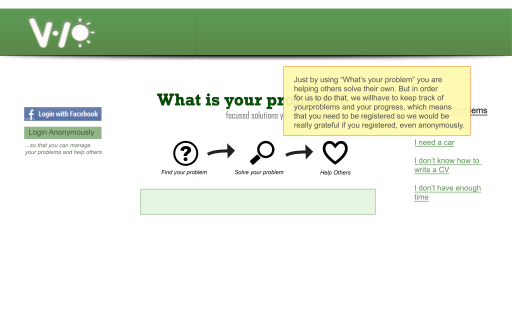
**Click post problem**

**Click cannot find solution**

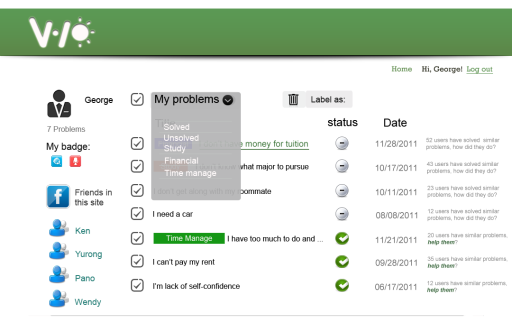
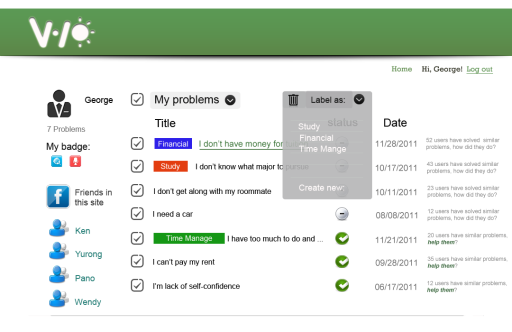
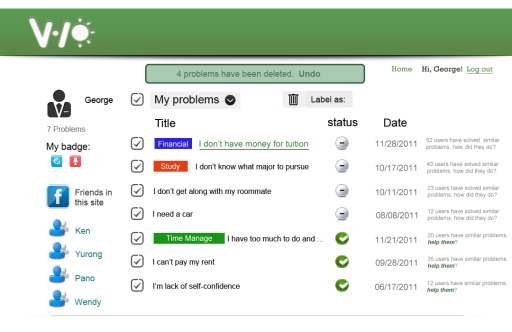
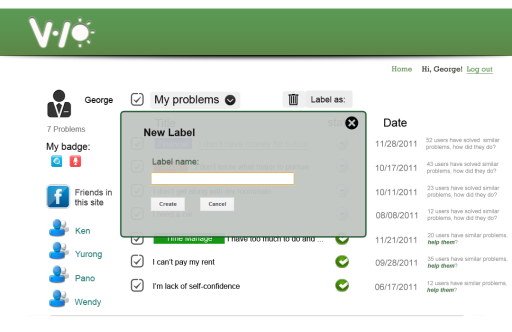
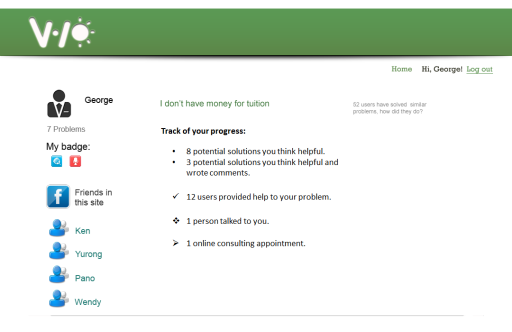
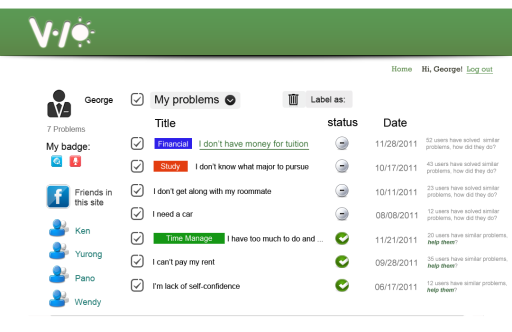
**Click send email**

**Click talk**

**Click Yes**



**Click login**



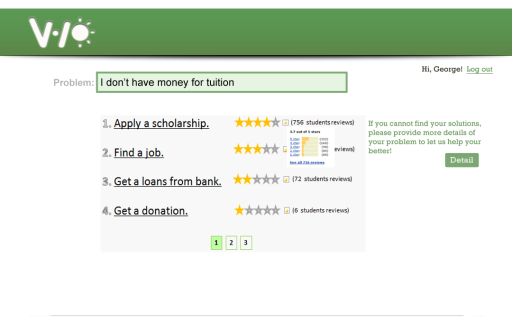
**Put mouse on find your problem**

**Put mouse on solve your problem**

**Put mouse on help others**

**After login**

**Click problem**



**Put mouse on reviews**

**Click my problem**

**Click label**

**Click delete**

**Click label as**

Table 13. Site map of the second prototype.

For homepage, we added tips for users to understand how to use the website better.

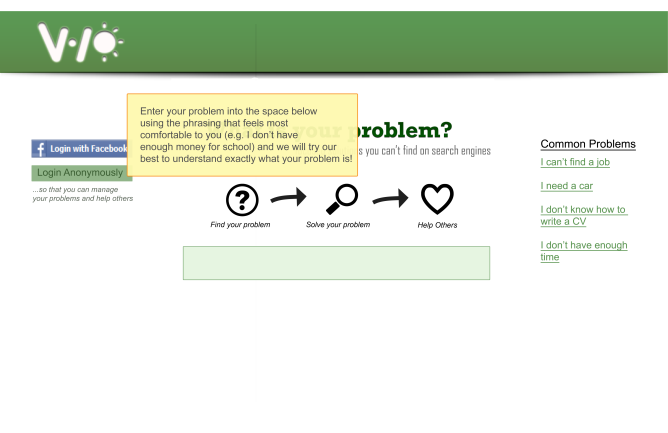


Table 14. Example of tips.

For solution page, we add more solutions and provide comments.

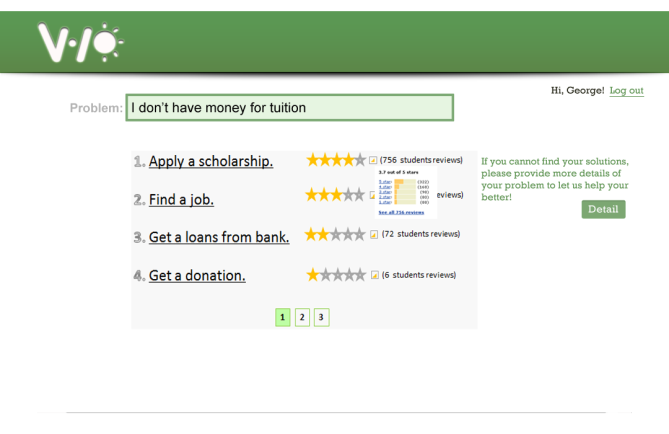


Table 15. Solution page

For identify problem page, we add a chatting robot. The left white box is for Emily’s questions. The right white box is for users’ answers. The blue boxes are all clickable and link to solutions for those problems. The conversation will not stop until use stop and click “Still not what I want…”

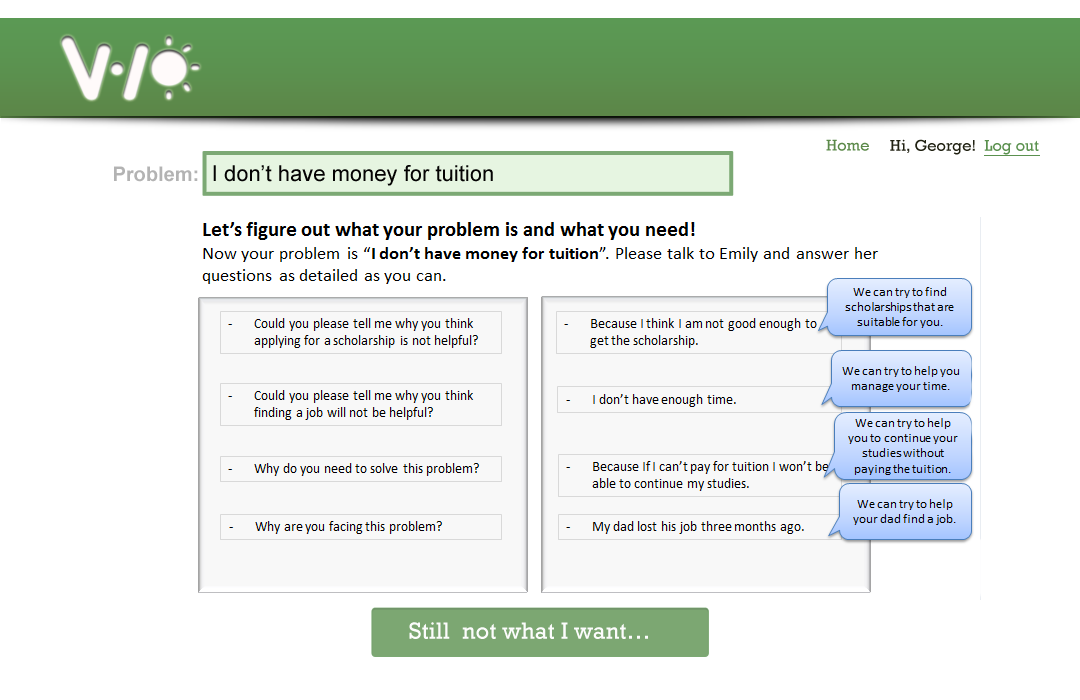


Table 16. Identify problem page

If users still cannot find satiable solution, we will provide three more way to help, post problems waiting others’ help, talked to other users who have similar problem or email to our website to make an online consulting appointment.

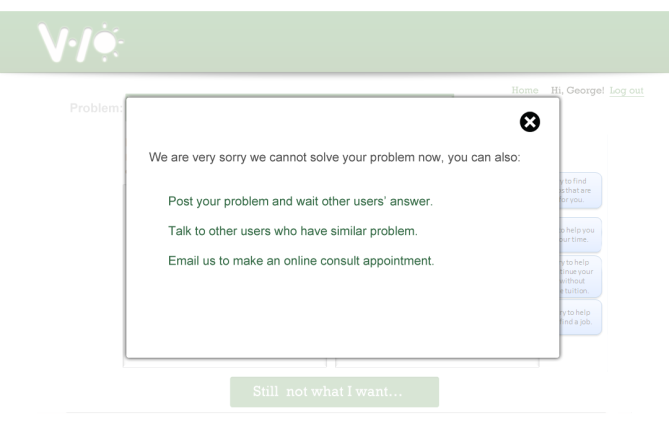


Table 17. We are very sorry page

We rearrange the resource page to make it more readable. And we add comments box here for users to input their opinion about these solutions.



Table 18. Resource page

We deleted the feedback page in account, separated the solved and unsolved problems. We added more features for users to get help from others and help others.

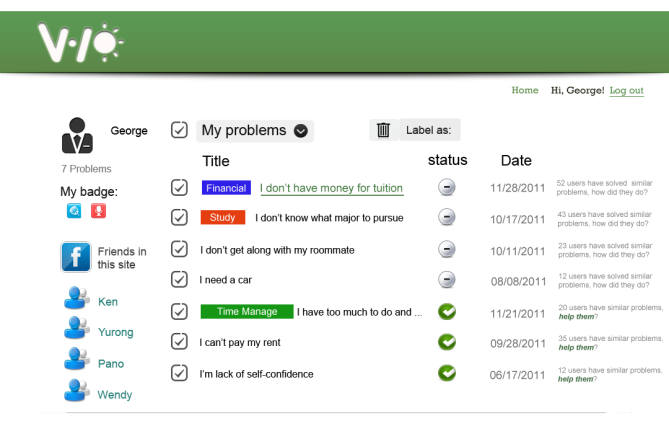


Table 19. Account page

We also added problem track page. It showed users the progress of solving each problem.

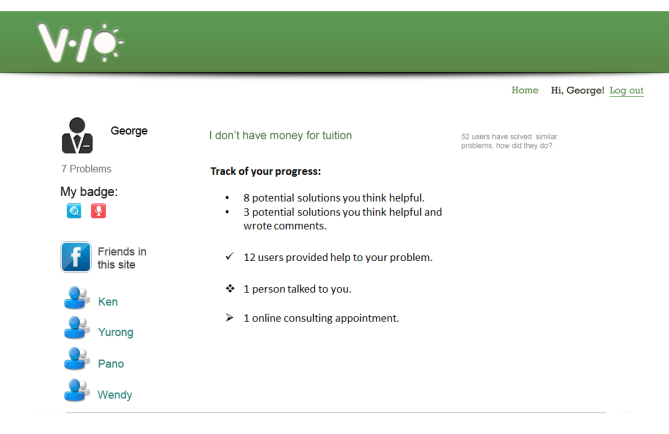


Table 20. Problem solving progress page

*User testing*

Two of our previous interviewees participated in the second prototype user testing. We still asked them to pretend this website was real and tried to use it solve their problems.

For home page, both users found that the “Go” button was missing. We assumed that pressing enter would be sufficient. But it seems users were more likely a “Go” button. For Login page, one user asked if users forget password, what will happen.

For solution and identify problem page, one user were not very sure what stars mean exactly. And both two users did not know who Emily is. And one user said he really liked this idea when he understood this page but he wanted Emily had an avatar and a more professional conversation box. One user liked the function that sending talk request to other users who have similar questions. The other wanted chat mentioned in the main page.

For resource page, one user asked who those users provided comments here were. Were they friend in facebook? He wanted this page notify him which solution he click in last page. And he found if he wanted to go to his account, there was no link to access. He can only access his account from the homepage.

For account page, one user wanted solved and unsolved problems use text to rather than confusing image. And he did not understand what those badges were for. He wanted to know whether those friends displayed in account page were from facebook or internal friends. Another user felt confused about how to use the menu. Both two users felt the trash can was too close to label.

We asked our users their general opinion about our design idea and the website. Both of these two users liked this idea and thought it was interesting. One user said that he definitely would love to use it if this website is real. However, both of them have some concerns. One of them said that our system was very dependent on how useful information users could provide, the range of problems that covered and the number of users. The other user said that he doubted that whether natural language processing and machine learning could provide the function we need. Maybe the current condition of these two technology were not advanced enough.

**NEXT STEP WORK and CONCLUSION**

Although we have good progress in our program, two prototypes and user testing helped us to improve the design very much, we still have many works need to do in order to perfect our prototype and make it into a real website. Our next steps include:

1. Recruit other two users to participate into the second user testing.
2. Collect and analyze four users’ second user testing and gathered new points of revising the second prototype.
3. Repeat the revising prototype and user testing until the current four users satisfy with the design.
4. Recruit more users to test the prototype, get revising ideas, revise the prototype and get the final version of prototype.
5. Modify visual design of the prototype.
6. Build a real website based on the final prototype.

In conclusion, we first gain the understanding of four first-generation college students’ problems they wanted to solve in college and adopted iterative design method to build a prototype of system. This system is a website which does not focus on solving only one type of problems but support connections between problems to help first-generation college student find and solve their problems, solve their problems and help other users to solve problems within a social network background. Furthermore, we do not want this system only limit to first-generation college student. We hope all college students can use it. Because of the function of helping others in our system, the more users join the system, the more help first-generation college students can get from their peers.   
  
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I especially want to thanks all of my teammates. Although the time is limit I cannot write more to thank them, this is really excellent teamwork experience. It’s very different from previous individual workout. Besides learn how to design, this time, I learn much more on how to communicate and collaborate with others. How we together to get though all of the tough problems we encountered in this project has become of my most wonderful memories. Thanks so much for Pano and Wendy’s patient. They must suffer from my bad English, but they always so nice and patient. My teammates are the best!

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