# User Study

## Type of Study

**Within-subjects:**

* Each participant solves half the task with the tool and half the tasks without the tool
* Disadvantages:
  + Carryover effects

**Between-subjects:**

* Half the participants solve all the tasks with the tool and half the participants solve all tasks without the tool
* Disadvantages:
  + More participants required
  + No direct comparison between tool/no tool in questionnaire possible

## Setup

* One desktop device with keyboard, mouse and one screen
* One tablet, one smartphone
* Without the tool participants have access to:
  + Chrome Developer Tools
  + Chrome Device Mode
  + Remote debugging of real devices (devices are already connected to Chrome before the study begins)
* With the tool, participants have access to:
  + Tool
  + Chrome Developer Tools
  + Chrome Device Mode
  + Remote debugging of real devices

## Introduction

Demonstration of the cross-device applications used in the study

Tool:

* Show how to create emulated devices and connect devices
* Show how to connect real devices
* Show how the JS Console and function debugging works
* Mention that Dev Tools need to be opened after devices have loaded for function debugging
* Show how record/replay works

General:

* Explain Chrome Device Mode
* Explain Chrome Developer Tools: console, HTML/JS/CSS inspection/debugging
* Explain how to remotely debug a real device
* Show users how to make multiple profiles in Chrome, possibly already provide a few profiles

## Evaluation

* Measure time/success rate for the different tasks with/without tools
* Logging actions of participants:
  + How often do participants use stuff like device mode when they have access to the tool compared to when they do not have access to the tool
* Questionnaire about the tasks
  + How easy/difficult was it to fix a bug/implement a new feature with/without the tool?
  + How efficient was it to fix a bug/implement a new feature with/without the tool?
* General questionnaire
  + Age
  + Sex
  + Previous experience with developing web application:
    - Responsive design
    - Cross-Device
    - How many years of experience? How many hours on average per week?
  + Experience with JavaScript in particular:
    - How many years?
    - Complexity of applications
    - How do you rate your skills from basic to expert?
  + Experience with Chrome Developer Tools
    - Also for particular features
  + Experience with Chrome Device Mode
* Concluding questionnaire
  + Suggestions for additional features
  + Suggestions for improvements
  + Easier/more efficient with or without?
  + Did you prefer debugging/implementing with or without the tool?
  + Was it easy to learn how to use the tool?
  + I thought the system was easy to use
  + The tool would be useful for debugging/developing cross-device applications
  + I would use the tool for debugging/developing cross-device applications
  + I felt very confident using the system
  + I thought there was too much inconsistency in the system
  + I found the various functions in the system were well integrated
  + The tool was unnecessarily complex
  + Which feature did you find most useful?
  + Which feature did you not find useful at all?
  + General comments

## Tasks

* Two applications
* For each application
  + Fix a bug
  + Implement a new feature
* Fixing a bug:
  + Describe the steps needed to reach the bug in the application
* Implementing a new feature:
  + Describe exactly how the feature should work, maybe provide a mockup

## Applications

* XDCinema
  + Possible additional feature:
    - In the movie view, display the price of the movie in each cinema and highlight the correct price when a cinema is selected
    - In the “extra” role, display additional information about the cinema when a cinema is selected, e.g. parking, public transport, nearby restaurants, picture of the cinema, …
    - Add button to show comments about a movie
  + Possible bug fixes
    - Bug: Some data is not properly synchronized
    - …
* XDYouTube
  + Possible additional features:
    - Add a play/pause button to landscape view
    - Go to first page of videos
    - Show multiple videos in parallel: All but one device have the video role and always take the first video from the queue
  + Possible bug fixes
    - Bug: If a video has finished, always take the next video and update the current video, even if the queue is empty
    - Bug: if the user clicks on the next page/previous page button, always show the first page
    - Bug: error when the user clicks on the previous page button while on the first page
    - Bug: queue not properly synchronized
* Gallery
  + Possible additional features
    - Add title/category to images
    - Mark images as favorite and browse favorite images
    - Go to next/previous picture on devices that only show the picture
  + Possible bug fixes
    - …
* Maps
  + Possible additional features
    - …
  + Possible bug fixes
    - …

## Variables

* Application:
  + Application 1
  + Application 2
* Task:
  + Fixing a bug
  + Implementing a feature
* Setup:
  + With tool
  + Without tool