

Transitioning to a Large-Scale Distributed Programming Course

32nd IEEE International Conference on
Software Engineering Education & Teaching
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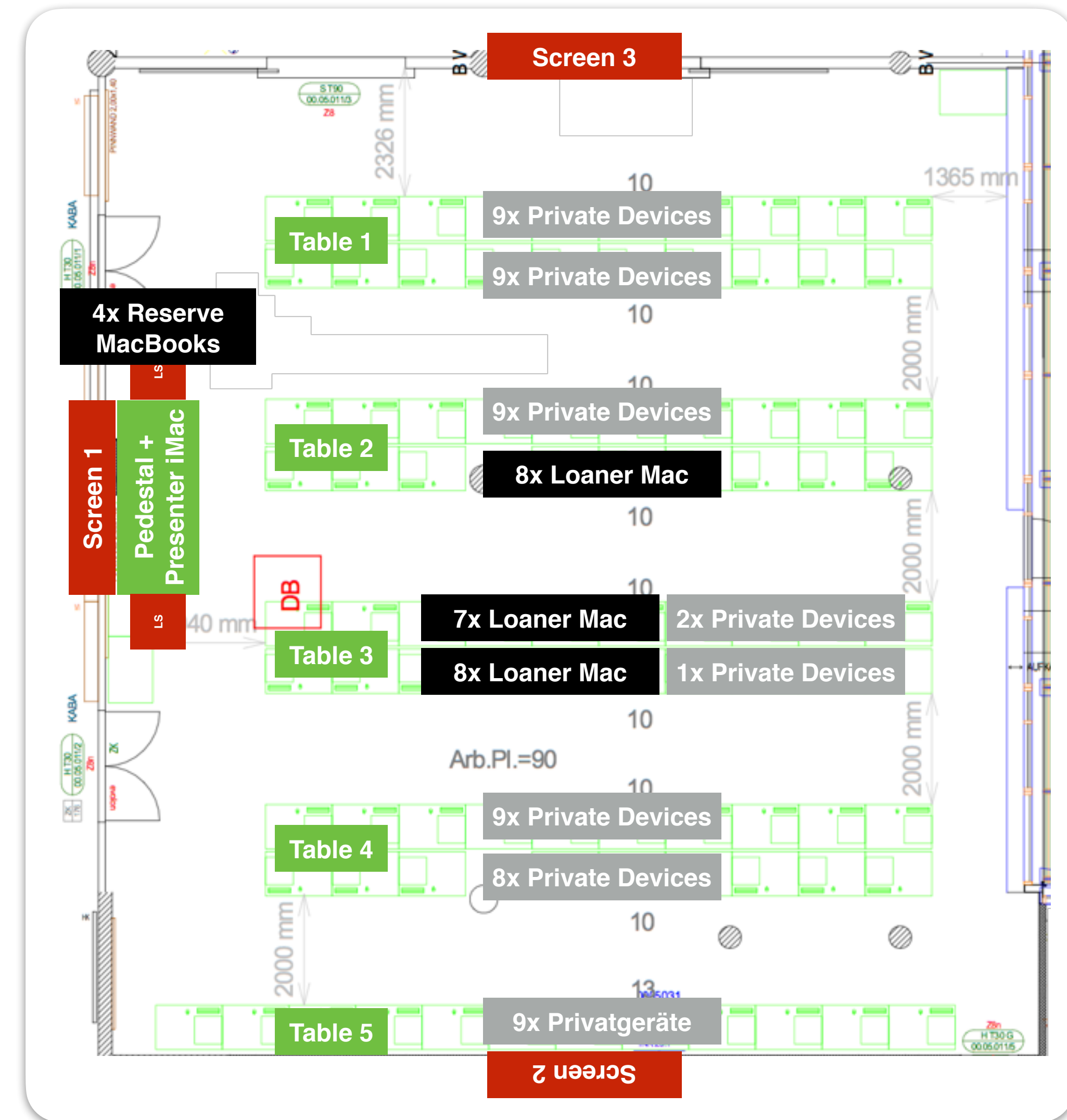


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The Swift Bootcamp

- Teach application and server-side development in Swift as a prerequisite for the iPraktikum [1] capstone course
- Up to ten tutors (teaching assistants) who supervise and support students
- Homework assignments are corrected using pull requests to provide in-depth feedback
- The lecture hall setting was not possible due to the COVID-19 pandemic





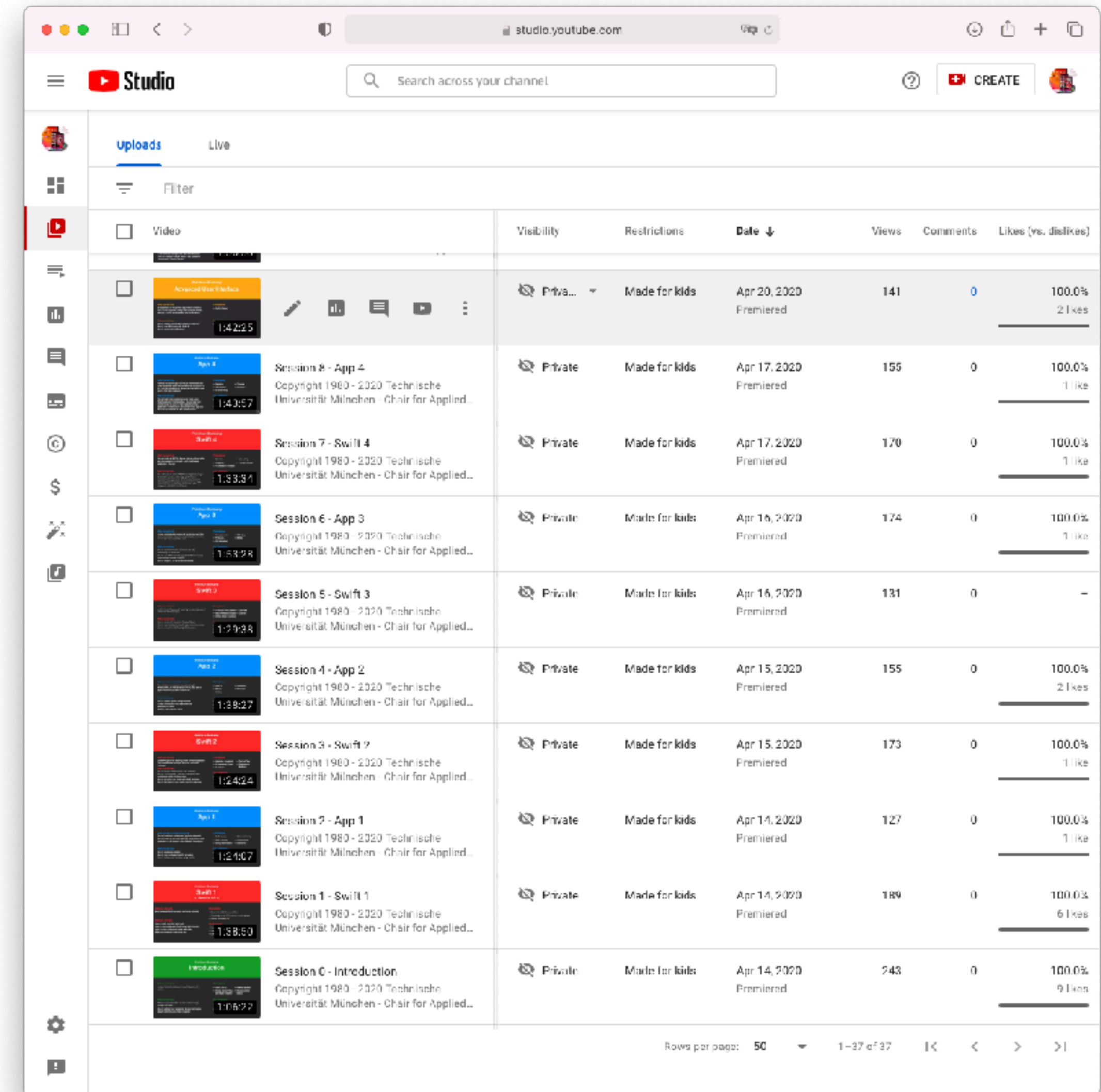
The Swift Bootcamp

October 2019











	Mon 7	Tue 8	Wed 9	Thu 10	Fri 11	Sat 12	Sun 13	Mon 14	Tue 15	Wed 16
9 AM		8:30 AM Lab Time	8:30 AM Lab Time	8:30 AM Lab Time	8:30 AM Lab Time			8:30 AM Lab Time		
10 AM	9:00 AM Getting Ready								9:00 AM Lab Time	9:00 AM Lab Time
11 AM	9:30 AM Introduction	9:30 AM Swift 2	9:30 AM Swift 3	9:30 AM Swift 4	9:30 AM Tutor Session 1			9:30 AM Tutor Session 3		
Noon	11:30 AM Mac 101					10:00 PM Lab Time				
1 PM	12:30 PM Swift 1	12:30 PM App 2	12:30 PM App 3	12:30 PM App 4	12:30 PM Tutor Session 2			12:30 PM What Now?		
2 PM										
3 PM	3:00 PM App 1	2:30 PM Lab Time	2:30 PM Lab Time	2:30 PM Lab Time	2:30 PM Lab Time			1:30 PM Lab Time		
4 PM										
5 PM	5:00 PM Lab Time									
6 PM										
7 PM										

Online Streamed Sessions

- Similar schedule to October 2019
- Option 1: Live-streamed, live sessions
- **Option 2: Live-streamed, pre-recorded sessions**
 - Tutors were available during the sessions to help students
 - We kept the sessions online to allow students to rewatch the content
- Option 3: Continuous access to pre-recorded sessions

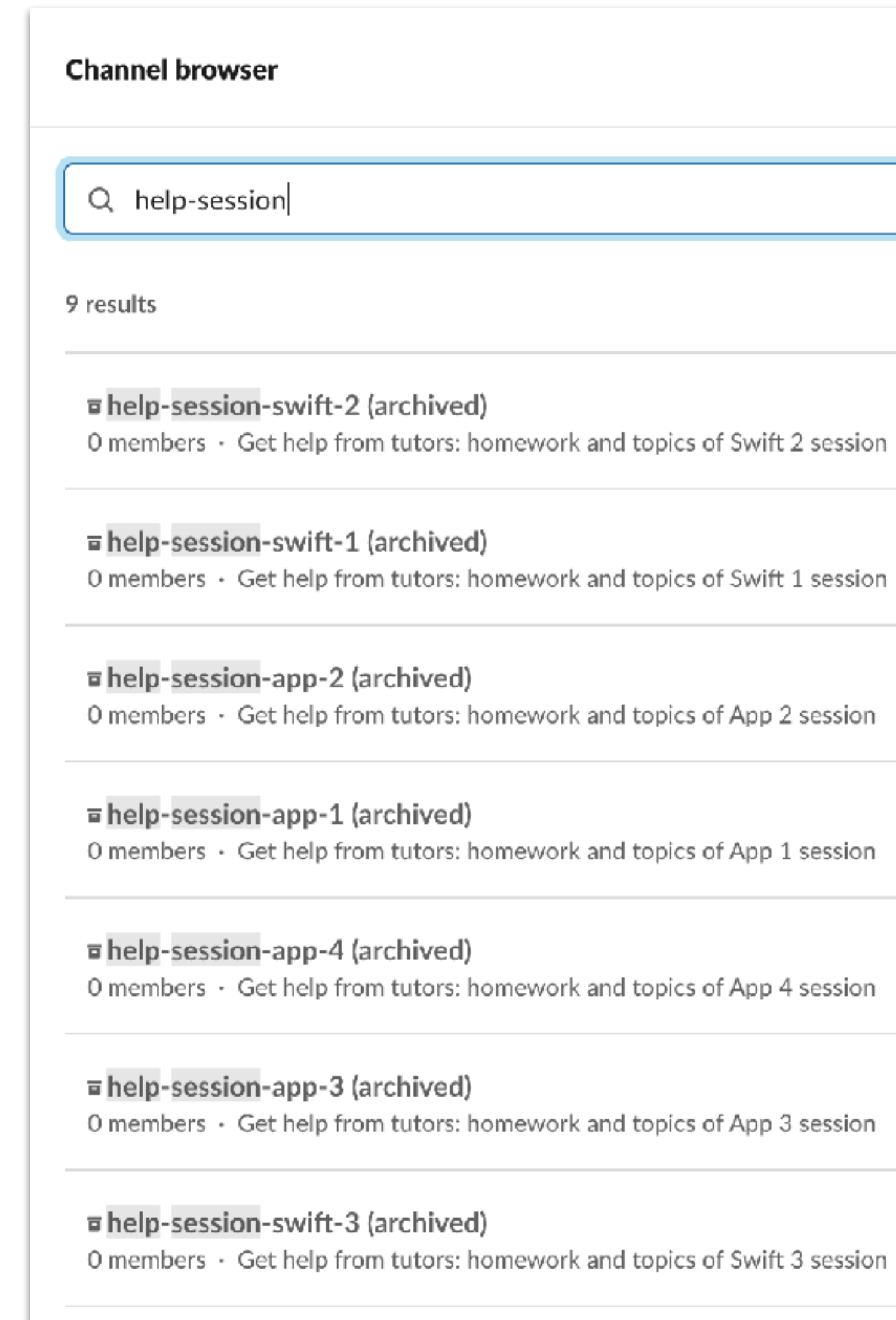


The screenshot shows the YouTube Studio interface with a list of uploads. The table below represents the data visible in the screenshot.

Video	Visibility	Restrictions	Date	Views	Comments	Likes (vs. dislikes)
	Private	Made for kids	Apr 14, 2020 Premiered	243	0	100.0% 9 likes
	Private	Made for kids	Apr 14, 2020 Premiered	189	0	100.0% 6 likes
	Private	Made for kids	Apr 14, 2020 Premiered	127	0	100.0% 1 like
	Private	Made for kids	Apr 15, 2020 Premiered	173	0	100.0% 1 like
	Private	Made for kids	Apr 15, 2020 Premiered	155	0	100.0% 2 likes
	Private	Made for kids	Apr 16, 2020 Premiered	131	0	-
	Private	Made for kids	Apr 16, 2020 Premiered	174	0	100.0% 1 like
	Private	Made for kids	Apr 17, 2020 Premiered	170	0	100.0% 1 like
	Private	Made for kids	Apr 17, 2020 Premiered	155	0	100.0% 1 like
	Private	Made for kids	Apr 20, 2020 Premiered	141	0	100.0% 2 likes

Remote Supervision and Support of Students

- Nine tutors were distributed to 80 students and were the first point of contact for the students
- We created chat channels (Slack) for every session to enable the students to ask questions
- Used video meetings (Zoom) to enable 1-1 or 1-many communication between the students and tutors
- Students were required to post summaries of video calls so other students can benefit from the results

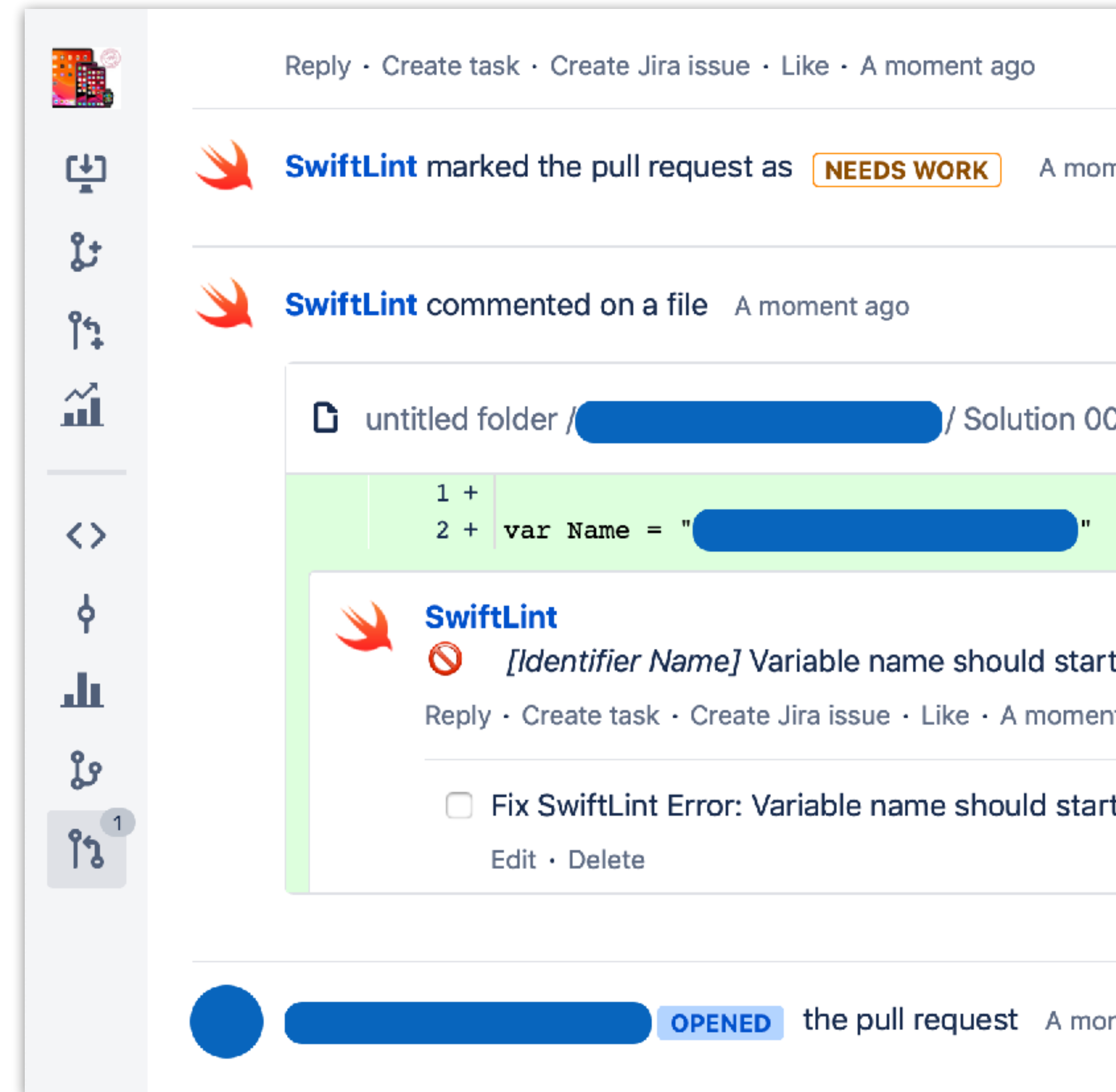


The screenshot shows a Slack channel browser interface. At the top, there is a search bar with the text 'help-session' entered. Below the search bar, it indicates '9 results'. The results are listed as follows:

- help-session-swift-2 (archived)**
0 members · Get help from tutors: homework and topics of Swift 2 session
- help-session-swift-1 (archived)**
0 members · Get help from tutors: homework and topics of Swift 1 session
- help-session-app-2 (archived)**
0 members · Get help from tutors: homework and topics of App 2 session
- help-session-app-1 (archived)**
0 members · Get help from tutors: homework and topics of App 1 session
- help-session-app-4 (archived)**
0 members · Get help from tutors: homework and topics of App 4 session
- help-session-app-3 (archived)**
0 members · Get help from tutors: homework and topics of App 3 session
- help-session-swift-3 (archived)**
0 members · Get help from tutors: homework and topics of Swift 3 session

Semi-Automated Code Review Process

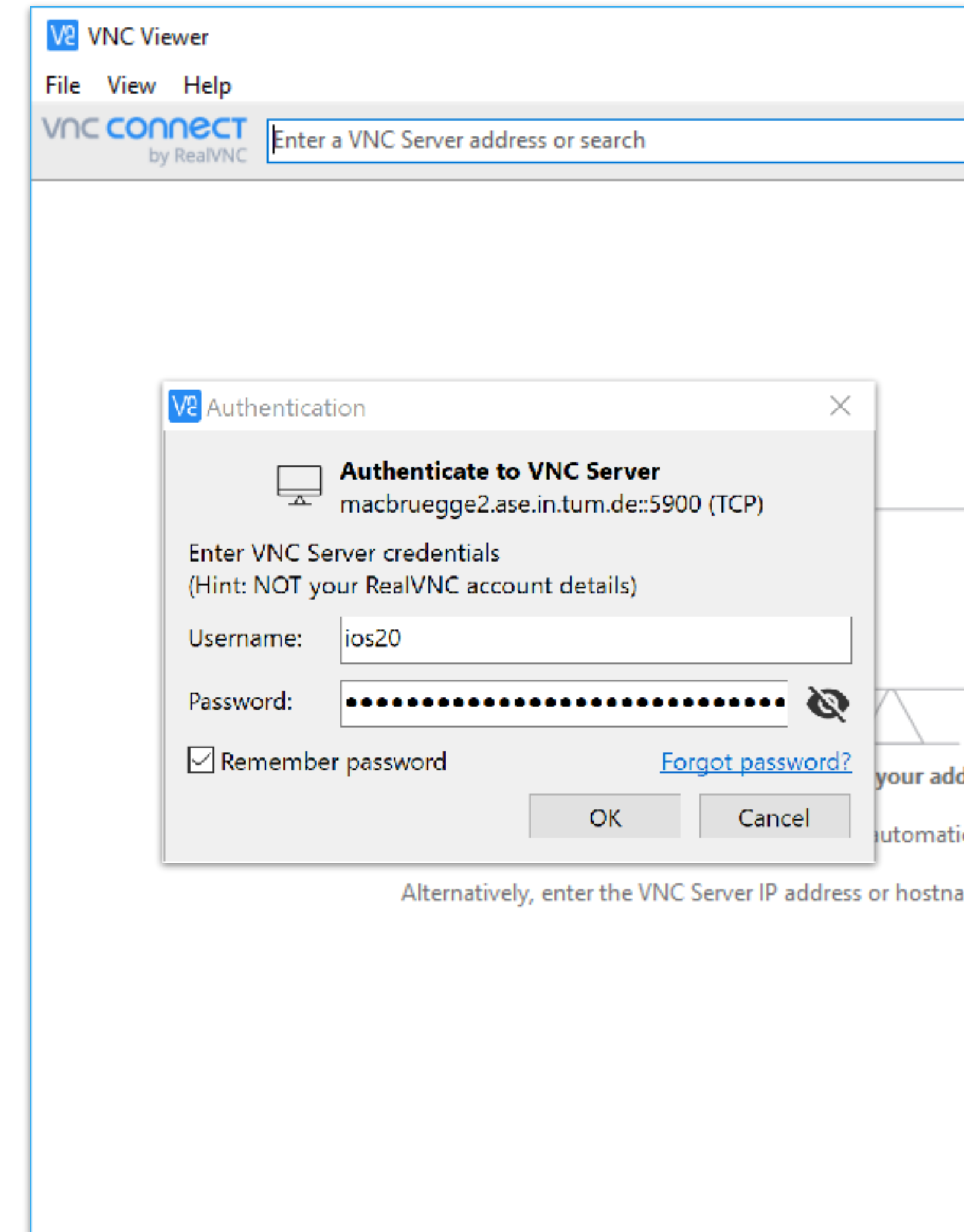
- We used pull requests to correct the students' homework
- We created a bot that uses static code analysis to review Swift code
 - Integrated into our existing infrastructure using BitBucket
 - Build using server-side Swift and the SwiftLint framework
- The tutor provides manual feedback after the bot has approved the pull request



The screenshot shows a pull request interface with a sidebar on the left containing icons for repository management, code review, and analytics. The main content area displays a comment from the bot 'SwiftLint' with a red bird icon and a 'NEEDS WORK' label. The comment states: 'SwiftLint commented on a file A moment ago'. Below this, a code snippet is shown with a green background: '1 +', '2 + var Name = "[redacted]"'. A red error icon and the text '[Identifier Name] Variable name should start' are visible. Below the code, there is a checkbox labeled 'Fix SwiftLint Error: Variable name should start' and buttons for 'Edit' and 'Delete'. At the bottom, a blue circle icon is followed by a blue bar and the text 'OPENED the pull request A mor'.

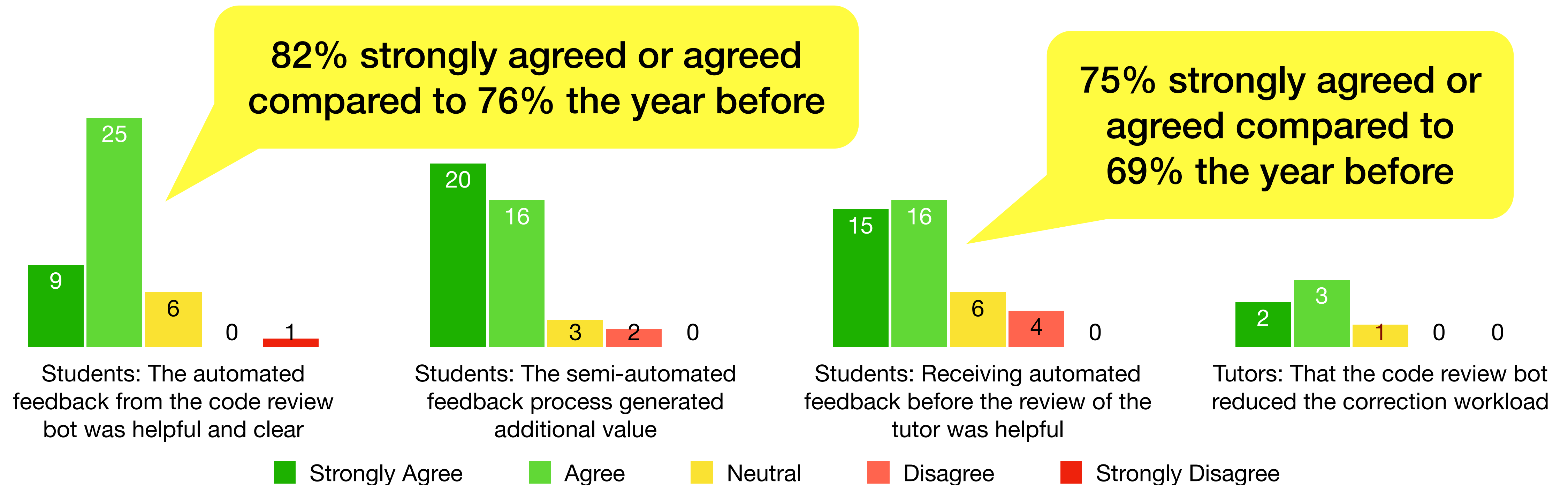
Access to the Required Hardware

- 55 of the 76 student participants did own or had access to a computer running macOS
- We supported two tutors among nine who were only using virtual machines with a MacBook
- We repurposed our iMac laboratory by relying on a remote desktop connection to the machines
- All machines were placed inside a virtual private network (VPN) that students connected to before accessing the macOS machines



Results and Discussion

- All students could participate, had access a macOS machine, and it was perceived positive that students could rewatch the sessions at any time
- Some students hesitated to ask questions in the channels with all students
- We Conducted a survey one week after the Swift programming course and received 41 answers from students and six answers from tutors



Conclusion and Future Work

- We will keep using the semi automated review process and improve its functionality
- Due to the increasing number of COVID-19 cases we will also conduct the next Swift Bootcamp virtually
- The prerecorded sessions can be reused and slightly adapted for the next Swift Bootcamp
- We want to use a forum based platform for students to answer questions and provide feedback
- We will reuse the infrastructure setup from the last semester to provide access to macOS machines

October 2020

	Mon 26	Tue 27	Wed 28	Thu 29
		8:30 AM Lab Time	8:30 AM Lab Time	8:30 AM Lab Time
9:00 AM Getting Ready				
9:30 AM Introduction		9:30 AM Swift 2	9:30 AM Swift 3	9:30 AM Swift 4
11:30 AM Mac 101				
12:30 PM Swift 1		12:30 PM App 2	12:30 PM App 3	12:30 PM App 4
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