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Direction of research: Usability study into the process of adding third party  
apps for 2-factor authentication

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# Executive Summary

## Overview:

Our team was sponsored by Duo Security to conduct a usability study of their app with the UW demographic. Our team investigated how the UW demographic interacts with common and uncommon use cases of the Duo Mobile app.

## Participants:

All participants were required to be UW-affiliated, i.e. students, professors, employees. Our recruitment criteria was as follows:

1. The participant is UW-affiliated
2. The participant uses Duo in an academic context
3. The participant is willing to take part in a usability study

## Methods:

1. A **survey** to identify demographics and to act as a screener to recruit participants for a usability study.
2. A **usability study** with 3 tasks:
  - a. Task 1: Walk moderator through the process of logging into canvas using Duo without the participant using their mobile device
  - b. Task 2: Log into Canvas using Duo on their mobile device
  - c. Task 3: Add a 3rd party app of participants choice into Duo for 2 factor authentication

## Findings and insights:

We found that task 1 and 2 were very easy for participants, while task 3 had several critical issues for completion.

| Issues                                                                                                                         | Recommendations                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Participants struggled with completing necessary steps to add third party apps due to a <b>lack of context &amp; clarity</b> . | Add clear <b>calls to action</b> , specifically <b>links within Duo</b> that would lead users directly to the necessary tab. |
| Participants <b>unclear</b> about where they are in the journey, and <b>unmotivated</b> without tracking progress.             | Create a clear <b>progress bar item</b> informing users of what stages of the <b>process</b> they have reached.              |
| Participants <b>misled</b> due to <b>unclear, out of date instructions</b> .                                                   | Create a <b>short onboarding educational sequence</b> to <b>familiarize</b> users with Duo Security.                         |

# Study Objective

Duo Security is a leading multi-factor authentication (MFA) service, with over 1 billion monthly authentications. It is mainly used to provide secure authorization into sensitive applications. We're in a unique position as UW students to understand how the UW demographic interacts with Duo Mobile.

## Goals

- Identify opportunities for actionable usability improvements for Duo Mobile.
- Inform product direction through an evidence-based understanding of the audience.
- Increase user experience, satisfaction, and trust with the product.

## Purpose

- Understand the current experience of users in academic settings linking third party/personal accounts.
- Provide insights to improve overall usability.

## Research Questions

How is the usability of linking Duo with personal accounts (third-party apps)?

- Are users aware of the ability to add personal accounts?
- How successful are users in linking third-party apps?
- If any usability issues arise, is the usability issue with Duo or the third party app?
- If with Duo, what is the issue?

# Methods

Our methodology for this study was two-fold.

Firstly, we sent out surveys to gather demographic data about Duo usage among the UW population. The latter half of this survey asked respondents if they were interested in participating in further research through a usability testing session. Our survey ran from 2/16 to 2/25. We received data from 23 respondents, 17 of which were interested in follow-up usability testing.

Secondly, we took a sample of 6 respondents who expressed interest and invited them to participate in a moderated usability test session to test specific tasks involving the Duo Mobile interface. Our usability tests ran from 2/25 to 3/1. During each session, we collected a mixture of qualitative and quantitative data to produce evidence-based findings. Quantitative data included time on task, post-task ratings from post-task surveys, and success rate. Qualitative data included user interactions and behaviors, along with quotes and testimonies that we gathered from audio recordings taken with consent.

Our task list for the usability test is as follows:

**Task 1:** *Visualize the process of logging into UW Canvas with Duo in your head, thinking out loud from start to finish.*

**Task 2:** *Use Duo to log in to UW Canvas.*

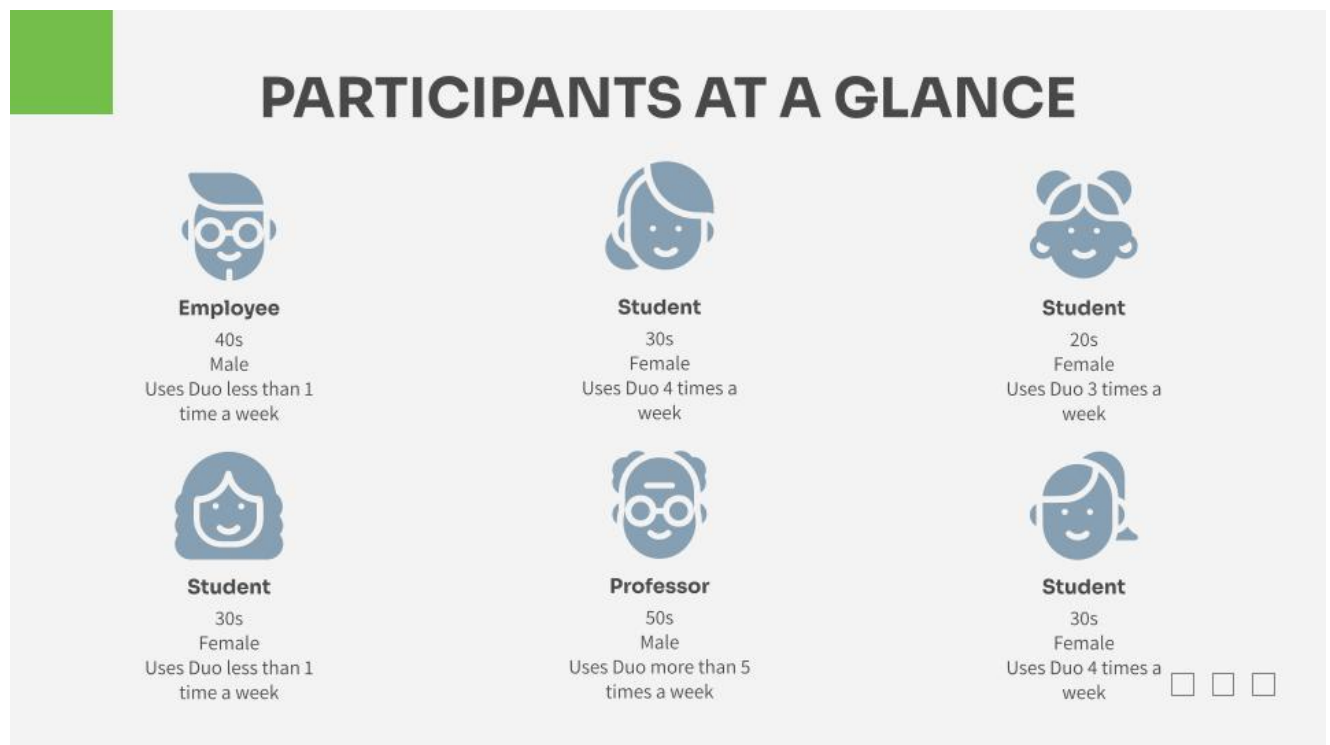
**Task 3:** *Add two factor authentication to a third party service (Gmail, Amazon, Instagram, etc.) with Duo.*

# Participants

Participants were students, faculty and staff that were using Duo Mobile in the educational contexts at the University of Washington.

## 6 participants for usability testing:

- 4 Students
- 1 Instructor
- 1 Employee



# Findings & Recommendations

To categorize issue severity, we used the severity scale heuristics demonstrated in our HCDE 517 Usability Studies class. We define the severity levels and dimensions as follows:

## Severity Levels

1. **Cosmetic:** Does *NOT* contain any dimensions, but is inconsistent or visually incorrect.

These are the lowest priority.

2. **Minor:** Has 1 serious dimension, OR has 2-3 moderate dimensions.

These are medium priority.

3. **Major:** Has 2 serious dimensions.

These are high priority to fix.

4. **Catastrophic:** Has all 3 serious dimensions.

These are the highest priority and imperative to fix now.

## Dimensions

### Moderate Dimensions

Frequency of occurrence is *rare*.

Impact on users is *easy to overcome*.

Persistence is *low* - *only needs to be overcome once*.

### Serious Dimensions

Frequency of occurrence is *common*.

Impact on users is *hard to overcome*.

Persistence is *high* - *needs to be overcome repeatedly*.

## Area of Improvement 01: Participants failed to add third-party apps

Severity: 4 (Catastrophic)

| Observed Usability Concerns                                                                                  | Recommendations                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Missing context: Clarity of QR code feature was missing.                                                     | Add information and help buttons wherever necessary.                                                                                                                                                                                |
| Incomplete Information: regarding where to find the activation code in the 3rd party app misleads the users. | Give further information and steps where the 3rd part app can give information on the 2FA option.                                                                                                                                   |
| Ambiguity on length of task and further steps.                                                               | Create a clear progress bar item informing users of what stages of the process they have completed and what is the next step                                                                                                        |
| Users were unable to navigate to the necessary sections in 3rd party apps.                                   | Add links in Duo that would lead users directly to the necessary tab in 3rd party apps/sections of 3rd party websites. This would eliminate the need for users to navigate through menus of other apps and reduce the time on task. |

When the users were asked to perform task 3 (Add two-factor authentication to a third-party service (Gmail, Amazon, Instagram, etc.) with Duo), the **average time on task was 9.8 mins** with a range of 6 min - 18 min. The success rate was 33% - 2 participants could finish the task and 4 users failed to complete the task.

One of the concerns that came across was a lack of information on each screen. This was expressed by the users through their expressions, and quotes.

*"The task felt impossible."* ~ P6

*"It's impossible for me to complete the task and I would definitely not want to try again."* ~ P4

## Area of Improvement 02: Participants were misled by inaccurate instructions

Severity: 4 (Catastrophic)

| Observed Usability Concerns                                                                                                                                                                     | Recommendations                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| "Head back to Amazon" Open (app name), go to settings then turn on 2FA<br>This instruction is not tailored to the specific app the 2FA is being added to.                                       | Give clear instructions that are specific to the app. Also, provide a link to where one can enable 2FA .                                                             |
| The gray icon gave the users a feeling that the process is stuck and the action is incomplete.                                                                                                  | Instead of using a basic common icon, an instructional image clearly stating where in the 3rd party app the users must navigate would guide users to the next steps. |
| The "Use QR Code" and "Use Activation account" buttons seemed to be misunderstood. Users did not understand the purpose and did not find a connection with the "go back to Amazon instruction". | Same as above.<br>Once the next instructions are clear, the action buttons for using QR code and activation code could be more relatable to the users.               |

When the users were asked to perform task 03, users were misled by inaccurate/confusing/out-of-date instructions. 4 out of 6 users were confused in this step. Some of the quotes that were mentioned during the process by the users were:

*"I am so lost! What is happening here?" ~ P6*

*"It's just not enough information and when I try to add it, it's just bad design. Bad interaction." ~ P5*

*"I wish it would give some steps on how to do that" ~ P1*

## Area of Improvement 03: Participants stopped due to mistrust and anxiety on the data

Severity: 4 (Catastrophic)

| Observed Usability Concerns                                                                                                            | Recommendations                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Lack of context and introduction:</b><br>No clarity of what the app is and its application to give a sense of security to the users | Create a short onboarding educational sequence for new Duo users in order to demonstrate to them why the system is safe, and how it helps them keep their accounts safe. |
| <b>Reliability:</b> Missing “help” or “info” button to know more about the action buttons                                              | A guided tour of what each feature is and its action must be clear. This can help users get some context                                                                 |
| <b>What does this do?</b><br>Do not understand the Users need or importance of adding these accounts (unless compelled to)             | In addition, there can be a reminder when users go to add a 3rd party account, to make sure they understand how they are being kept safe                                 |

A lack of trust was seen among the participants. 3 out of 6 participants assumed that the Duo app was a University of Washington-initiated app for protection. When participants were asked to add a 3rd party app, they were reluctant and did not understand the purpose of 2FA. Some comments that were made were:

*“I don’t understand the point of this x at all. Like, how does it actually add value to my data protection.” ~P4*

*“I don’t know enough about Duo outside of UW and how they treat my data” ~ P5*

*“There is just too many things that are put on my decision-making without enough information” ~P5*

## Additional Findings

- 39.1% of survey respondents did NOT know they could add personal, third-party, accounts to their existing Duo account.
- Participants did NOT want to add a third party account. Since those participating in the study were associated with UW, the participants were under the thought process that Duo was a UW app and did not want to link their personal information to what they understood as a UW app.
- Participants were confused on using QR code vs activation code. When a user was trying to add a third party app on their phone and couldn't understand how to use the QR code or where and how to use the activation code. This led to switching between both phone and computer use that caused more confusion.
- Participants were frequently unable to identify the next steps and at a total loss of where to go and what to do next. This caused participants to want to stop the process.
- Those who succeeded in adding an account needed help. This help came in the way of hints, redirection or the user initiating a Google search to find the information they needed to link the account.
- Participants didn't feel the "Remember Me" button actually does anything. Several participants said they always hit the "Remember Me" button when they send for a push notification, however they didn't feel it was responsive as they had to relog into Duo constantly.

# Reflection

## **The Journey:**

Initially the goal of this study was to test power users within the University of Washington community. A power user was defined as someone who had linked 5 or more accounts to their Duo Mobile account. This posed a problem as not many people in the UW community realized they could link third party accounts, that it was not a UW app, or knew what the real purpose of the app was for. Ultimately, we were unable to find power users for this study and ended up pivoting our focus to monitoring the linking process and usability of adding additional accounts to Duo Mobile.

## **Limitations:**

Time constraints were a factor in this study. With a short, 10 week quarter and limited time to conduct the studies, several constraints came up. It would have been more ideal for our team to conduct testing together so we could all get a sense of what issues were coming up. It also would have been beneficial to have a true pilot testing session to really work out the testing issues sooner.

Due to the fact that all the participants were reluctant to add their personal accounts to Duo Mobile, the sponsor suggested we create a burner Duo account to add their account to. However, this didn't help the situation much as the participants were now reluctant to add their personal accounts and information to an account that was not theirs. Duo also lacked giving out any type of incentives, which would have been a helpful "thank you" to the participants who were gracious with their time.

## **Gains:**

With Duo being a product that has many user issues, one of the best outcomes we could have asked for was the amount of useful data we were able to come away with from the testing. The sponsor received a lot of useful information to improve their product.

We as a team came away with a much better understanding in how to conduct a usability test with a real world product and communicate those findings to a real company that will hopefully benefit from our findings.

## **Next Steps:**

Duo Mobile looks and feels like a very simple app with only two buttons. While the simplicity is a key factor in making Duo easy to use for required users, it also proves that the simplicity can make the app harder to understand its capabilities and purpose. Duo Mobile proved that there are many areas with room for improvement. Some other suggestions for research that our sponsor suggested were:

- What happens if you don't have your phone with you and you need to authenticate? How would someone deal with that?
- How would the process look if the user was trying to switch or merge phones?
- Who are the power users and do they know the difference between adding a third party app versus a Duo endorsed app?



## Task 2

All 6 participants found this task easy, short, and were likely to continue use.

Time on task numbers are generally short, although may be longer than usual due to participants describing each step of the process with think-aloud protocol.

**No usability issues were uncovered for this task** - participants had no identified pain points with login.

| Task 2 Post-Task Questions                                 |       |       |       |       |       |              |           |
|------------------------------------------------------------|-------|-------|-------|-------|-------|--------------|-----------|
| Participant                                                | P1    | P2    | P3    | P4    | P5    | P6           | Avg       |
| <b>Difficulty</b><br>Difficult 1 - Easy 7                  | 7     | 6     | 7     | 7     | 6     | 7            | 6.67      |
| <b>Perceived Time</b><br>Long 1 - Short 7                  | 7     | 7     | 7     | 7     | 6     | 6            | 6.67      |
| <b>Likeliness to Continue Use</b><br>Unlikely 1 - Likely 7 | 7     | 7     | 7     | 7     | 7     | 7            | 7         |
| <b>Time on Task</b>                                        | 1 min | 3 min | 1 min | 1 min | 2 min | 1 min 30 sec | 1.583 min |

## Task 3

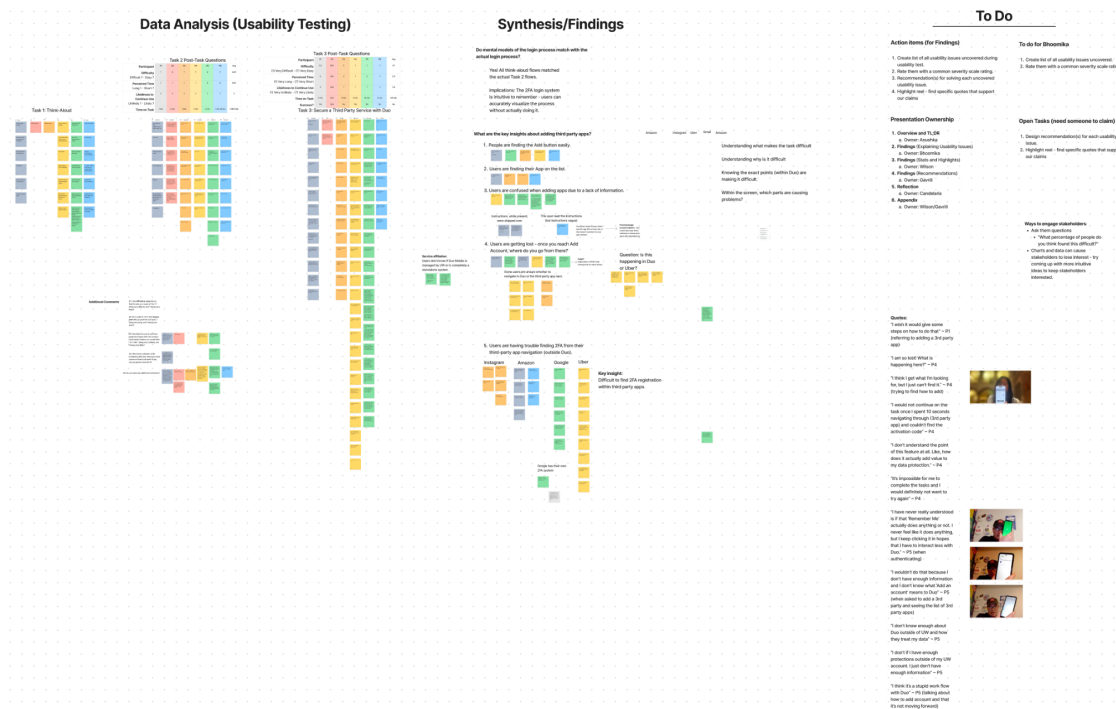
A majority of users found this task difficult, long, and were unlikely to continue use.

Time on task was long. A majority of users failed this task.

## Task 3 Post-Task Questions

| Participant                                                              | P1    | P2  | P3    | P4    | P5     | P6    | Avg     |
|--------------------------------------------------------------------------|-------|-----|-------|-------|--------|-------|---------|
| <b>Difficulty</b><br>(1) Very Difficult - (7) Very Easy                  | 5.5   | N/A | 2     | 1     | 1      | 1     | 2.1     |
| <b>Perceived Time</b><br>(1) Very Long - (7) Very Short                  | 6     | N/A | 3     | 1     | 2      | 1     | 2.6     |
| <b>Likelihood to Continue Use</b><br>(1) Very Unlikely - (7) Very Likely | 4     | N/A | 1     | 1     | 1      | 1     | 1.6     |
| <b>Time on Task</b>                                                      | 6 min | N/A | 8 min | 9 min | 18 min | 8 min | 9.8 min |
| <b>Success?</b>                                                          | Yes   | N/A | No    | Yes   | No     | No    | No      |

## Affinity Mapping



## Usability Test Demographics

### UW Affiliations

Students - 4

Teachers - 1

Employees - 1

### **Primary Operating System**

iOS - 4

Android - 2

### **Gender Split**

Female - 4

Male - 2

## General Survey Data

We collected a survey to gather information about UW Duo users.

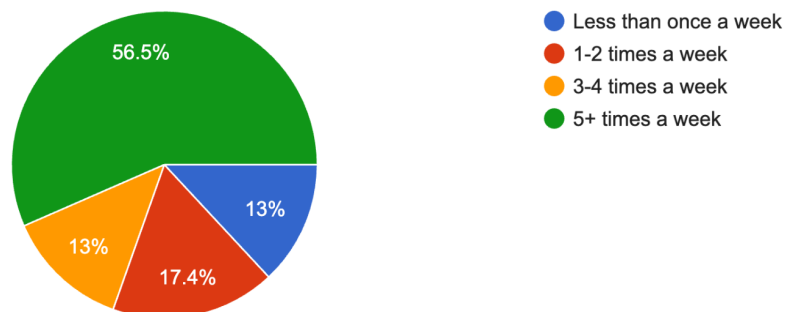
While only a fraction of survey respondents were selected for a usability test, our survey data is shown to provide additional context about this user group.

Survey link:

**REDACTED**

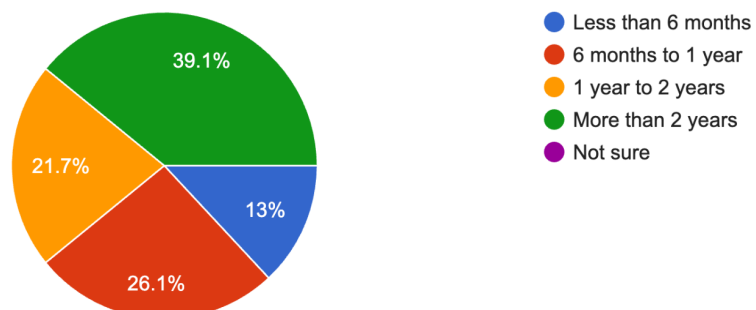
How frequently do you use DUO Mobile for authentication purposes?

23 responses



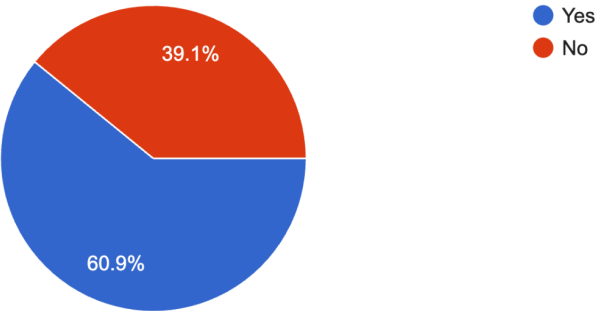
Approximately how long have you been using Duo Mobile?

23 responses



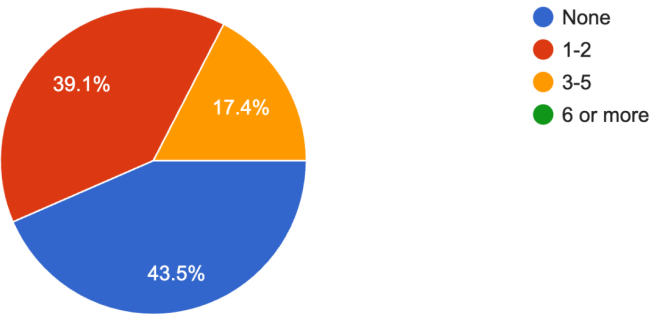
Are you aware of the ability to add personal accounts (third-party apps) to Duo Mobile for authentication?

23 responses



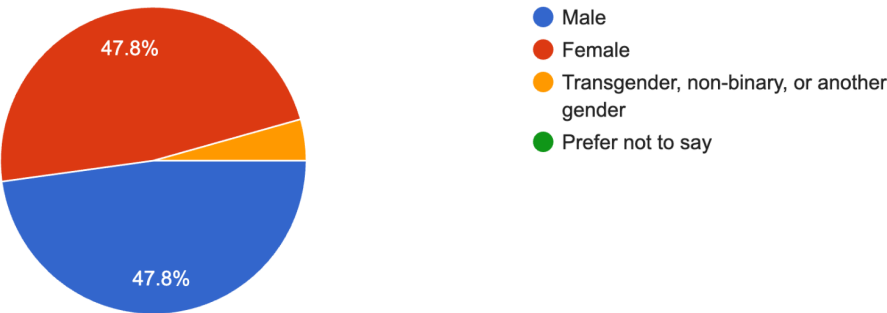
How many third-party apps have you linked to Duo Mobile for authentication?

23 responses



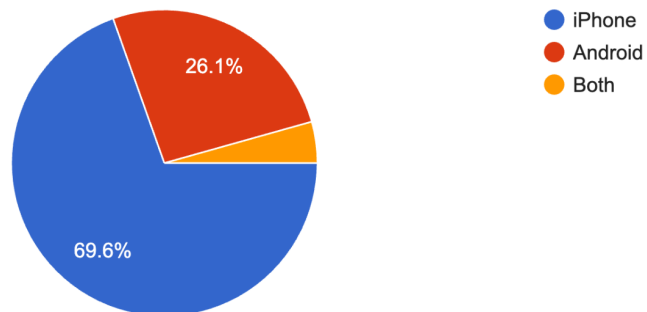
What gender do you identify as?

23 responses



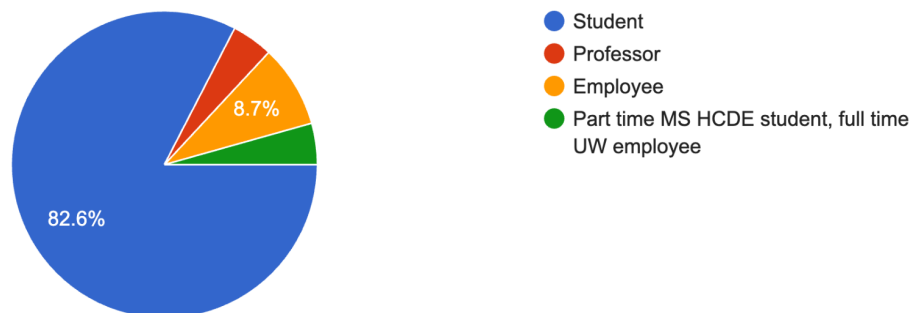
### What is your primary phone's operating system?

23 responses



### Are you a student, professor, or an employee at UW?

23 responses



### What year did you join the University of Washington?

23 responses

