Draw Two!

Improving the way students find roommates during In-House Draw

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For CS 278: Social Computing

This project is equal parts technically-challenging and socially-challenging.
1 Introduction

In-House Draw. To undergraduates, the mere mention of it recalls memories of uncomfortable interactions and small selection pools. At many universities, the annual housing draw is the single largest cause of visits to mental health services. For a good outcome, it’s important not just where you live, but who you live with.

A significant chunk of campus goes through draw alone, and these people are poorly supported by in-house draws. Existing augmentations like pre-draw mixers and roommate spreadsheets are plagued by high search costs and information overload.

Enter Draw Two: your saving grace for In-House Draw.
2 Design

Draw Two is a two-step process on the part of the user, each step a few days apart from each other.

First, the user fills out a short questionnaire, answering questions that cover the essential elements of pairing successful roommates. We ask users about habits such as waking and sleeping times, but also questions that tackle personality traits and temperament, such as how they’d approach resolving an interpersonal problem with their roommate.

Then, one to two days before their dorm’s In-House Draw, we send over a shortlist (left) of the one to three potential roommates who are most compatible with them, including each student’s email and a short introduction they wrote themselves.

Future actions are up to the participants, and it’s something we’re keenly interested in. We designed this with the hope that students would reach out to their matches before or during In-House Draw and get a feel for whether or not they would get along. We purposefully chose to leave this connection and interaction off-platform for reasons we’ll get into regarding prototyping.

Ultimately, Draw Two’s value proposition to users is to facilitate introductions to other users (the creation of weak ties among users) with the hope that at least one of those weak ties has the potential to develop into a strong tie (i.e. their roommate for the next year). By getting key rooming essentials right (or as right as possible given the pool), we can let students focus less on evaluating roommates on these challenging specifics and instead focus more on talking to each other, discussing the last few intangibles they’d hope for in a roommate that could never really be captured in a form.

Our hope is that by reducing the complexity of the problem for the users—by reducing the total burden of finding roommates on students—they’ll feel more secure about their living situation for the upcoming year, and less stressed throughout the In-House Draw process.
3 Prototypes

Prototypes for a system like Draw Two have sprung up naturally across campus, borne from the deep need. At their simplest, an entirely social, nontechnical solution is a “mixer” before the true In-House Draw, where next year’s residents have the opportunity to meet other residents over light snacks and potentially identify a roommate among them. While these let people meet face-to-face, it’s socially unacceptable to ask for all the information you need in order to qualify a potential roommate, and these mixers fail to solve the fundamental search problem.

Intermediate prototypes include bricolage’d socio-technical systems: in the past, dorms have used Google Sheets (e.g. Ng House, 2018, at right) for people to publicly report details about themselves in the hopes that they’ll be able to identify a prospective roommate in the same sheet. These successfully reduce the cost of querying potential roommates for answers, but they’re far too transparent—as anyone can read a user’s responses, users are incentivized to misreport the truth about themselves.

Our implementation solves the social translucence problem by keeping students’ details private. Further, we incentivize truthfulness by (i) not sharing those responses and by (ii) asking questions that are **strategy-proof**—questions where the user can tell that misreporting would lead to a worse outcome. Critically, this meant ideating, iterating, and interviewing to find ways to phrase questions in a non-judgmental way. Two tricky questions we managed to ask:

<table>
<thead>
<tr>
<th>If we need to have a difficult conversation, I prefer to</th>
<th>230 out of 236 answered</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="3.2 Average rating" /></td>
<td><img src="image" alt="4.9 Average rating" /></td>
</tr>
<tr>
<td>1. Initiate it 2. Just move on</td>
<td>1. A hot mess™ 2. Clean always—ALWAYS</td>
</tr>
</tbody>
</table>
We also sought to strike a balance between utility and quality of experience—we relied on a playful tone and evaluated questions along both criteria (some questions were more important to outcomes, while others were more important to the quality of the questionnaire experience). Finally, we selected for value in a given question: the total utility it brought to the product divided by the cost of asking the user an additional question (ultimately aiming to keep friction low; attention is a limited resource).

For example, a selection of final questions:

- I usually wake up at...
  - ≤6AM ... 12PM+
- I usually go to bed at...
  - ≤10PM ... 4AM+
- If I had someone over, I would expect my roommate to stay out until
  - 9pm ... 12am ... the next morning
- My roommate and I will share...
  - nothing ... fridge space ... toothbrushes
- I hope to host parties in our room... (how frequently)
  - Never ... a few times a quarter ... every weekend

And for comparison, a selection of cut questions:

- I hope to go out and party...
  - Never ... a few times a quarter ... every weekend
  "While potentially a signal for cultural compatibility, this has little impact on the situation in the room itself, which is sufficiently covered by a question about hosting."
- Do you plan to use your room for studying?
  - I’m studying in Green ... this room is my study space
  "Not sufficiently high value for assessing cohabitation compatibility."
- How emotionally open would you hope to be with your roommate?
  - We’re just living in the same space vs. We should be close friends
  "Not the role of this questionnaire; can let the users assess with finer nuance after introduction."
- If your room were a Dorito, what would it be?
  - Cool Ranch
  - Nacho Cheese
  - Poppin’ Jalapeño
  - Spicy Sweet Chili
  - Simply Organic White Cheddar
  - Jacked Ranch-Dipped Hot Wings
  "Potentially beneficial for form experience, but low utility relative to cost of yet another question."
We also tackle the problem of high search costs by (i) avoiding profiles, so people can’t spend time exploring or interrogating the dataset, and by (ii) algorithmically determining compatibility and only showing users the highest-quality options.

In the results email, we chose to share just the prospective roommate’s name, email, and brief self-introduction. The name and email are practical, but early experiments showed us that providing the brief introduction helped personalize the matches and helped reduced users’ fears of reaching out to their matches.

Unlike Tinder and similar matching platforms, we chose to keep communication between matches off-platform. While doing so would possibly let us analyze conversations that led to good or bad outcomes, realistically, we don’t share most of Tinder’s needs for a chat system. We don’t require anonymization. Moreover, our utility function is purely based on outcomes—not on time spent on the platform. In practice, all users looked up their matches on social platforms (usually Facebook) before deciding whether or not to reach out to them. Rebuilding Messenger would have been a difficult engineering task with little upside over the naturally-occurring bricolage-oriented solution.
4 Implementation

In order to begin the roommate search, participants filled out intake forms that were hosted on Typeform. We decided to use Typeform over Google Forms because of the additional metrics and reporting in addition to the aesthetic value of the platform. The responses were then aggregated onto a spreadsheet that held user information. A link to the final implementation of questionnaire can be found here.

A day before a dorm’s In-House Draw, we collected resident data and determined whether we could reasonably match residents. For those with too few responses (≤5), we sent out emails apologizing for our inability to match them. Otherwise, for those with enough responses, we first cleaned the data for users with incorrect information (i.e. incorrect first names, emails). We then wrote a Python script that aggregated current user information to create a database of users. After, we matched roommates with the same residence, room-type, and gender based on how similar their rooming habits were.

We assigned scores by minimizing a weighted L1 norm: we multiplied the absolute difference in responses by weights for each question. The intuition here is that minimizing roommate differences in lifestyles and expectations would maximize roommate similarity, thereby leading to compatible roommate pairings. At right is an example of roommate pairings based on scores; the lower the score, the better the pairing.

After compiling roommates pairings into csv files, we used the information in conjunction with Yet Another Mail Merge (YAMM) to send out our results. YAMM helped us send out personalized emails using a template and the compiled csv file, and proved to be especially helpful in measuring user engagement, as it revealed which users had seen their results. Several days after In-House Draw, we sent out a follow-up Typeform to get user feedback on the Draw Two experience.
5 Deployment

With both the form and program done, we deployed our final system on May 23. In an effort to build a bustling space of participants (in our case, a diverse pool of residents across all dorms which hold In-House Draws), we targeted Resident Fellows, student staff, and the general undergraduate community with separate methods of communication. We motivated potential users to sign up using intrinsic motivators.

With Resident Fellows and student staff, we sent an introductory email to both the RA Commons list as well as the RF general list, asking them in turn to send out the form to their communities. Our pitch for the product was that it would reduce the stress of In-House Draw and provide a starting point for residents (especially those who drew alone) who might have wanted a life raft to kick-start their search for roommates. We also hinted at a secondary extrinsic motivator for incoming student staff by alleviating pressure on them to set up their own systems for finding roommates—all they needed to do was distribute the form to their incoming residents, and we would take care of the rest.

Reaching out to the general student population, we flyered every dining hall on campus before Saturday morning brunch (with at least one flyer per table). We made posts in each class Facebook group sharing the form, and wrote an email we forwarded widely across undergraduate mailing lists. The email contained the same content as the flyer (right). Our pitch to residents was that Draw Two provided a solution to those who were still unsure about who they’re living with next year. Moreover, we wanted to convey the ease and relatively low effort required to participate into the system; completing a three-minute form was all they needed to do to receive a shortlist.

In all, 230 participants filled out the form for In-House Draw. Of the 230 participants, we were able to provide a list of matches to 133 of them across 7 dorms and houses on campus: Ng, Robinson, Mars, Kimball, Crothers, Trancos, and Toyon.

After In-House Draw period (which ended on June 5), we sent out a follow-up survey to all 133 matches seeking more information about what they did post-matches and during In-House Draw; of that group, 16 replied.
6 Interactions

The most difficult interaction we observed was that students were interested in Draw Two regardless of the size of their future communities. While we were able to provide matches for 133 users, 97 other users went unserved by our product because, despite their need, their communities were too small. These residences—often row houses—had only a handful of people who drew in alone in the first place. 31 different residences had at least 1, but 5 or fewer signups (which was our cutoff for a community to be too small for us to make effective recommendations).

Another interesting interaction we observed was uneven interest across the gender of users. Women were 33% more likely to use our product than men. It’s possible that women find the quality of their relationship with their roommate to be more important than men. It’s also likely that women are more in touch with the quality-of-life ramifications of roommates to begin with.

Another interaction we observed was that labeling the “neutral” point of the Likert scale risked distorting the distribution of responses. For example:

<table>
<thead>
<tr>
<th>My roommate and I will share...</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0 Average rating</td>
</tr>
</tbody>
</table>

- 2% nothing (5 res)
- 6% fridge space (15 res)
- 11% toothbrushes (27 res)
- 11% toothbrushes (27 res)
- 59% fridge space (137 res)
- 13% toothbrushes (32 res)
- 4% fridge space (11 res)
- 1% toothbrushes (3 res)

230 out of 236 answered
7 Discussion

In examining the distribution of participant responses in the intake form, we found we’d reasonably succeeded in phrasing and balancing the questions. To us, this looked like high dynamic range: Responses were fully captured within the bounds of the Likert scale (i.e. most response distributions didn’t max out at one end) and they also used the full breadth of the scale (weren’t too narrow).

Aggregated, anonymized participant report

One challenge we faced was balancing depth of the questionnaire (including users’ power to fully express themselves) with ease of use/keeping minimal friction in the user experience. One user expressed in feedback that they wished they or their matches could have indicated if any of their responses constituted a “deal breaker” requirement (e.g. a hard requirement for bedtime in their room). This granularity was something we didn’t allow for in our form, and it caused our product to fall short for that individual. That said, we believe the weighted questions + minimizing L1 norm struck a good balance between these opposing needs and served the large majority of our users. It’s possible future implementations could allow optional sections, where users who want to share more can do so, but which are not required. We do note this would add significant complexity to the matching process as users would no longer be representable as vectors in equal dimensions.

A number of people expressed in feedback that they liked their matches and wanted to room with them next year, but were prevented from doing so by ResEd’s established room selection process. This ties into another thing that didn’t work well: our service of small communities (as discussed above in “Interactions”). Perhaps a solution for both problems could be implemented in future iterations: Partner with ResEd to embed this process in the Draw. In the main Draw, have students rank baskets of similar housing types (e.g. EAST, Murray, and Yost are fungible goods in terms of housing quality, and could therefore comprise a single basket) which would create larger communities in which students could find compatible roommates.
8 Conclusion

On the whole, we’re pleased with the outcome of Draw Two and are happy that despite the kinks, we were able to deploy a system that managed to provide matches to many students. Given more time, we hope to extend the Python script to include semantic processing of free response data and incorporate additional preferences for people who prefer students in the same room choice priority. While the project was not perfect, it helped to fill a void in the Stanford housing experience that sorely needed to be filled, and we really enjoyed helping match roommates.