

City, University of London
Centre for Human Computer Interaction Design
MSc Human-Computer Interaction Design
Project Report
2018

**How do people learn synchronously/asynchronously
with distributed video?**

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1st October 2018

Declaration

By submitting this work, I declare that this work is entirely my own except those parts duly identified and referenced in my submission. It complies with any specified word limits and the requirements and regulations detailed in the assessment instructions and any other relevant programme and module documentation. In submitting this work I acknowledge that I have read and understood the regulations and code regarding academic misconduct, including that relating to plagiarism, as specified in the Programme Handbook. I also acknowledge that this work will be subject to a variety of checks for academic misconduct.

Signed:



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Acknowledgements

First, I would like to praise and give thanks to God the Almighty Allah for giving me the opportunity and perseverance to undertake my postgraduate program and complete this project as part of it.

I would like to give a huge thanks to Dr Radu Jianu for taking me on as a supervisee and providing me support and encouragement. Thanks to the participants who were involved in this study. I would also like to give thanks to all the academics involved with the Human Computer Interaction Design program for helping me gain invaluable knowledge throughout the academic year.

Finally, thanks to my family for inspiring me to take on this course and always try to better myself.

Abstract

Meaningful connections with peers/colleagues and the use of organised spaces facilitates better learning. Having such connections and spaces are what makes physical collaborative environments valuable. With technology it is now more than possible to see people through telepresence or webcams etc and do tasks remotely. This is easier said than done as it's relatively unnatural, it's hard to build awareness in contrast to face-to-face collaboration. Creating fluid relationships with peers/colleagues in organised co-located physical space is easier offline as its more structured and ampler compared to distributed online environments that is arguably not commonplace.

This project seeks characteristics that are useful for video learning in asynchronous and synchronous collaborative, distributed, groups of people. In order to answer this the author understood how people currently do this. Followed by producing design features that would make a digital system for remote asynchronous and synchronous video learning. Multiple observations followed by interviews and qualitative analysis was completed to identify the characteristics. The output of the project is a set of design features to support creation of collaborative video learning applications. With the findings it was clear there is space to make such a setting and details about good practices and issues are given.

Keywords: video-learning, collaboration, synchronous, asynchronous, groupware

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1. Introduction and Objectives

1.1 Background

Multimedia learning is an effective learning mode that facilitates student's abilities to understand scientific concepts (Mayer, 1997). As multimedia is being integrated into institutions, the idea of the 'flipped classroom' has emerged. Students are now often encouraged to collaborate using multimedia with peers to learn topics opposed to the traditional method of an instructor guiding students the whole way (Silagadze, 2018). Whilst the use of multimedia learning has grown, video has proven to be useful to students in different forms such as: recorded lectures, instructional screencasts and self-created videos. Education entrepreneur Salman Khan (2011) explained that video learning subverts the traditional model that 'penalises you (students) for experimentation and failure'; video encourages students to do exploration by being able to easily review videos until 'mastery' of the topic being studied is achieved.

In turn, the fruition of 'massive open online courses' (MOOC) over the last decade has integrated multimedia to accommodate learning. A MOOC is an e-learning environment that offers courses and are typically available to a multitude of people by an institution. MOOCs are open to all through an online platform (Porter, 2015) e.g Khan Academy and EdX; commercial MOOC providers such as Lynda.com and Codecademy do exist showing how MOOC types are diverse and not so open. MOOCs can help people share knowledge and understanding and/or learn knowledge and skills etc (Yuan et al cited in Porter, 2015). These environments advocate the use of multimedia and the flipped classroom approach by adding some collaborative social aspects such as videos and interactive quizzes, self-guided learning paths and discussion forums respectively. MOOCs have created a 'blended model of education' where learning is delivered online (through video) and in person to students to achieve good grades according to Anant Agarwal (2013).

In the last decade there have been developments in making video and other multimedia more useful for digital learning contexts. This has partly happened due to the interest of creating Web 2.0 websites that are typically dynamic and involve user generated content. MOOCs fall under such websites as people 'share' courses continuously. For example, studies have concluded that the use of annotations on media (documents) and general interaction, such as go-to links, can lead to more sophisticated learning (Huang et al, 2015; Su et al 2010). Research in video has shown that collaboration can be done with the multimedia. For example, a study by Chiu et al (2016) showed how annotations being directly added on CPR videos by students during their first viewing helped them understand the concept easily when they were reviewing it and in turn led to higher success rates in their tests.

Collaboration in MOOCs are mostly asynchronous virtual discussions. As mentioned beforehand social aspects are provided with forums and wikis. These environments have the potential to distribute learning with video where participants can sit together from different places, at the same time and/or different time, and share the learning experience. The research presented in this report details how to address designing a distributed synchronous and asynchronous collaborative video learning environment following multiple observations and interviews. In turn, the findings should be useful to create video-based learning environments in MOOCs. Part of the challenge is to also discover an experience that can mimic the offline setting where people might use gestures, eye contact and their personalities to make more meaningful interactions. The

end of the project intends to help give ideas for a new virtual experience of collaborative video learning.

1.2 Research questions

The overall aim of the project was to unpack the ways in which a distributed synchronous and asynchronous video learning environment may be. The following research questions were explored in this project:

- **What are the typical challenges currently faced by groups of students who wish to use video as the focal point for learning in a digital setting and how do they currently tackle them?**
- **What makes a useful synchronous/asynchronous distributed video learning environment?**

This will lead to a set of design features that could be of use to designers of such courses.

1.3 Objectives

To address the two research questions a user centred approach was taken where observations with follow up interviews were carried out. Following this the data collected was analysed with Distributed Cognition for teamwork framework, External cognition, the theories of Connectivism, Social Presence, Student agency and Thematic analysis. The techniques aforementioned provide empirical evidence for the research questions and a list of design features are produced as a result of the work. The methods section goes into this in more detail, below is an overview of each exercise.

1.3.1 Methods overview

Observations - participants were observed in a fictional distributed synchronous and asynchronous video learning MOOC. The focus was on how collaboration worked out.

Informal interview debriefings – following the observations participants were interviewed to discuss their sessions and uncover further insight.

Analysis – the raw data collected was put through coding using the frameworks and theory stated above.

Production of design features – as a conclusion there are recommendations for a video learning environment based on the results of the analysis.

1.4 Beneficiaries

This project's outcome intends to benefit researchers in computer science, human-computer interaction, interaction design and professionals who are interested in creation and fruition of computer supported collaborative environments. The results for this study could help create a new collaborative learning environment that can be used in MOOCs and open new research questions and studies about such environments. Finally, the project aims to help participants of MOOCs gain better experience but also facilitate 'students' in getting an improved learning experience they may not be able to access otherwise (Liyanagunawardena, 2015a).

1.5 Report structure

The rest of the report is organised as follows. Chapter 2 showcases the literature linked to this project and builds context to inform the current climate for video learning in MOOCs. Chapter 3 details the research method used for the project by explaining how data was collected and analysed. Chapter 4 provides the results of the observations and interviews after qualitative analysis. Chapter 5 draws back to the objectives mentioned above and sees how the project was reliable and valid. Finally, chapter 6 is the evaluation, reflection and conclusions on the project overall and how future research could pan out.

2. Context

2.1 Background and motivation

2.1.1 MOOCs and learning from video content

As Liyanagunawardena et al (2013) say MOOCs have made a large impact since its creation a decade ago in a course named 'Connectivism and Connective Knowledge' by George Siemens and Stephen Downes. This came after developments started by institutions like MIT in USA and Open University of UK wanting to share digital content in the early 2000s (see Figure 2.1).

MOOCs allowed a different direction to sharing learning content and have two categories (pedagogies): cMOOCs and xMOOCs (Daniel cited in Liyanagunawardena, 2013; Yuan et al cited in Porter, 2015). cMOOCs are more social and based on 'connectivism': everything is integrated, and everyone provides to the learning environment (see more on Connectivism below). Siemens and Downes built their MOOC using the connectivism concept and led on to say the ideal is 'the learner is the teacher is the learner' (Siemens cited in Li et al, 2014). xMOOCs follow a more traditional approach: an instructor gives their sessions and learning is more passive. The project aims to build design features for an environment that is more of a cMOOC.

As MOOCs grow more pedagogies have evolved. As explained by Sharples instructivist and social constructivist pedagogy have emerged in MOOCs where teachers lecture students and cater to their needs or people mutually construct their understanding of topics respectively (ColumbiaLearn, 2015). The terms are not much different to xMOOCs and cMOOCs in retrospective. The diagram below (Figure 2.1) shows the evolution of MOOCs with well-known MOOCs and their pedagogies labelled.

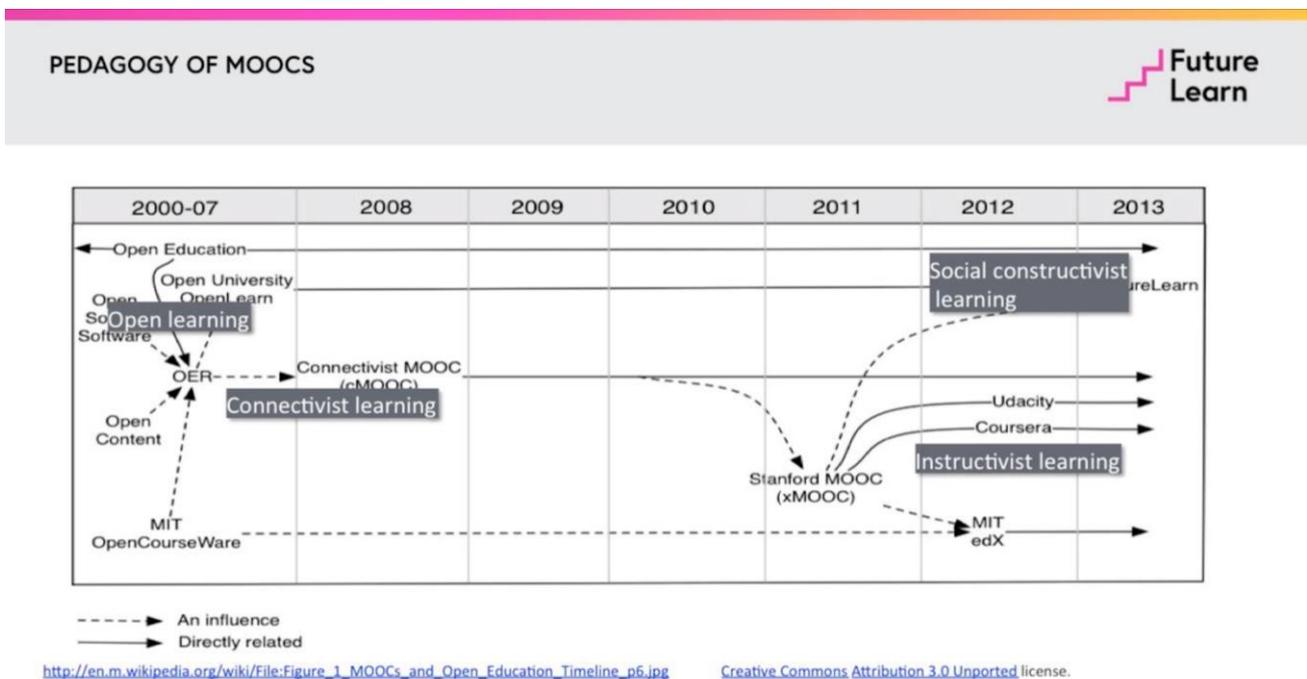


Figure 2.1: Evolution of Massive Open Online Courses and pedagogies 2000 - 2013 (ColumbiaLearn, 2015).

The need for collaboration in online learning is desired because as Sharples explains, it 'brings people together into rich conversations...where the larger the scale the better the conversations the richer the discussions' leading to idea sharing (ibid). Sharples explains with MOOCs ability to reach masses of people online, learning is becoming a 'social process...(and) a compassionate endeavour'. Enabling people to learn together and collaborate is vital as well as allowing people to enjoy the experience. Students need to actively engage with fellow learners because 'we learn most effectively when we mutually construct understanding' (ibid). The idea of social learning being a part of pedagogies comes from previous studies such as Meltzoff et al (cited in *ColumbriLearn*, 2015) where small groups have shown that idea sharing is a catalyst for learning. Student collaboration in MOOCs has become more prevalent after a push for more social constructivist MOOCs (synonymous with cMOOC but more integrated platforms) with the creation of MOOCs like 'Future learn'.

Massive open online courses (MOOCs) are intended to be available to a large amount of people, unrestricted and free of charge on an online platform (Porter, 2015). Videos are typically the main way to show content on MOOCs according to Hansch et al's survey (2015). In the last few years, due to their popularity, MOOC environments have received particular attention. Based on Sharples idea of social constructive MOOCs (*ColumbriLearn*, 2015), it was useful to see how collaboration and use of video has been explored and disseminated in other studies involving MOOCs to inform the study to be carried out. The literature search did also involve looking at environments/studies that are similar to MOOCs.

2.1.2 Collaboration in MOOCs or similar environments

MOOCs typically implement forums as the main communication hub for students and teachers (Manathunga, K & Hernández-Leo, 2015; Roll et al, 2016; Boroujeni et al, 2017; Poquet, 2017). MOOCs are part of the distance education movement that has implemented different types of interactions including discussion forums (Gillani & Eynon, 2014; Bernard et al cited in Zhang et al, 2016). Therefore, the use of forums is seen as acceptable and has been incorporated into MOOCs as 'optional, open, and loosely structured environment(s)' (Zhang et al, 2016). MOOCs also lean to other asynchronous modes of collaboration. Other modes of collaboration in MOOCs involve messaging, emails, editable wikis and peer reviews (Ramirez-Donoso et al, 2017).

However, the use of forums diminishes the opportunity for collaboration and most students rarely use them (Boroujeni et al, 2017; Poquet, 2017). Such systems lead to 'loose collaborations' as its asynchronous and timely support isn't guaranteed (Li et al, 2014). Forums are not rated as well as other resources, such as video tutorials and interactive quizzes, in MOOCs. Murray's (2014) 'Equine Nutrition' MOOC self-completion survey showed nearly 90% of students rated video lectures as very good or excellent. 80% of students rated quizzes similarly high. However only 60% of students rated forums highly. In fact, only 10% of survey respondents used the forums to collaborate. Murray explains this is due to the fact people prefer quality interaction and implies forums barred such experience. Peers do not respond to each other's threads in MOOCs. Onah et al (2014) ran two versions of a MOOC simultaneously to uncover the use of forums for collaboration. One MOOC encouraged students to discuss with peers and collaborate using forums and the other encouraged the same but offered an additional forum to speak to tutors. In both versions students wanted to confirm answers with 'experts' (teachers) instead of discussing different approaches and/or collaborating in problem solving to create computer programs etc. These findings about forum use appreciate Murray's (2014) view that students rather have quality interaction than bond with peers.

In light of research showing forums are ineffective, researchers have studied how to facilitate collaboration in forums by introducing strategies and new functionality. Liyanagunawardena et al (2015b) discussed how teachers in a programming MOOC had to 'endorse particularly helpful answers' by students. Endorsements empowered students to post more often to other peers' posts/questions, but this doesn't necessarily enable more peer to peer communication to scale. Roll et al (2016; Penn Online Learning, 2016b) encouraged teachers in MOOCs to facilitate further conversations opposed to providing answers and this helped other students join or read the conversations. Future Learn have adapted forums by creating conversations through 'discussions threads' directly aside video content to facilitate conversations immediately (ColumbiaLearn, 2015). With social networking mechanisms students could see 'most liked' comments and people within a network etc. However, the use of social networking mechanisms can leave other students contributions underappreciated or feeling dismissed.

There is a clear debate in the literature and content covering forum use in MOOCs and how it effects collaboration. Other studies declare forums as 'inconsistent and non-cohesive' as student's participation in forums fall imminently after the first week. There is no sense of community through discussions in forums rather people discuss in short lived 'crowds' (Gillani & Eyon, 2014). On the other hand, studies that advocate the use of forums imply they are a core component as it was used the most frequently following lecture videos and homework (Seaton et al, 2014). Liyanagunawardena et al (2015b) mentions how populous forums can create space for immediacy of responses and 'social presence' (see below for details). However, it is clear there is a corpus of literature that gives 'negative' and 'positive' findings about forums. Covering such depth on forums is out of scope for this project.

There have been a few novel solutions to facilitate collaboration in MOOCs such as 'Study Groups', 'Private Team Spaces' and video watching in co-located settings. Sharples et al (2016, Penn Online Learning, 2016a) created 'Study Groups' in MOOCs to improve knowledge transformation. Study groups enhanced student's learning experience as they continuously interacted well with peers as teachers made contributions. Students had the option to be allocated into study groups and collaborate asynchronously with course peers once a teacher asks questions etc in parallel with the course. However, study groups saw the inevitable drops in participation leaving students frustrated. Clear topic-based activities needed to be projected by teachers to continue conversations. These findings are much like forum use where students need teachers. Versteegen et al (2016; Penn Online Learning, 2016a) created private team spaces for problem-based learning with chat facilities, file exchange and a meeting scheduler. Students felt encouraged to work together and the more organised groups made use of the settings with some conservative tools (Skype, Paddle and Google Docs) then succeeded in completion of the MOOC. This shows how more novel environments can encourage people to work together, an integrated video call feature or word processor would have made a more complete system. Li et al's (2014) study focussed on how group learning is applied to video watching (with the use of quizzes) in co-located settings. The results showed there is high level satisfaction in such conditions leading to 'increased levels of attentiveness and engagement'. It was clear synchronised viewing amongst students leads to better experiences for learning. Observations showed distributed controls allow a more fluent learning environment as people can clarify topics by stopping the video whenever. This study shows how video introduced a more cohesive learning tool that could be useful for MOOCs. To the author's knowledge this is the only study that had explicitly made video the focal point of a MOOC collaboration and this search seems to confirm the research into novel collaborative learning experience in MOOCs is sparse.

Collaboration is supported well in other online environments (outside of MOOCs). For example, Fita et al (2016) created a virtual learning platform that provided virtual sessions to replace asynchronous course management systems that lacked interaction between students and teachers. The platform allowed the students to upskill together and motivate teamwork. An Algorithms and Data structure class used the platform's screen sharing and distributed remote control authority to allow students sitting in a room together to debug programs on the teacher's computer. Aggregated results showed that people didn't use chat features and preferred to show their self with audio and video. In contrast to the studies above it could be argued advanced technologies (i.e video conferencing) can be used to foster communities instead of 'crowds'.

In some cases, there are collaborative systems used in MOOCs and similar environments. Pandey et al (2015) used the 'think-pair-share' framework on a Coursera MOOC to provide better collaboration and transfer of concepts. The results showed people enjoyed structure to conversation through a small Google Hangout application part of the MOOC. Over each phase the enthusiasm of participants grew showing it fosters communication between peers well. Students momentarily think about a concept then pair up with a peer and discuss ideas then finish with a whole class discussion. The think-pair-share framework improves structured conversations that students already have by eliminating moments of casual banter that lead to poor thinking about topics. Yim et al (2017) discovered how students collaborate synchronously in Google Docs and identified different styles of writing documents. For example, 'cooperative revision' is a writing style that shows how people construct documents together by assigning roles and editing together in later stages. Google Docs have also implemented the '<Name> suggests <changes>' feature opposed to showing the changes directly, which was reflected with the 'suggesting' feature in 2015. In turn this led to more harmonious collaboration as the user would not get offended with direct changes by others. These two studies show there are many solutions to get people to collaborate and it should be researched with different communication channels.

There has been little research about using other means to provide collaborative experiences to foster community that MOOCs want to live up to. Instead there has been heavy reliance on the use of forums with little innovations. The review has also shown examples of similar environments using other implementations and strategies to introduce collaboration. This project aims to fill the gap by studying how people could use video to foster collaboration in a MOOC.

2.2 Knowledge gaps

2.2.1 Little research into video collaboration in MOOCs

Little research has been done in enhancing collaboration in different ways, this project aims to provide initial developments for a novel solution. It is clear there has been plenty of research looking into the use of forums in MOOCs, especially with an emphasis on collaboration. Aside, different strategies and implementations have been used in similar environments further motivating the idea that there can be different approaches for collaboration in MOOCs.

This project aimed to explore and observe the phenomenon of using instructional video for remote (distributed, in different places) student collaboration at the same time (synchronous) and different times (asynchronous). The project explored how collaboration focussing directly with video learning content uncovered for groups of students spread apart. In turn, uncover the challenges faced in such settings and what makes a good synchronous/asynchronous distributed video learning environment.

Further arguments to support the project's objectives are given by Poquet et al (2018a). They merit the use of video with interactive elements (quizzes and self-reflection prompts etc) as it helps recall and helps 'apply mental effort. The paper also says how 'there is limited understanding around the effect of collaborative tasks for video viewing in asynchronous mode' and mentions how social annotation could be used but it's still in its infancy. Additionally, Sharples et al (2016) dismissed the idea of synchronous real time discussion of content and live chats in favour of study groups during their enhancement to MOOCs even though it was clear such settings are possible. This happened because of the fear that not many students would be available at one time (Penn Online Learning, 2016a). With video viewing it is possible to create real time discussion and live chats and study what happens in terms of collaboration and would be insightful for fellow MOOC creators (as suggested by Hansch et al, 2015).

2.3 Related theory and methods

This section talks about the three theories in literature that will be added to the analysis to see whether their prevalent in a distributed synchronous and asynchronous video learning environment. The three theories are Connectivism, Social presence and Student agency. Next, how the project was informed to set up a distributed learning environment to test for observations using the Computer supported collaborative work matrix. The final subsections talks about known methods to analyse collaboration in teams with the Distributed cognition for team's framework with the addition of External cognition.

2.3.1 Connectivism

Connectivism is one of the theories this project wants to integrate during the analysis phase. The concept entertains the idea that learning is a constant process that changes over a lifetime due to work etc, representing that learning is continuous. More importantly, the concept shows the value of informal learning/participation metaphor is high and needs to be acknowledged. This concept is not much different to the social constructivist theory mentioned above.

The notion of connectivism is often referenced when speaking of MOOCs. The learning concept was developed by Siemens (2005) and it is very apparent in today's web-hosted learning environments. In light of the concept, the project wants to see if other technology is added with video to allow students to share knowledge successfully. As seen with the examples above, digital technology can create engaging learning environments such as the blended learning model. Connectivism is the 'integration of principles explored by chaos, network, and complexity and self-organisation theories. Learning is a process that occurs within nebulous environments of shifting core elements – not entirely under the control of the individual. Learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or a database), is focused on connecting specialized information sets, and the connections that enable us to learn more are more important than our current state of knowing' (ibid). This concept came as part of the uprising of the digital world that called for such adaption.

2.3.2 Social presence and Student agency

The set-up this project proposes is susceptible to Social presence and Student agency. MOOCs recommend students to do things not require (ColumbiaLearn, 2015). Students will be interacting with videos and it will be interesting to see in what they make engaging conversations and relationships with distributed video synchronously and asynchronously. The project will be able to see if video is accepted as a collaborative tool.

Previous studies show that having research on environments are important as we get to figure out what's meaningful and could work for optimum environments (see above). Through observations of a MOOC course, Kop (2011) identified challenges that are useful to this study: 'presence' and 'self-directed learning'. The presence of others allowed more engagement and shows how connectivist learning environments are worthwhile. Design patterns presented to help forum use by Liyanagunawardena et al (2015b) also reflect how social presence is important. It was clear in some instances people preferred structure opposed to directing their own learning.

Social presence is defined "as the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships" (Short et al, 1976, p. 65). Since then there have been enhancements to the definition by various authors (such as Gunawardena cited in Poquet et al, 2018b). However, just the understanding that social presence helps build learning communities is useful (Ryman et al, 2009). Embedding social presence allows meaningful 'interpersonal communication and relationships' by people effectively communicating and knowledge sharing with media (ibid).

According to Poquet et al (2018b) social presence in MOOCs is under-researched but talks about forum use and is out of scope for this project. This study will see if video collaboration settings offers stable social presence and if it provides seamless interaction whilst using video that gives instructional content. As MOOCs aims to foster communities with anyone and everyone. It may be difficult to maintain social presence when more people join in the distributed video learning environment. It will be interesting to see how people show their social presence to have an engaging learning experience.

Student agency is when a student has the power to choose what happens in their learning experience. Students can make choices about 'what, where and with whom to learn'. Knowing that students make meaningful choices that have a knock-on effect on learning, it is good to see what students do in environments for assessment purposes (Lindgren & McDaniel, 2012).

2.3.4 Computer supported collaborative work matrix

The Computer Supported Collaborative Work matrix (see Figure 2.2) allowed the author to identify the 'type' of collaborative system this project could inform and use for analysis. With video as a learning object, two types of collaborative interaction can be supported.

The project aims to inform 1) synchronous (same time) and distributed (different place) interaction. 2) asynchronous (different time) and distributed (different place) interaction with video. The project doesn't explore co-located interaction (same place) as it seems unlikely to occur in MOOC settings. Using the matrix, it made sense to incorporate video viewing into video-conferencing which fit the first type of collaboration. For asynchronous distributed viewing it was difficult to think of an observable situation therefore the way participants viewed video asynchronously and then get together was studied using video-conferencing as well. In turn, it would gather data on what people will do when viewing video asynchronously for learning and whether they can be collaborative with their output from viewing.

		Time	
		Same	Different
Place	Same	Face-to-face meetings and meeting support tools	Post-it messages, e-mail, shared information spaces such as Lotus Notes Project management and version control software
	Different	Tele-conferencing Video-conferencing Collaborative text and drawing editors Instant messaging	Traditional letters, e-mail, shared information spaces such as Lotus Notes Workflow Threaded discussion databases

Figure 2.2: Computer supported collaborative work matrix (Benyon, 2014).

2.3.5 Distributed cognition for teamwork (DiCot)

Distributed cognition for teamwork (DiCot) is the first of two tools this project intends to use to interpret behaviour in a distributed video learning environment. In short, the framework sees how small groups/teams of people plus the environment solve problems in a socio-technical system (see Figure 2.3), its well suited for the collaborative task identified in the research objectives (Berndt et al, 2015). The main purpose is to understand 'propagation and transformation of information at work' (ibid). This framework is different to other cognitive models in that it doesn't focus on what is happening in the head, i.e the information processing model, but as aforementioned between people and artefacts.

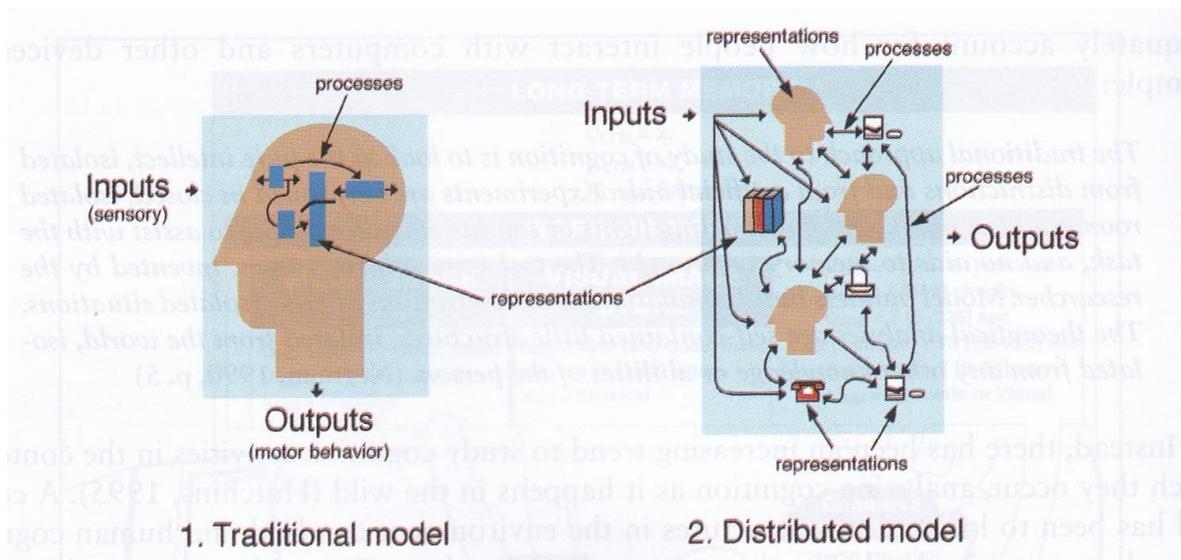


Figure 2.3: Comparison of traditional and distributed cognition approaches (Preece et al, 2015).

Poquet et al (2018a) made it clear that psychological aspects allowed research to show how behaviour unfolds with video use. Therefore, it makes sense to enhance observations with frameworks that facilitates qualitative analysis and leverage participant's strength and weaknesses to inform design requirements. DiCot provides a formal way to understand what learners are doing. It explores how the environment helps decision making processes for teams and helps inform what works and does not work. As mentioned beforehand DiCot allows observers to see how people think externally. The framework shows work-flows that happen and how people rely on things in the environment and each other in the physical world to meet goals. The knowledge gained

helps design a digital system in a way that supports the task. These benefits align well with the research questions of this project as well as facilitate the objectives.

Blandford and Furniss (2005) developed DiCot and provided a checklist structured into two layers. The first layer has three facets: physical layout: information flow and artefacts. The second layer is the several principles within each facet to consider for analysis. This allows a more organised approach to analysis when considering cognition.

Each principle's facets can be used as a question to see how people are working in a system. The data collected from the framework can be used to inform the design of a system. More about the use of the framework is detailed in the following chapters. Below describe the facets further and exemplifies some of their principles (for the full list, see Appendix B).

Facet 1: Physical layout considers the factors that influence the performance of a system, and of its components in physical terms. It looks into how people see, hear or interact with things. Examples of principles in this facet include: 'Space and cognition' where physical arrangement supporting cognition is uncovered; 'Horizon of observation' where you establish what each team member can and cannot see/hear.

Facet 2: Information flow seeks to uncover the communication between members, identify member's roles and the sequences of events that define the mechanics of the system. 'Information movement' and 'Hubs' are examples of principles in the facet where information flow and aggregation are investigated. This facet provides the researcher to observe and understand communication between members and a system which helps understand collaboration.

Facet 3: Artefacts simply considers how artefacts can support cognition in a system. Principles such as 'Goal representation' aims to discover how artefacts indicate system state and progression towards a goal (ibid).

2.3.6 External cognition

External cognition allows artefacts to be seen from a slightly different perspective. The points below can be used to see how artefacts are used in conjunction with the principles shown in the DiCot discussion. The idea is that aspects of cognition is externalised (offloaded) to tools and artefacts (as seen in Figure 2.3). In turn, this improves decision making and cognition mainly in four ways (Preece et al, 2015):

1. Reducing memory load: e.g using notes and reminders to reduce memory load.
2. Computational offloading: e.g using tools such as excel sheets and calculators to do complex computational tasks instead of causing cognitive load.
3. Process (annotating): manipulating external representations such as using to do lists.
4. Perception and action (cognitive tracing): optimising environments to ensure things are easier to do.

2.3.7 Chapter summary and conclusion

This chapter informs how MOOCs have grown in the recent past. Different pedagogies have appeared to exist suggesting there is many collaborative tools available to facilitate them. Knowing this, the author decided to investigate the collaboration in the literature and content. It was clear asynchronous methods, mostly forums, were used for collaboration and little attempts have been done to create novel solutions. Thus, the decision to investigate how distributed video could be useful to a MOOC was taken. The rest of the chapter talks about related theories and analysis tools that can be used to further an observational study focussed on in-situ video use in MOOCs.

3. Methods

This project's purpose was to observe the way in which learners use video collaboratively as a learning object in distributed synchronous and asynchronous settings. The two aforementioned research questions and objectives informed the methods for the project.

It is clear MOOCs have been developing since 2008 and has received a lot of attention from institutions. The previous chapter's literature showed how current products and academic research has focussed on asynchronous modes, mostly forums, to aid collaboration in MOOCs. There hasn't been enough research into how novel solutions can be implemented into MOOCs specifically whilst other environments have had success. Therefore, there is a space and motivation to see if the idea of using distributed video to learn collaboratively works.

In order to meet the research questions and objectives, it was useful to run observational studies of participants watching videos at the same and different times (synchronously and asynchronously) in distributed settings. Following this, there were short informal interviews conducted straight after the observations. These activities provided a naturalistic setting as 'students' got to show their actions and then provide their reasoning. Following the data collection, there was rigorous qualitative analysis regarding how groups of people work with video in distributed settings, in relation to learning topics. As a result, there will be an account of how groups of people work in the learning context. Also, this will inform the strategies students employ when watching distributed videos with peers, what other technologies and artefacts may be used and what is useful or lacking etc. The analysis focussed heavily on participant's distributed cognition within the distributed setting. Therefore, the project used DiCot (Blandford and Furniss, 2005) and External cognition (Scaife and Rogers cited in Preece et al, 2015) to analyse the data. In addition, the analysis checked whether connectivism, social presence and student agency were prevalent. Finally, there was thematic analysis to show themes of how participants felt in the interviews.

The following sections describe in detail the methods used for the participant recruitment, data collection and analysis activities carried out for the project.

3.1 Participant recruitment

In order to conduct the observational studies, the author recruited 14 participants as students in fictional MOOC environments. The participants were recruited through social media (namely Facebook, Twitter and WhatsApp) by the author posting statuses and sending broadcast messages etc calling for higher education students or recent graduates to come forward (see Figure 3.1 for an example). It was reasonable to observe students and recent graduates because they are proven subsets of participants' MOOC courses take in (Gillani & Eynon, 2014; Glass et al, 2016). Such participants are most/more likely to use a MOOC although MOOCs are open to all. Furthermore, recent graduates and students would be more familiar to collaborative work through their courses and potentially provide more deliberate strategies useful for this project. Due to the way the tasks were designed, the synchronous tasks allowed students with no programming experience to be recruited. The asynchronous task recruited intermediate programmers as it was about a slightly more advanced web programming topic. The recruitment process was carried out in late August 2018 and sessions were carried out between 24th of August - 6th of September 2018 after the participants and the author mutually agreed times.

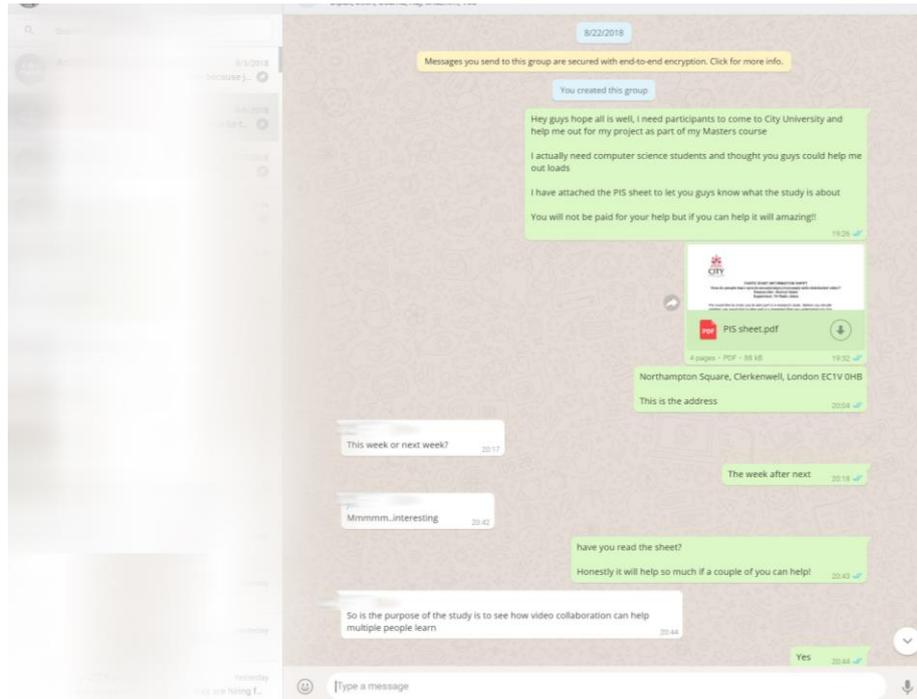


Figure 3.1: Example of message sent to participants in recruitment session on Web WhatsApp.

3.2 Data collection

3.2.1 Observation of synchronous and asynchronous video viewing

The purpose of this research was to see how students use video as a learning object for collaboration. In turn, this would go on to inform how a design of a potential video learning environment could be.

In order to uncover the objectives, there was a series of observational studies carried out to start the project's process. As mentioned beforehand this involved 14 participants acting as students in a MOOC learning environment and then being informally interviewed. There were two modes of observation: synchronous use of distributed video and asynchronous use of distributed video.

The observations aggregated the current actions and behaviours of distributed learning groups. In total there was 7 sessions conducted; 6 participants (in 3 groups) in synchronous observations and 8 participants (in 4 groups) in asynchronous observations. The participants were aged 19-26 (13 male and 1 female).

Session	ID	Gender	Type of observation	Date of session
1	P1 & P2	Male/Male	Synchronous	24/08/18
2	P3 & P4	Male/Male	Synchronous	27/08/18
3	P5 & P6	Male/Male	Synchronous	28/08/18
4	P7 & P8	Male/Male	Asynchronous	03/09/18
5	P9 & P10	Male/Male	Asynchronous	04/09/18
6	P11 & P12	Male/Male	Asynchronous	06/09/18
7	P13 & P14	Male /Female	Asynchronous	06/09/18

Table 1: The basic information of participants who took part in these studies and type of observation they took part in.

All observations were held at City, University of London. The reason the studies were held at the university was for the author's convenience and stable internet speed/connection. These settings allowed students to easily complete the same task(s) in a structured

fashion and allow easy comparison of interactions in the data analysis phase. These settings still provided ecological validity as people were easily placed into different locations (rooms) mimicking a distributed experience.

Before the observations commenced, the participants were provided a participant information sheet covering the purpose of the study. The sheet also provided reassurance about information remaining confidential and having the ability to drop out at any point. The researcher (author) had a script which enabled them to repeat all this information before conducting the session on the day (see Appendix E). Once the participant understood what the project entailed they signed their consent forms and took part in the studies. These documents are provided in Appendix C and D.

The observations of the groups were overseen by the researcher participating in a passive - marginal level. The researcher sat not too far away from participants in the synchronous observation and joined the Skype call (see below). The researcher sat beside the participant viewing video in the asynchronous observation. This allowed observation notes about distributed video to be done more easily opposed to multiple reviewing of sessions and informed the subsequent interviews. Also, if any technical issues occurred the author was able to attend to it fairly quick. Otherwise, the researcher was unobtrusive as the task was carried out by participants.

3.2.2 Experimental setups and tasks

In the **synchronous setup** observations participants were put into different rooms at the same time and told to watch novice level video content about HTML and CSS together remotely using Skype and a YouTube playlist. Participants watched content together as they built a basic web page about a city in Europe. Deliberately the playlists were comprehensive to replicate a MOOC for beginners and included challenges to see whether students adopt collaborative video use to learn. To maintain naturalistic settings, participants were told to collaborate on their own agreed set of rules during their calls and do whatever they see fit. This led to an open-ended interpretive study as encouraged by Blandford et al (2016).

In the **asynchronous setup** observations participants were also put into different rooms at the same time. However, this mode of the observations with video use was slightly structured to simulate asynchronous 'viewing slots' with the use of Skype to bring information together for collaborative calls. The collaboration element showed whether participants can collaborate based on viewing video at different times and can complete a task. Participants were told they will not be 'online' with another student when viewing video. They enhanced a web page about London together by sending each other information about CSS grids from a video on YouTube at different time slots. The way in which they sent the information was up to them (e.g annotations, screenshots, notes and time marks of video etc).

To view the task sheets participants were given see Appendix F and G.

3.2.3 Equipment provided

For optimum data collection, both settings provided participants with a laptop, printed and digital task sheets, pen, highlighters and paper to make extra notes etc. Also, participants were given the freedom on how to orientate themselves and their allocated machines. In turn, this facilitated distributed cognition. Participants used equipment in ways that they saw fit. Below shows the typical set-up of a participant's workspace (Figure 3.2).



Figure 3.2: Typical work space for participant (left hand side). Camera angle of recordings (right hand side).

3.2.4 Data recording materials

As there were inevitable conversations and actions to unfold, video and audio recording tools were also used to collect the conversational data and actions of participants in the observations and interviews. The tools allowed multidimensional capture of data. Cameras were placed beside participants in order to be less intrusive but also to have less impact on behaviour that leads to rationalised actions (see Figure 3.2). In some cases, video capture had to be done above the shoulder of the participant due to recording constraints of not being able to place the camera still. In turn, recording allowed the capture of a whole distributed session, participant's body language, gestures and interaction with physical artefacts. Laptop screens were also recorded to help facilitate the author in finding quirky actions in data analysis that were not apparent on the day of the session. The laptop recordings also recorded any coordination done with video content and additional software to allow a more in-depth analysis and gain further insight for the subsequent DiCot analysis mostly. Namely Camtasia and Windows Voice Recorder were the software used for screen recording and interview recording respectively.

3.2.5 Interviews (informal debriefing)

After the observations there were small semi-structured interviews poised as informal debriefings to the participants to ease off rationalised answers. The interviews lasted 5-15 minutes. Such interviewing techniques also allowed participants to feel more at ease. All participants involved in the observations took part in the interviews. The interviews allowed the author to clarify any actions that didn't make sense or gain further insight as suggested by Preece et al (2015). Also, participants were able to raise concerns they felt the need to address from their experience in the session. The short interviews let the author see how participants thought about the fictional MOOC environment they were put into.

Interviews happened directly following observations by bringing members of the group together into a room at City, University of London. This also enhanced the environment for a good conversation as the group members were already familiar with each other from the observations beforehand.

To help the interview flow there were questions based off the research questions (see Appendix H). However, the interview was more open ended as this project aimed to

discover how a new design idea would work and additional questions were asked and didn't necessarily follow the questions point by point.

The interviews allowed the study to gain a better understanding of how people used distributed video and is a form of methodical triangulation (Preece et al, 2015) with the analysis tools.

3.3 Data Analysis

3.3.1 From raw data to coded data

In the data analysis stage, the raw data collected was coded through qualitative analysis to make more sense of it in relation to cognition. Coding presented the key components of the data set for this study. The coding allowed the author to see how distributed and external cognition works in an online video viewing environment and how it effects learners. Coding happened once the raw data was transcribed/summarised; the data was put against the checklist provided in DiCot (Blandford and Furniss, 2005) and types of External cognition listed in Preece et al (2015). Actions or themes that were identified are noted.

In addition to the cognition coding, the related theories: connectivism, social presence and student agency (discussed in chapter 2) was coded through qualitative analysis. The coding allowed the author to see if the environment incorporated the theories.

The raw data was transcribed using Microsoft Word, all aspects of the frameworks and tools mentioned above were applied by viewing and coding transcripts (see Appendix I-J for transcripts and coding). In turn, key trends were identified from the data set in terms of connectivism, social presence, and student agency, external and distributed cognition.

3.3.2 Thematic analysis

The author conducted a Thematic analysis (Braun & Clarke, 2008; Clarke, 2018) with the transcripts. As the raw data from the sessions was transcribed/summarised the same was done with the audio recordings saved on the author's computer. The technique allowed a way to uncover and detail patterns in overarching themes within the fairly small dataset. It helps inform the second research objective by exploring what makes a useful synchronous/asynchronous distributed video learning environment.

Coding was done using a digital pen and some highlighting and this allowed easy aggregation of codes (see Appendix I). The author took a simple approach as suggested by Clarke (2018) by getting familiarised with the data and being able to generate codes leading to overarching themes for sets of codes after a few iterations. The approach was more inductive and used mostly semantic codes where the surface meaning of utterances was identified.

The codes and core themes were generated fairly quickly as the interview sessions were short.

The next section of the report talks about the results from the data analysis.

4. Results

This section of the report details the findings of the observations and interviews analysed with DiCot principles, facets of External Cognition, Connectivism, Social Presence, Student agency and Thematic analysis.

4.1 DiCot

This section shows the range of results after coding the transcripts with the DiCot principles. The two systems were analysed and put into three models: the physical model, information flow model and artefact model.

4.1.1 Physical model

Synchronous Level

Space and Cognition & Perceptual principles:

As a whole, participants barely made changes to the physical environment they were presented with (see Figure 3.2). However, small alterations and strategies were employed leading to enhanced experiences. Participants moved their plain paper about and made thought-out notes in some instances. Referral to a source, i.e task sheet or notes, allowed the task to move smoothly. Few issues raised with regard to sharing notes, reading material together and technical issues.

All participants kept their laptops in front of them to absorb the video content as the main source of attention. This meant that participants preferred to work with their direct observation towards their screen.

Participants showed that they move their physical notes to a space of their liking. P2 moved it for their writing needs whereas P5 did it purely to enhance their note taking. This shows how participants have note-taking preferences in regard to their space to aid cognition. All other participants who made notes (P6 & P1) kept physical notes to the right-hand side. On top of this participants (P1 & P2) tend to segregate their written notes to make sense of it by making it easier to read.

Three participants (P3, P4 & P6) showed how having a physical task sheet as a reference point can help them focus on the task by glancing at it and reminding themselves what they need to do.

P1 showed how they could use their space bar as a pause/play button on request from P2 or when they wanted to pause the video themselves. Video on YouTube can be given more attention through 'cinema mode' where the viewport of the screen gets larger.

Issues:

- Participants were unable to share their physical notes about video unless they verbally communicate it. It takes some time trying to search and unpick points before speaking about notes.
- A digital task sheet taking up the whole screen can be daunting to participants and counterproductive. For example, P1 and P2 tended to the task sheet in the beginning of their call then realised it is extraneous to see together. They move away from the sheet to continue their session.
- Participants were unable to view video in full screen due to screen share causing lag. P1 and P2 continued their session normally and didn't face further severe issues.

Naturalness principle:

Participants were presented simple examples of naturalness in the environment they were given. There was a small feature that would add to 'naturalness' identified.

A digital task sheet represents a real task sheet through pixels, the digital task sheet was used in session 1 and 3. The sheet can get picked up by the share screen and be used for a connected learning experience alongside Skype and YouTube.

YouTube has naturalness embedded well in its design with playlists and its timeline. In all three sessions participants used the playlist as if it were a contents page to see what they can view, for example P6 says the following when viewing the playlist "*There's other videos on the HTML, we know we want to do headings and text, heading structure and.... We still have to do the syntax and structure right?*" P6 was reading the order of videos out to P5. Sessions 2 and 3 used the video's timeline to flick through content like going through a book and typically skipping to see implementation straight away.

The Skype chat is used by P3 like a board to send information about HTML tags. P1 uses a cursor as a pointer on the videos during their screen share.

Issue:

- Screen sharing lacks a zoom feature as P2 needed to slouch to see the screen share/video appropriately.

Subtle bodily supports principle:

There were a few instances participants subtly used their bodies to support the process. Unfortunately, their partners were not able to see them in most cases. Small movements the participants do can use cognitive resources needlessly. In session 2, P3 used subtle hand gestures a couple of times to gain attention of their partner by putting their hands and thumb up. Participants in all sessions make gestures by physically pointing at the screen or task sheet. P1 tends to move their sheets around to help them read what they wrote and was quick to always pause their video and use their mouse to explain content.

Issues:

- Participants cannot see what their partners are pointing to and leads to less coordination which is undesired for collaboration. The participants continue subtle acts as if their partner can see them.
- Participants sharing their screen on Skype cannot use their web cam, thus impedes communication. Participants on the other end cannot see subtle gestures or expression the participant makes. Participants have to make do with the voice chat through their microphones.
- Participants look sideways to refer to the physical task sheet and subsequently miss out on video content.
- Participants have to look downwards to pay attention to other areas such as their notes and this subsequently makes them miss out on video content.
- Participants who wrote notes required them to move their hand often to 'watch and note using up human cognitive resources (i.e motor control, perception and working memory).

Situation awareness principle:

Verbal communication and sharing screen with audio play a big factor in situation awareness within the synchronous sessions. Web cams help but with minimal impact in retrospective. The use of screen share with audio presents continuity problems.

Throughout the sessions (1 & 3) participants used verbal communication in order to help each other know what's going on with their understanding of the video content and for their coordination. In session 3 participants spoke a lot less during video viewing. Participants in session 1 and 2 were able to showcase doubts they had through voice presence provided by the use of their microphones and discussing content.

All sessions made use of screen and audio share to understand and learn using video together. With verbal communication this allowed participants to easily clarify things together. For example, P2 is able to clarify what CSS does with P1, "*So just as a note...CSS is meant for colouring and images...*" whilst viewing CSS content being played through P1's screen.

Webcam provides P4 to know how P3 feels by being able to see his subtle movements. In session 1 and 3 the participants would ask to pause the video and talk about it.

Issues:

- Having no web cam capabilities does not allow participants to show things other than virtually or verbally due to screen share being enabled.
- In some instances, video sound overlapped the participants and it's hard for participants to gain attention of the participant through the voice features.
- Participants tend to speak less during the session as it gets tiresome.
- Participants cannot see any physical notes, nor do they get discussed in depth leading to 'lost' information.
- Skype chat notifications are easily missed as they are in the participant's peripheral vision.

Horizon of observation principle:

Due to Skype's capabilities the horizon of observation for participants was fairly desirable in relation to collaborative environments. Participants are able to hear/share audio and screen together at the same time because of Skype's ability for calls to have a 'synchronised view' with the screen sharing feature. Participants are able to see notes when they are digitally sent (session 2) in the shared Skype chat. In session 3 there were sound issues where P5 could not gain the attention of P6 as video volume clashed with the microphone output.

Issues:

- Participants couldn't bring physical notes into the vicinity of their partner unless they discuss it verbally.

Arrangement of equipment principle:

Participants barely moved their arrangement of equipment but those who did showed useful strategies (Figure 4.1 shows an overview). Having the note area and task sheet on the sides allowed the participants to engage with them but still get information free flowing as the laptop played in their direct observation (in front of them). Two participants moved the notes for their preference and ability to write. Otherwise, the equipment was arranged as it was like in the beginning of the session.

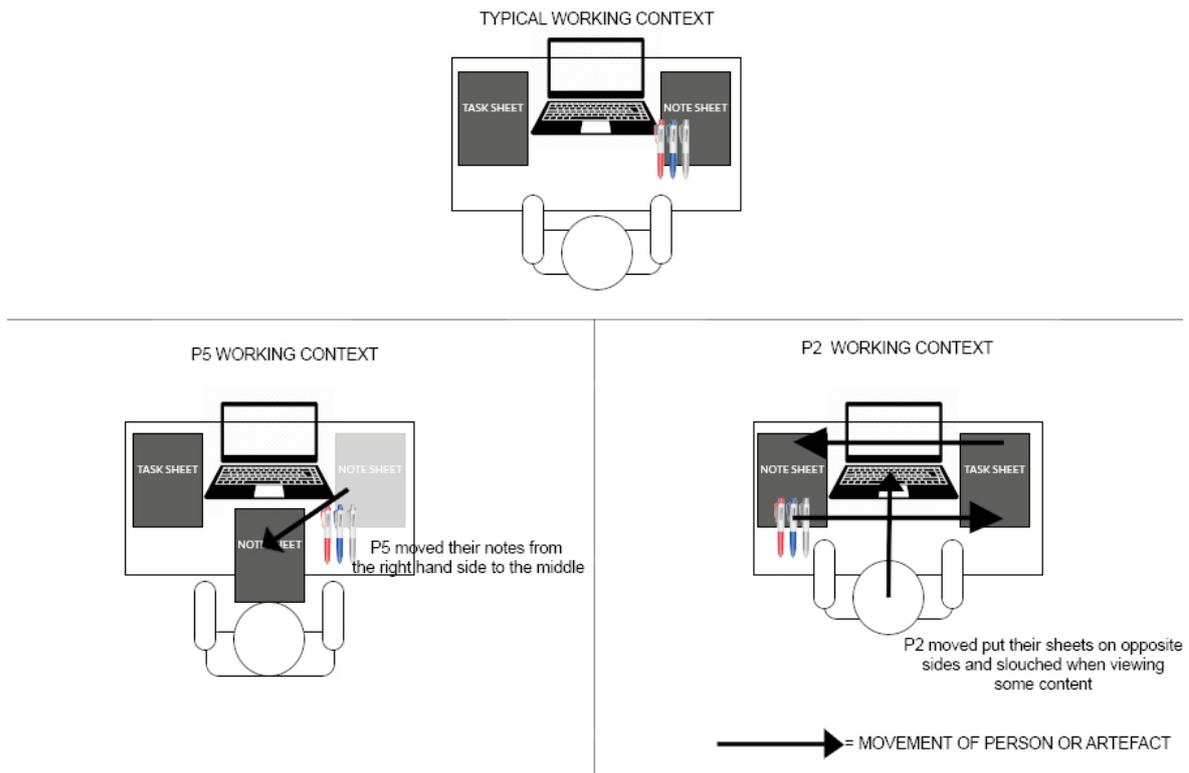


Figure 4.1: The typical working space of participants in the synchronous observations. Examples of nuanced experiences for P5 and P2 are shown and labelled.

Asynchronous Level

Space and Cognition & Perceptual principles:

On this side of the observations, participants showed findings similar to the synchronous sessions. There were barely changes to the environment and similar strategies with note taking were taken by some participants, i.e moving notes. Participants made use of their virtual space efficiently.

All participants kept their laptops in front of them to absorb the video content as the main source of attention. This meant that participants preferred to work with a direct observation towards their screen. This finding is no different to synchronous results made above.

Participants who wrote notes digitally (P7, P9, P10 and P11) about videos attained a desired area to compose them by rearranging the windows on their screens. This allowed them to emulate a physical working environment where there are well thought-out setups.

The physical notes sheets were used a lot as well in this side of the study. Participants (P8, P9, P10 and P14) sectioned their notes based on what each viewing slot required. P9 moved their task sheet but did not do much work with it. Whereas, P12 centred their notes and task sheets with the laptop at the back to make notes. P14 just placed their notes in the centre like P5 in the synchronous study.

P10 was readily waiting to pause video when viewing videos with their fingers on the space bar.

Naturalness principle:

Word processors affords a strong space for note-taking and is manipulated in the

asynchronous sessions, but it was clear they are hard to distribute. The use of the windows metaphor allows participants to easily create a workspace.

In all but one asynchronous session there was use of word processors which emulate paper from the physical world. Interestingly, P11 started a new 'Notepad' document for each section of notes they wrote.

Participants (P7, P9, P10, and P11) are able to create their own work space/study space with manipulation of windows.

P9 used their cursor as a highlighter to explain their notes on the video to P10.

Issues:

- Participants write notes digitally however external resources like Google Drive or Microsoft Word requires effort to send. In fact, when P7 sends their notes it is not with the software they used, they sent it to the Skype chat. There is an excessive amount of technologies used to share an item (notes).

Subtle bodily support principle:

Not many observations of subtle bodily movements were possible as there is no real communication during video viewing. However, P10 showed how they were ready to pause by readily placing their finger on the space bar.

Situation awareness principle:

There isn't any situation awareness whilst the participants make notes and watch video. This is an independent task. Participants got to know about others work through conversation and not explicitly discussing or using notes later in the collaboration. The way participants showed awareness would overlap with findings in the synchronous study and wasn't included.

Issues:

- However, upon reflection the setting doesn't explicitly let participants know other participants they are making notes. Only a task sheet lets them know. Letting participants know what is happening could provide structure.

Horizon of observation principle:

The participants can only see their notes, task sheet(s) and video (/laptop) during the asynchronous moments of video viewing. The collaborative aspect was only done to see what people do when asked to express their notes and therefore out of scope.

Issues:

- However, participants should be able to know what other participants have done when note-taking and/or video viewing. Participants have to guess what is happening or 'go with the flow'. P8 said "*it felt a bit slow and I didn't know what he (P7) was going to do, and I didn't know my next step*" when answering what he would have liked to see added implying just waiting is uninformative for the participant not making notes.

Arrangement of equipment principle:

In this side of the study it was clear participants wanted to make use of the equipment however there was a split between physical and digital tools. In hindsight it was clear digital tools allowed some cohesive collaboration later on. Participants moved from physical note taking to digital notes allowing them to pay full attention to the screen and provide notes for their partner and them during the collaborative section of the task. This

shuffle is seen by P7, P9 and P10. Only P11 started off by using digital notes first. This is interesting as students did not do this in the synchronous task. People made their own work space with this opportunity.

However, those who used physical notes were able to write comprehensive notes. Two participants (P12 and P14) placed their notes in the middle for their viewing slots.

Issue:

- Regardless of the type of notes, it is difficult to move notes around, instead, participants converse their 'learning' rather than explicitly share notes with one another (see information model section).

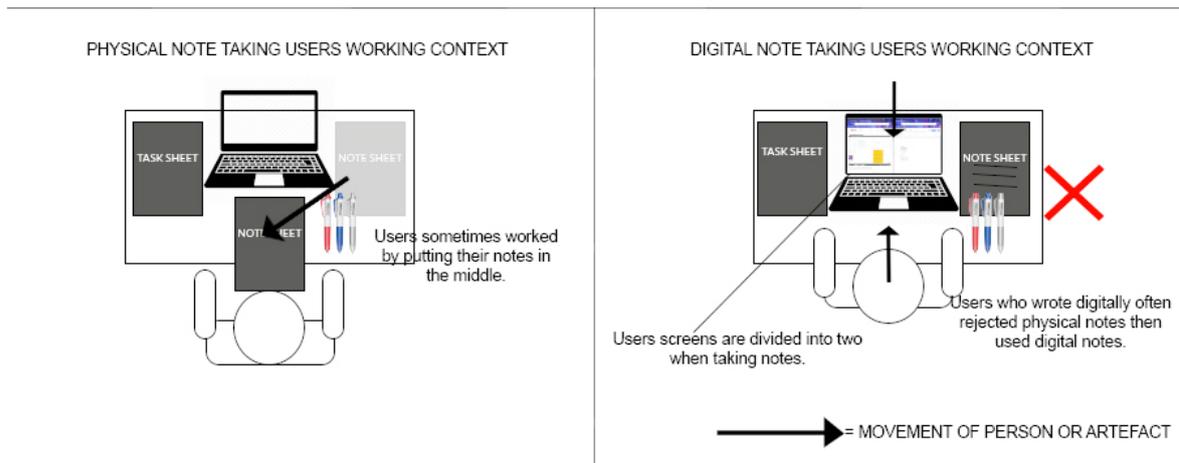


Figure 4.2: How the physical note takers (left) and digital note takers (right) worked in the asynchronous sessions.

4.1.2 Information flow model *Synchronous level*

Information movement principle:

Participants showed that information moves with the use of task sheets, notes, screen share (with audio), verbal communication and webcams. However, screen share bars flow in other places. Participants are not necessarily storing information and web cams functionality being locked is unhandy.

Participants understood the task in different ways by using different resources. In session 1 participants used the digital task sheet to write notes on what's required for the task. In turn, the notes allowed the participants to establish an intersubjective understanding of the task. In session 2 the participants used the physical task sheet to discuss what needs to be done by glancing at it. Session 3 saw the participants understand the task sheet together as well but there was use of both physical and digital versions through discussion. In session 3 the digital version was used by both participants then P6 opted to use the physical task sheet later on.

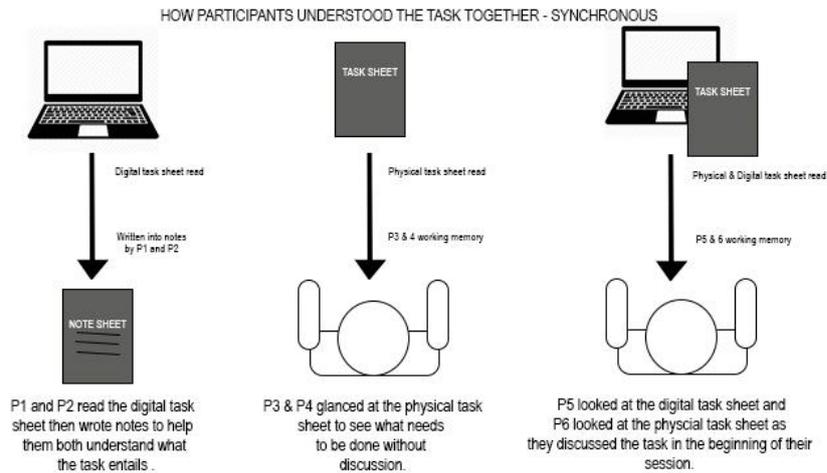


Figure 4.3: How participants made use of digital and physical task sheets in the synchronous sessions.

Participants are able to have the same flow of information as they can share their screen to other participants with Skype and all sessions made use of it. This allowed a synchronised view which is handy where participants can view video together in real time without much delay.

Participants in session 1 used verbal communication to talk about the video content together using their microphones. For example, P1 said *"Yeah, so paragraphs/text you have that. P and a slash p isn't it? That's how you close it."*, during a moment they paused video and this simply allows clarification between the participants. P5 and P6 verbally spoke about their current time mark when viewing video independently. They also verbally talk about some tags for example P5 said *"Pause it P6. Can you see on the first line is (it) says h1...That's a heading? With p it was a paragraph...heading like Lisbon and write below in our paragraph we have our p"*.

The web cam allowed participants, who have the ability to view them, to see what other participants are doing. In their interview P1 says the following about web cams *"I could see him (P2) and his reactions. Whenever he was speaking I knew he was speaking even though I couldn't hear him properly. I could see him talking"*. P4 was able to see P3's subtle gestures. Web cams allowed a persistent communication for those participants who had web cams views of other participants and made use of it (P4 and P1 mostly).

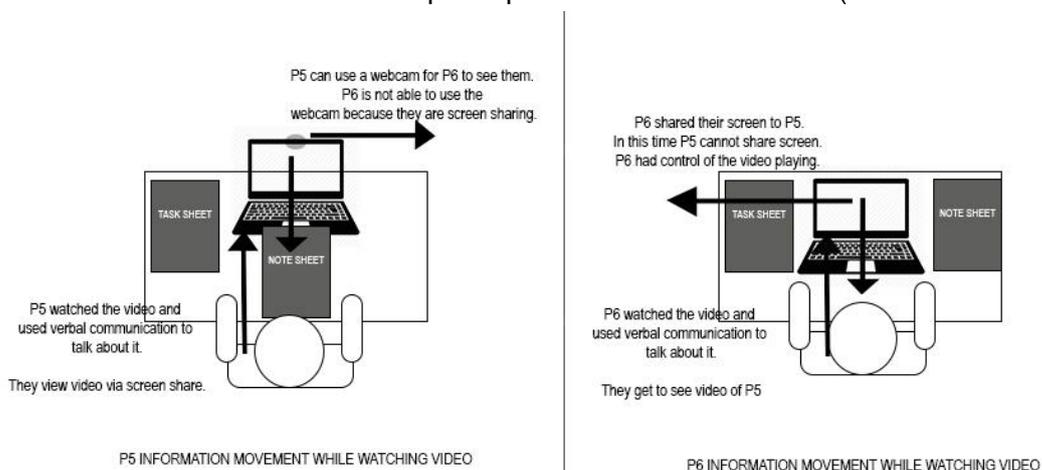


Figure 4.4: How participant's information movement was whilst watching video in session 3.

Issues:

- The screen share feature does not work in two ways. One participant at a time could only control the screen share feature and host. This is probably due to technical constraints faced by Skype but is unhandy. Independent tasks become hard to share as participants cannot physically show what they are doing explicitly/virtually.
- Participants may be able to speak to one another, but it doesn't mean the information gets stored into long term memory.
- Participants without the ability to use web cam due to their screen sharing isn't able to demonstrate their social presence as well as their partner in a call. Their partners resort to hearing out for them instead.

Information transformation principle:

Information moved in various forms during the session. Information from video is typically made into some form of notes then swayed into the conversation during the task completion. It is clear there were problems with physical notes in regard to sharing them explicitly.

It is clear the information from the video is turned into notes and stored for referral if needed. Both session 1 and 3 make use of physical notes whereas session 2 makes use of digital notes. Physically written notes are then transformed into verbal communications to help discuss content (shown by P5, P1 and P2). Interestingly, participants in session 1 wrote down time marks of the video content in their written notes but they never referred to it in the coding task. Digital notes are created by P3 and able to be referred to whenever. Information from the video is taken and formed into speech between the participants in session 2. There is also use of screenshots in session 2 but this was never referred to again.

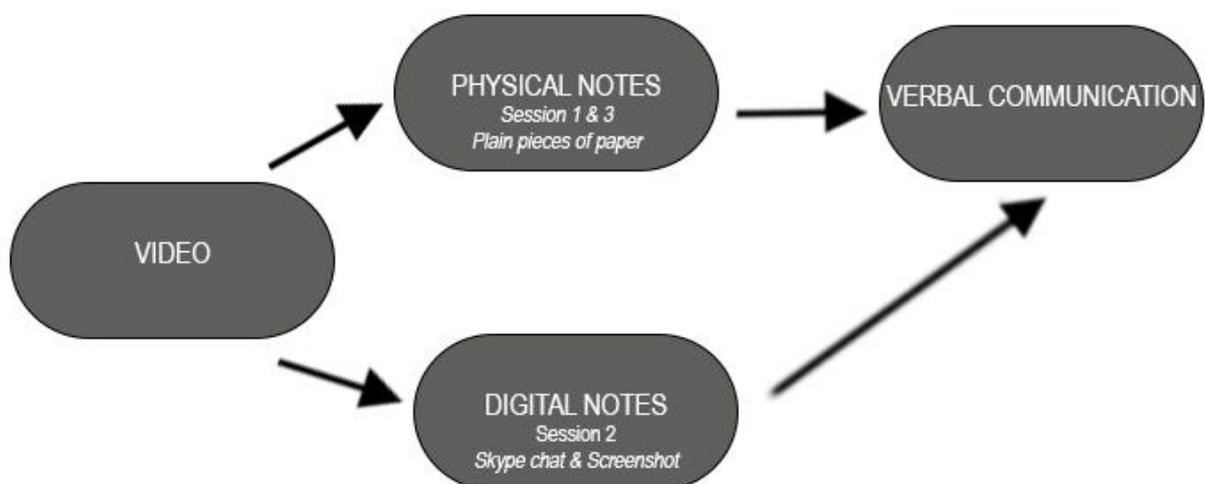


Figure 4.5: Information transformation in synchronous sessions.

Issues:

- Physical notes are made but they do not get shared easily leading to lost information. However, digital notes were also unread until given explicit notification. P3 had to remind P4 that notes were made by them. It is hard to convey information that has been stored from the screen, especially when it isn't on the same screen as the screen share.

Information hub principle:

The task sheet and Skype were the information hubs for the synchronous observations. However, reading task sheets together impeded the efficiency of the collaboration.

The task sheets in this version of the study allowed participants to know what they need to do and construct a plan. Session 1 used both the physical and digital task sheets for reference and planning respectively. The same actions are seen in session 3. Finally, session 2 used it as a reference to understand the task.

Skype provided participants to be able to view video together with screen sharing, participants can also make use of the chat features, but this is only done by P3. The verbal communication is provided by Skype as well and was used in all sessions.

Issues:

- Reading information together is cumbersome/awkward, this is seen in session 1 where the participants tried to understand the task together. P1 was adamant to move on but P2 was more comprehensive with writing their notes for the task. P6 also had issues reading the sheet and listened passively to P5 to keep things moving.

Buffering principle:

In all session's participants would need to pause the video to be able to speak about doubts and not disrupt the flow. For example, P4 establishes the rule to pause, *"P3 I can't hear you properly so if you want to speak, put your hand up and then I'll pause it"*.

Issue:

- Notes work as buffers when participants wanted to store information then talk about it when they could and not interrupt the other participants. However, participants do not always speak about them all the time therefore stuck in the buffer essentially.

Communication bandwidth principle:

Voice chat on Skype allowed a richer conversation as participants could say anything they needed. On the other hand, screen share and webcams have problems in providing 'full' communication.

Issues:

- As mentioned beforehand screen share doesn't allow both participants to share screens and this is problematic for participants who may not watch videos in sync. This is seen in session 3 when participants ended up having to share screen because audio overlapped during the call otherwise.
- Only the host that shares screen can control their screen meaning the participant must explicitly tell the host to stop the video.
- Webcams are not two-way when the share screen is on. Therefore, communication is simply impeded as participants cannot visibly see their partner's reaction. It is easy to miss actions too because the minimised window is so small (e.g P2 waving their pen to P1).

Informal communication principle:

Informal communication occurs very often when participants pause the video and talk about the task. What this does is establish the plans participants have and participants tended to skip videos for a briefer viewing experience (see connectivism section).

Behavioural trigger factors principle:

When in doubt a participant would tell their partner about a concern and the participant controlling the screen would pause the video.

Issue:

- The issue here is that the participant is not able to pause the video actively if not screen sharing.

Asynchronous level**Information movement principle:**

As the video viewing task was independent all participants just viewed information from video. There was no other real movement of information.

Information transformation principle:

Participants wrote information based on the video viewing. This meant the video turned from digital video into digital notes or physical notes. See arrangement of equipment to see how participants wrote notes. Session 5 used screenshots and Skype's chat feature for note taking.

Information hub principle:

The information hub was the Skype chat window but there was an unclear preference to what works the best: physical notes integrated into a call or digital notes sent over. Any case would lead to participants subtly using notes regardless.

All participants on this side of the study sent their notes to the Skype chat if they were digital except P7 who sent it within the call. P12, P8, P13 and P14 could not send notes as they just used the physical note taking paper. P8 provided a reason to why sending notes over doesn't make sense to him "*I feel like I used my notes for myself but not for the others*" and P12 made it clear they cannot express their self digitally "*I wrote on paper because it was easier to annotate stuff. Whereas Notepad it is a sequence...a piece of paper I can basically brainstorm all the stuff. I would put arrows to refer parts of the video. For me writing on paper was easier*".

Issue:

- Writing on paper is an obvious issue because it is unable to be shared barring communication.

Buffering principle:

Participants were able to use notes for referral later instead of memorising everything.

Communication Bandwidth principle:

Notes did not persist into conversation as much as it could, participants would often go on to make implementations based on conversations instead of seeing the notes together in the collaborative task. Notes did not work as a shared resource.

Informal communication & behavioural trigger factors principles:

Not applicable in this situation as participants were observed in their asynchronous video slot. The collaborative task was done to see how their actions work or pan out.

4.1.3 Artefact model

Synchronous level

Mediating artefacts principle:

In this case there were no boundaries within the system that required mediating artefacts to move between the systems as participants were just viewing videos.

Create scaffolding principle:

Physical notes, segregated notes and the task sheets helped create scaffolding. In session 1 and 3, participant's notes provide them help when completing a task, they referred to content they wrote from the video. In session 1 the participants arranged their notes and flipped them around to help them find relevant notes. The task sheet also helped P1 complete his task he used it to glean for the requirements of the task. P3 and P4 looked at the physical task sheet as a reference point. Finally, P5 continuously used the digital task sheet.

Representation: goal parity principle:

Participants used the task sheet to see if they completed the requirements of the task.

Coordination of resources principle:

Screen sharing allowed coordination of resources to occur, i.e share resources together. Participants were able to watch video together with the use of screen sharing. In session 3 and 2, when participants were not watching videos together they told each other what they were doing.

Issue

- One person only has the control of the system that is being screen shared. It would be better if the host's partner can have remote control access.

Asynchronous level

Mediating artefacts, representation: goal parity, coordination of resources principles:

These were not applicable to the situation.

Create scaffolding principle:

Participants use notes to help them complete the task. They go on to use the notes to complete the collaborative task. P8, P12, P13 and P14 used physical notes whereas P7, P9, P10 and P11 used digital notes.

Issue:

- It was hard for participants to share their physical notes in the collaborative task. They had to speak about notes and not do it 'fully' and mentioned what they felt was relevant.

4.2 External cognition

This section shows the results after coding the transcripts with the facets of External cognition presented in Preece et al (2015) and analysing the system in terms of how participants improved decision making.

4.2.1 Reducing memory load

Synchronous level

Note-taking and the use of task sheets helped reduce memory load for participants. Making physical notes takes away the burden of having to memorise everything from the

video needed for the task (see session 1 and 3 transcript). Session 3 had differed this strategy by using digital notes using Skype instead. The physical and digital task sheet allows participants to remember what they need to complete with the video and this was apparent in all sessions.

Asynchronous level

Notes also helped reduce memory load in the asynchronous sessions. All participants made notes to help them complete the task, they reference the content they wrote from video during the collaborative element of the sessions. However, it must be discussed that during collaboration the notes are used briefly to complete the task and there isn't much discussion regarding them as the collaboration went on.

4.2.2 Computational offloading

There were no instances of computational offloading in both synchronous and asynchronous observations.

4.2.3 Process

Synchronous level

Participants created a list and used the digital task sheet to aid the process. P2 wrote a checklist to see what they needed to complete for the task and that let them refresh their mind. P5 looked at the digital task sheet which let them see what they need to complete.

Asynchronous level

There were no other instances of people interacting with information or creating information that facilitates process in the asynchronous observations.

4.2.4 Perception and Action

Synchronous level

The movements of notes supported perception and action in the synchronous session. P5 placed their notes in the centre and it enabled them to write as the information flowed to them. P2 moved their notes around often to make sense of them and mostly to facilitate their writing. During the collaborative task they stacked their notes in chronological order to see what may be relevant to the task.

Asynchronous level

P12 and P14 moved their notes to the centre to allow them to do work appropriately. This helped them write comprehensive notes.

4.3 Connectivism, social presence and student agency

This section summarises whether connectivism, social presence and student agency existed in the distributed synchronous and asynchronous video learning environments.

Connectivism

In the synchronous sessions it was clear that participants had the urge to use the internet and use search tools for their queries. Participants went on to use search tools when they felt there wasn't explicit explanations in videos or sold on video use. P5 and P2 were persisting to use Google once they found out the playlist doesn't explicitly explain a task. P4 used the internet and searched into the use of some HTML tags opposed to viewing the videos on the playlist.

The bullet point implementation was not explained deliberately in the playlist to see whether students explore the videos to see how it may be done together. P1 and P2 were on the right track but the final implementation did not see them use it (see transcripts). P5

& 6 were not bothered to look through the videos to implement bullet points. However, P4 just dismissed the use of the video since they did not like it.

Knowing this, it was hard to conclude whether connectivism is really used with videos during the sessions and shouldn't be considered in a design of a video learning environment.

The asynchronous tasks were straightforward to follow, and participants didn't really require extra materials through connectivism.

Social presence

There are instances of social presence in the synchronous video learning environment. Not surprisingly, there is no social presence in asynchronous video viewing. Social presence is provided by: verbal communication, screen share and web cams in the synchronous sessions. The voice chat allows participants to know what they are thinking and allows informal conversation in all of the synchronous sessions. Only one participant can use their webcam when screen share is on, i.e the person viewing the screen share. Therefore, the presence of the participant hosting a call becomes low. Screen share allows participants to see what their partner in the call is doing and it is used in all sessions. The constraints of this are explained above in other sections.

Student agency

It is clear students did not want a comprehensive version of understanding CSS and HTML through video in the synchronous observations. It reflects Kop's (2011) findings that students prefer to self-direct their learning. In all sessions there are informal conversations regarding the fact time can be cut down by watching videos and doing trial and error to get the task done. For example, P2 wanted to watch more about styling but P1 was not interested in learning 'more':

P2: *What was the last video about?*

P1: *It was just about CSS...*

P2: *How to style text? What if it tells us how to underline...?*

P1: *We don't need that though, do we?*

P2: *I mean, we don't have to but maybe for subheadings.*

P1: *It's alright man.*

Another example shows how participants just wanted concise content to reach their learning goals. P3 says at one point "*We are just trying to make three paragraphs... Why am I listening to all of this nonsense?*" The videos provided a comprehensive account for beginners in HTML and CSS. Participants simply did not show the enthusiasm to view all of them. In all synchronous observations there were internet searches done by the participants regarding how to implement something in HTML showing videos may not be 'to the point' (see above). Participants in session 2 and 3 got frustrated with watching video and increased its speed in order to go through it quicker.

Participants did not unanimously use the same note-taking tools in the 14 sessions. Some participants used digital notes, and some used physical notes across all seven sessions.

4.4 Thematic analysis

Upon completion of the thematic analysis of the interviews, there were four themes identified. The themes can go on to give some evidence to what makes a useful distributed video learning experience synchronously and asynchronously. ‘Synchronous viewing collaboration pain points’ and ‘Asynchronous viewing collaboration pain points’ includes the aspects that respective session participants disliked during their sessions. ‘Synchronous viewing collaborative positives’ and ‘Asynchronous viewing collaborative positives’ includes the aspects that respective session participants liked during their sessions.



Figure 4.6: Final thematic map on interviews after observations.

4.4.1 Synchronous viewing collaboration pain points

Through the interviews it emerged sound encounters, cautious communication and long-winded viewing were problems across participant’s interviews. The following sections provide more detail.

Sound encounters

Three participants spoke about how there were sound issues and how they had alternatives to help them lessen it. Two of the participants made it clear they didn’t like the sound issues and one participant gave it a brief mention. P4 and P5 said the sound was poor because of clashes between video and their partners microphone output. P1 said they could not hear their partner well during the call.

“So, for the collaborative tools and using the videos, it wasn’t that great. For example, I had to put the volume high enough just so I can hear it. At the same time, I couldn’t hear him say anything. So, for him to start talking I’d have to mute (/pause) it then ask him to repeat his question”. (P4)

"The issue I had was the audio with regards to the video was very low. I think it was because P6's audio was taking over. When we shared the screen, I was able to then hear the video..." (P5)

"I could see him and his reactions. Whenever he was speaking I knew he was speaking even though I couldn't hear him properly". (P1)

Cautious communication

Three participants shared their concern about not wanting to cause disturbance to the Skype call when watching videos. This shows how participants sometimes were not able to express themselves because they thought they may cause a disturbance. This stops the session from being able to be open and connected as a MOOC aspires to be.

"Sometimes I would want to skip something forward. I feel like I can skip because I don't need it. I'm not sure if P3 wants me to skip that". (P4)

Researcher: "You didn't collaborate over videos sometimes. Is there a reason?"

P2: "I was worried if I speak over".

"I would give hints like I don't like think this is relevant. He would take time to see if something is relevant or not". (P2)

P6 found it hard to make P5 aware they should view sections when coordinating with them. In fact, in the actual session they ended up suggesting going through the video in 1.5x speed to stop disturbances to the video viewing.

Researcher: "What would you think is the worst thing for learning, in this situation?"

P6: "Coordinating videos with the other person. What you might see as important or you want to skip, the other person may think we don't need that...".

Long winded video viewing

Three participants explained how they found videos excessive and it made them feel like they cannot process it and learn as quickly as they like.

"Overall, I would say the steps were longer than expected. In the sense that they weren't that direct...it wasn't showing the example straight away..." (P5)

"The videos were long, for myself it would be easier if it was in a written format. I could read each example and just do it". (P6)

"Long winded video aren't for me. My learning style is - get in there and try learn or decipher from there and get the information. The possibility of watching 8 videos back to back ... was distressing". (P3)

4.4.2 Synchronous viewing collaboration positives

This section talks about the positive aspects participants felt they had in the synchronous video viewing environment with the fictional MOOC incorporating Skype and YouTube. Through the interviews it emerged verbal presence, synchronised view and gratification upon completion made participants have a good experience.

Verbal presence

Participants mentioned having the ability to hear someone let the task flow and provided high quality interaction.

"The new addition of the sharing screen and sound. I was not only hearing the YouTube video, I could also hear his voice, there wasn't much delay in response". (P2)

“Our voice chat was very helpful. Speaking to each other we made sure that...we spoke about everything that we were going to do. We made sure that it was clear: our actions, what we’re doing, when we’re going to do it...” (P3)

Researcher: *“What are tools you used in the scenario to help you coordinate?”*

P6: *“You write down the notes and just explain what you wanted to do. Then you talk with each other to come up with the similar idea”.*

Synchronised view

Screen sharing allowed participants to go through the video at the same time. It was merited for its ability to create an intersubjective understanding of what is happening on the video content.

Researcher: *“What excelled the collaboration?”*

P3: *“I think it was Skype because I could see your (P4’s) screen. Whenever you (P4) were running it, I didn’t really need to. I could see a live thing on Skype, so I would see everything that you (P4) were (was) doing”.*

“The collaboration, I didn’t see any big problem with it. Again, with the sound it helped a lot that the fact I can simultaneously listen to him and the YouTube video. There wasn’t much delay between the two. So, when I say stop the video, we’d take notes and then continue on after”. (P2)

P5 talks about screen sharing but in context to the task which is out of interest in this project but mentions in his retrospective *“It is always good to have a second eye. With Skype we were able to work together at the same time”*. This shows he valued the screen share as much as P3 and P2.

Gratification upon completion

Participants were satisfied when they were able to complete the task after/during viewing video. When the author asked whether they learned anything, P1 and P2 happily responded with *“I never knew how to code, so I thought it was good”* and *“I learned how to code, it showed me how complex it is”* respectively. P3 simply stated the best thing about the situation was *“the website coming to fruition”*. P6 said they were highly motivated to do the work because of the task provided with the video, *“Focussing on completing the task at hand was a motivation for communication. Just wanting to excel at what we were doing”*.

4.4.3 Asynchronous viewing collaboration pain points

This section talks about the problems participants faced in the asynchronous video viewing environment with the fictional MOOC incorporating Skype and independent YouTube use. Through the interviews it emerged participants had issues with note-viewing, note-taking methods, time issues to make notes and note preparation.

Note-viewing

Participants had issues throughout the asynchronous sessions to view each other’s notes. Three participants made it clear that it was difficult for them to see notes or explained that it was hard to articulate notes for another person. This shows how there is no agreed format/artefact for students to share content that expresses their learning once viewing a video. It was common for participants to just summarise their learning and try embedding it into the task through verbal communication.

“I did find viewing my team-mates notes quite difficult. Especially since we wrote it down or even if it was on a Skype chat. It was a bit hard to follow in that format”. (P8)

*"I think the notes, the written notes, I couldn't understand P8's notes. He couldn't really see mine".
(P7)*

"You see P9, he had set out bullet points, sometimes sentences. Whereas me I'd have two three words. Say for if I look at my notes I would probably understand what I'm saying but if he looked at my notes he'd be like (confused)". P10 said this as during the session their notes were subtly dismissed by P9.

Researcher: *"We did mention already, notes were not used. Just to confirm the answer, does it feel unnatural?"*

P8: *"Notes to me was valuable for me. I don't think they were valuable for P7 and his notes were valuable for him but not for me. Individuals need their own notes, but it doesn't need to be seen by everyone".*

Note-taking methods

As mentioned in the student agency section participants throughout the sessions took different approaches to making notes. Participants presented the idea that they hadn't have enough tools to create notes. This shows students do not know how to express their thoughts well enough through an online platform that was open to many options.

"The way I take notes is by writing it down in the format it is. It's more of a drawing than notes. That is not possible to do on Skype".

"I just felt like my notes had to be more visually stimulating than just straight lines of text". (P8)

"I wrote on paper because it was easier to annotate stuff. Whereas Notepad it is a sequence...a piece of paper I can basically brainstorm all the stuff. I would put arrows to refer parts of the video. For me writing on paper was easier". (P12)

Researcher: *"How did you deliver information into the conversation...?"*

P10: *"I thought it would be preferred to take screenshots. You can have a large sum of information in one screen".*

P9: *"I was going to do that, but it was time consuming like cropping it and pasting. I just left it out"*

Time issues to make notes

Participants mentioned how they did not have enough time to make notes. This was probably due to the way the task was set up. However, it goes to show giving more time allows people to make more concrete work.

*"Generally, I pause and type up and code and pause. I'm always rewinding and fast-forwarding...
In the task we were time restricted and we had 10 minutes". (P7)*

"I think if we had more time on note-taking it would have been better. I didn't have that much notes as P9 did". (P10)

Researcher: *"What was the worst thing about the situation for learning?"*

P12: *"The fifteen-minute time. The ten-minute time"*

Note-preparation

Building on the issue with time, participants in session 6 and P9 expressed how any preparation for collaboration should have happened beforehand. Again, this may have been due to the task constraints (the project's evaluation is discussed in chapter 6).

"I would have preferred to watch the whole video. Rather than watching parts. For me I prefer getting the whole idea first". (P9)

Researcher: *"Having more time would have been...?"*

P11: *"Not necessarily enough time but having all the preparation for collaborating".*

P12: *"Doing everything beforehand then starting. Instead of splitting it in times".*

4.4.4 Asynchronous viewing collaboration positives

Clarified communication

Almost all participants in the asynchronous sessions merited the use of video conferencing after viewing slots. Video conferencing allowed participants to speak with their partner and confirm their idea of the CSS grid implementation. The utterances made by the participants suggest they feel assured once having a line of communication and viewing alone is undesired. The verbal communication allowed participants to discuss their findings and was highly rated showing how confirmation upon viewing allowed collaboration.

“There was a continuous line of communication without breaking down. Even though there were things to refer to, it was still easier since we had a clear line of communication. We can explain it in a form that is possible” (P8)

“If I had any concerns or questions, I would ask P9 and he could quickly tell me or show me while he’s not stopping working. He can still continue while I catch up.” (P10)

“It’s always easy when you have a direct connection. Waiting for some one’s response made it more collaborative, easier.” (P11)

“Once you’re not listening to each other it’s a bit more difficult to complete the project.” (P12)

Researcher: *What was the best thing?*

P14: *“I would say communication. When you’re working with someone they can help you out also.”*

Researcher: *“How did you refer to specific content using the notes? If you did...”*

P13: *“I did, we talked about the (CSS) items and obviously took similar notes just in case it came up. Then we asked if each other had something.”*

4.5 Design features for video learning synchronously and asynchronously

The following subsections bring together design features recommended for a distributed synchronous and asynchronous video learning MOOC. The features are built on the results from prior sections.

These design features could be used to drive or give ideas for MOOC developments that seek video at its core for social learning. These design features are mainly about concepts that could be used in a digital distributed synchronous and asynchronous video viewing system. Design features are by no means limited to this list.

Synchronous level

For the synchronous level it is recommended that a video viewing system should: make use of web cam, microphones and remote-control access. Allow participants to have their own cursors, a shared note space, an integrated system, interactive video and short courses.

- **Allowing the use of web cams and microphones with remote control of video.**

Learners need to be able to share their web cams, speak to each other and control the video together with remote control features. These tools facilitate social presence to the online setting and control for participants in a digital synchronous video viewing environment.

Verbal communication simply aids learners to discuss content. Without verbal communication, students cannot ‘re-teach’ content they are taking in to their peer. Other tools such as notes and typing are accessory and verbal communication is more

persistent. Web cams would help learners see each other and their actions. The two tools add social presence by allowing learners to hear and see one another. Remote-control of video addresses the issue of a participant not being able to control and pause videos. This still allows the informal communication over video and stops excise of having to request to pause the video when a host is screen sharing. Learners would be able to raise their concerns as they can pause the video without being cautious about communication causing disturbances.

- **Learners have their own cursors.**

Learners should be allowed to use their own cursor during the session and it gets shared to their partner when it overlays the video. With the cursor being shared, a learner can explain content. This should cover the subtle pointing that cannot be seen by learners during the synchronous setup observed. Shared cursors also help to add presence to the call as the participant's actions of using fingers from the physical world is emulated digitally on to the screen.

- **Shared note space.**

A shared writing space will allow participants to write and show their notes openly and learners can refer to it and spark conversation. With this, the information movement and transformation can be seen together and add to social learning as participants distribute their knowledge opposed to keeping it within their work space and themselves. This could also work as an accessory tool to reduce memory load and learners refer to it as its clear students really conversate their ideas.

- **Bring together artefacts for an 'all in one' system – an integrated system.**

Learners could be presented with panels on a screen and allowed to move them around for their own preferred setup using standardised layouts. Allowing full customisation freedom could lead to a potentially unusable system.

Learners should be presented with a task sheet space, task space, note space, text chat, playlist and video viewing space with the webcam overlaid. The video and playlist should be presented in a larger panel and the subsequent panels should be smaller. If a learner changes their layout, it is for one-self as other learners would have different preferences.

This feature addresses a new information hub where learners are able to give video direct observation. Learners are given freedom to setup their workspace accordingly in a digital environment. They can use the task space to see what work needs to be completed and can be read together if needed without complications to open and view it. Learners will not have to move their head around to see other artefacts and not use their motor skills as much to write physically.

- **Interactive video use.**

Videos should have a layer of interaction added on top of it to allow learners to skip content usefully. There could be use of markers on the video's timeline to indicate where different content picks up as a learner moves their cursor on it. The learners can click them to skip to content through discussion instead of randomly skipping to points using a thumbnail as they currently do. If learners understand content they can skip it purposefully and cut down long winded video viewing. This enhances the current interaction that participants have of skipping content as they run their cursor across the timeline and referring to time marks.

- **Short courses**

Based on the findings in regard to student agency and comments made about 'long winded viewing', participants should be presented with short video courses. Otherwise, learners are very reluctant to go through the videos. A few videos should be selected, and extra videos should be marked optional to enhance students learning if making a comprehensive viewing experience.

Asynchronous level

For the asynchronous level it is recommended that a video viewing system should: have an integrated system, notification system, note sharing, allow preparation beforehand, and create a collaborative space, leverage touch functionality and other tools for participants.

- **An integrated system**

This feature shows similarities to the design feature with the same idea in the synchronous level. Learners may benefit from selecting standardised layouts which cater to their own preferences.

In this case, learners should be presented with a task sheet space, task space, note space, playlist and video viewing space. The video and playlist should be presented in a larger panel and the subsequent panels should be smaller. Learners would be able to give video direct observation and freedom to emulate a physical work space with the standardised layouts. Learners would watch their video, log off and wait for their partner to make notes and come back to it another time to complete the task together using their knowledge acquired without the video space. This also saves participants from having to use word processors to write notes and save them.

- **Notification system**

Learners who are waiting to view video in an asynchronous system needs to be notified about their partner viewing video. This would stop confusion as to what is going on in the system. A system should notify learners in the MOOC when one person (their partner) has viewed the video and it is their turn. In the system observed this was done by the author messaging on Skype. This simply improves cohesion for the participants of the system.

- **Note sharing**

In order to keep the knowledge gained and notes useful, the system should have a stream showing what participants have created (if they have) in the viewing during their viewing slot. This helps keep the social learning aspect prevalent. This can help notes persist into the setting and not go to waste.

If the notes do not get shared it leads to a wasted resource. It was picked up that participants have issues viewing notes through the thematic analysis of interviews.

- **Allow participants time and preparation beforehand**

In brief accounts it was clear several participants stressed the importance of having more preparation time ahead of any form of collaboration, i.e watch the whole video. Learners should be paired and given a considerable amount of time to work on the video and then agree to collaborate with each other. This would simply allow the participants to contribute all their thought to the video and then collaborate accordingly.

- **Create a collaborative space**

Based on the comments in the interviews it is better to allow students to collaborate once the video is viewed fully opposed to chunks as done in the observations. This should include basic video conferencing tools and a task for the learners to complete with their acquired knowledge. The benefits are same as the points raised in the 1st design feature in the synchronous features.

- **Leverage touch functionality and other tools for participants**

Using touch interfaces to write notes can be used. With the release of more devices incorporating touch screens will allow systems to have an area that allows participants to use their fingers or pointing device to note take. Touch can be argued to be an easy to understand interaction idiom. Other tools should be encouraged such as annotated screenshots or whatever sparks creativity. Participants attempted to use screenshots but failed due to time issues. Such a system allows notes to stay within a digital system and cuts out the need for physical tools.

Without this functionality participants may not be able to externalise their thoughts. It was picked up that participants had issues with note taking in the thematic analysis for the interviews and they needed different tools.

5. Discussion

This project explored how digital distributed synchronous and asynchronous learning video environments could be designed. The work was carried out by running multiple observations and short interviews where students worked in fictional digital synchronous and asynchronous video learning MOOCs. The subsequent sections discuss the work completed in this project and if it was reliable and valid.

5.1 Review of the research objectives

Below are the research questions and objectives (as discussed in section 1.2 and 1.3) that this project aimed to cover and a short retrospective of how it was met.

- What are the typical challenges currently faced by groups of students who wish to use video as the focal point for learning in a digital setting and how do they currently tackle them?
- What makes a useful synchronous/asynchronous distributed video learning environment?

To meet this, the objectives were set to run a user centred approach by observing participants in fixed setups and then interviewing them. Following the data collected would be analysed with frameworks and theory to produce sets of design features.

This project detailed challenges after completing 7 sessions of observations and interviews with 14 participants to see how video is used in synchronous and asynchronous settings. 6 participants were coupled into 3 groups in the synchronous sessions and 8 participants were coupled into 4 groups in the asynchronous sessions. Through subsequent analysis using DiCot, External cognition, Connectivism, Social presence, Student agency and Thematic analysis it was clear what issues participants faced. All findings are reported in chapter 4 and most issues have their remedies detailed.

The results in chapter 4 present a detailed account of what made a useful distributed synchronous and asynchronous system with issues clearly pointed. Moreover, the final section in chapter 4 discusses what could be used as features in distributed synchronous and asynchronous digital learning environments using the data gathered and analysed.

In hindsight the objectives and research questions of this project were met however answering the question of how participants currently tackle challenges was not as detailed in all instances as there were no remedies shown or clear actions observed.

5.2 Findings

This section talks about other findings of this project in relation to the literature presented in the critical context.

5.2.1 A new communication hub for MOOCs

The findings suggest there is space for students to come together and communicate by viewing video remotely in real time and at different times. Through the interviews and observations, it is clear people enjoyed the sessions and are able to work together fairly well using Skype. It builds on Murray's (2014) point that people can learn using video tutorials, in this case, students came together to discuss it together using their artefacts. There was social presence with verbal communication, web cams and shared screens showing actions and this works in line with Fita et al (2016) findings that students like using such tools.

5.2.2 No need for presence of a tutor

In turn, this meant there is no need for extra tutor support as suggested by Roll et al (2016; Penn Online Learning, 2016b). Students can help themselves through discussion and pausing video like Li et al's (2014) study in the synchronous sessions. The idea of video learning this project took is that it can be used as a source of gaining understanding with peers and it is fair to say participants were able to do this despite the constraints in sharing resources. Through the synchronous observations it was clear that having video-conferencing tools enabled 'real' discussion aside video content and this can be seen as introducing an adaption of 'discussions threads' in Future Learn (ColumbriLearn, 2015).

5.2.3 The need for more complete systems

It is clear that there is no complete system for learners to partake in a truly fluid distributed digital video viewing learning system. Participants faced barriers in having full coordination. Similar findings are found by Verstegen et al (2016) when students used other tools to complete their learning system. For example, students in the asynchronous video viewing version, used external word processors to be able to reduce their memory load and use the work as a reference in collaboration. The details given in chapter 4 should inform how a synchronous and asynchronous video learning systems could be created using artefacts into one system.

5.3 Limitations of the research

The findings are susceptible to volunteer bias during the data collection and in turn possibly effects the external validity of the project. The recruitment process involved the author reaching out to their personal contacts through social media. Participants included those who volunteered in the author's previous studies. The recruitment process aimed to increase the external validity by recruiting students and recent graduates, as identified in literature, to make the data useful. In an ideal world, the recruitment process would involve using some form of recruitment agency to get actual MOOC participants and involving more subsets of MOOC students identified by Gillani & Eynon (2014) & Glass et al (2016).

The project immensely felt the limitation of the timeframe given to complete it. This also effected the recruitment of participants and analysis carried out. There was a low number of groups studied to make generalisations about how people work in the current setup. In an ideal world, more studies would be completed to see whether the trends identified occur in more couples in the settings and give the study more strength. The study oversaw 13 male participants and only 1 participant was female. This meant the project did not take the perspective of females and generalising this data as common behaviour is bad practice. With more time the recruitment stage could have been dedicated to finding a balance/diversity in the participants involved. Finally, with more time the author would be able to see the data and possibly pick more positives and negatives of the environment.

It was uneasy to see sessions to scale i.e involving more people to observe in a session. Placing this much work on the author would have been too heavy. It would have required more resources and researchers to see many people in a session. Involving more participants in the sessions is desirable as it is what MOOCs live up to in its courses.

Due to the tiresome sessions completed beforehand participants were reluctant to speak about their experience in their informal interviews. Participants had less enthusiasm compared to the observation session. The author had to cut the interview short often. This was a downfall of a semi-structured interview as there wasn't a comprehensive list of

questions to spark conversation. Interviewees felt the need to conform with their partners opinion and may have led to unreliable utterances. The quality of the interviews was limited leading to less findings than expected for the thematic analysis. This could also be due to the fact of the skill of the author being poor and in future more training is needed to run a conversation.

6. Evaluation, Reflections and Conclusions

This chapter discusses the evaluation of the whole project. The discussion talks about the project plan, critical context, data collection and data analysis. Then the project's final conclusion and future work are discussed. To conclude the report, a small reflection of the project is included.

6.1 Project evaluation

Based on the feedback from the supervisor, the initial plan of the project was inadequate in many areas and needed reconsideration before its proper start. The activities of the project were rethought after convening with the supervisor appropriately. Originally the project involved using other frameworks that were slightly irrelevant to the objectives of the project. The supervisor steered the project to employ the use of DiCot and reconsider other aspects such as rethinking the objectives itself and how many participants should be involved in a session. Naming all the recommendations before the start of this project is cumbersome for this space. Based on the feedback, the project was rethought and an appropriate amount of correspondence was completed until a new and realistic project plan was agreed on.

The gathering of the critical context allowed the project to see how MOOCs have been in development for the past decade. The author gained that MOOCs created a new direction for learning online through various pedagogies. It was apparent collaboration is a big key to creating MOOCs and has been studied. Evidence was gathered to conclude that video itself is not used as an explicit collaborative learning object and that gap solidified motivation for the study.

The critical context also showed methods that were useful to this study and simply informed the process in relation to the data analysis. Along with DiCot it was identified why External cognition, Connectivism, Social presence and Student agency could be helpful to analyse the data gathered in the observations. Other than External cognition it was apparent that the extra theories were prevalent in MOOCs and this project wanted to explore if they exist in the setups observed.

As explained in chapter 3 the method involved two activities: data gathering and data analysis. Data was gathered by observing participants and running informal interviews after them. Then the data was analysed using the aforementioned tools and theories. Also, interviews were coded using thematic analysis. This method seemed useful as it followed the fundamental idea of interaction design where participants get observed and some data regarding current actions is the output. In this case, participant's conditions and the good practices and challenges were focussed on and led to the creation of design features.

An improvement to the study would have been not setting up a pre-determined physical space in the observations. The author could have made participants get what they felt would be useful for themselves to the sessions. Or the session could have been held remotely over Skype in their homes/own spaces. Due to recording issues the author would face it wasn't possible for participants to get their own laptops or work remotely from home etc. In the current setting, participants are presented with a set physical setting and that slightly influences the flow of information as participants could only use what they have been given.

The decision to make a structured asynchronous video viewing MOOC was flawed as it was an unrealistic situation in retrospect. It may have been more useful for users to view a whole video independently and the data collected about how people view video would be the same. The structured setup was done mostly to keep participants upbeat during the session opposed to waiting long periods for their partner to 'respond'.

This study also focussed on whether students could learn fairly instructional topics through videos. It is unknown whether more challenging topics could be taught with video. Future studies may want to look into seeing how participants work for different subjects opposed to basic web programming.

On reflection it seems the use of extra theory on top of DiCot and External cognition was not useful. The connectivism findings were not useful due to the task set-up (see section 4.3) forcing Connectivism on session 1 and 3. In future the sessions should just see if participants use other tools instead of suggesting using tools or simply including a question in the interview about whether other sources, with video, are useful. Including student agency and social presence gave little extra insight. Whereas External cognition allowed an extension to DiCot principles. The time used to incorporate the theories could have been used for extra analysis time with DiCot and External cognition.

Some activities took a lot of time to get done and the author underestimated how much workload was required. The author mostly faced problems when transcribing/summarising the 7 sessions and analysing it. In turn, the design features needed more time to be novel as little time was spent on them. In the future there would need to be a lot more time dedicated to these tasks and help round a 'fuller' project.

It should be noted that the findings explained in chapter 4 are subject to the skill of the author. In a more ideal world, a team would work on this task to find as many challenges and good practices. The data would also be iterated plenty times to confirm the data whereas here due to the timeframe this could happen only a couple of times

Final criticisms should be raised about DiCot as it isn't necessarily easy to use and makes no distinction between people and artefacts. It assumes that information just flows between artefacts as it transforms. Researchers do not really know what a participant is thinking and it doesn't explain a participant's reasoning and researchers have to guess what is happening. A lot of time is needed to understand what a participant may be thinking and in context to this project's timeframe was slightly inefficient. The DiCot framework was very demanding in the sense that it assumes researchers can pick up findings by gleaning data swiftly. Furthermore, DiCot doesn't present a way in which to prioritise findings and left the author guessing what may be the best to address in their design features discussed in chapter 4. Despite this, DiCot allows researchers to see many interdependencies exist within a collaborative environment and was very useful. The author was able to identify interactions they may have not identified without DiCot.

6.2 Final conclusion and Future work

The findings in the project have shown what facilitates learners in a distributed synchronous and asynchronous video viewing environment. Before the completion of the project it was clear distributed collaboration over video was not explored in MOOCs. This project explored the phenomenon to inform what a digital environment could be like and created some design features to inform the design of such systems.

Future work should employ these findings and use the design features to start the design of synchronous and asynchronous systems followed by a usability evaluation with

participants. Other authors can explore the issues identified and produce concepts with their expert judgement. Saying this, the author of this project believes there has been a contribution to aid the creation of a new concept in digital distributed synchronous and asynchronous video learning systems. The ideas could be developed with a detailed design and be used in MOOCs.

However, to validate the findings there should be a larger study to see whether the results identified in this report as true to a wider population. Also, further analysis from other researchers would allow a more diverse data set to inform the design of such systems. Other researchers could also look into ways to rate the severity of the issues found in chapter 4 and make a more deliberate list of design features.

6.3 Reflections

The completion of this project has given the author the opportunity to showcase some of the skills attained during their modules in their MSc in Human-computer interaction course. Particularly, they were able to showcase how to collect data and analyse it within a fairly tight schedule. The author was also able to expand their skill set through this project by using tools unfamiliar to them such as Thematic analysis as they have never applied it. The project was very independent in contrast to other modules during the course and their previous studies, i.e undergraduate level and lower. The project has enhanced them in the sense that they will be able to carry out future individual projects with more confidence.

The best thing for the author was being able to run observation sessions appropriately. Being an inexperienced, the skill is fairly new to them and seeing participants understand and comply with their planning was a huge satisfaction. The aim is to continue improving this and hope to show it in a professional role outside of academic settings. However, in terms of interviewing there is a need for reading and training to improve the skill to encourage conversations.

The biggest challenge faced when completing this project was the timeframe left after rethinking it with the supervisor. Gathering critical context took longer than expected and in turn affected the subsequent stages, i.e recruitment and especially the transcription and analysis as they were done rapidly (as mentioned above). This left the analysis stage not having much attention as it needs. The design features would have been 'fuller' if there were more investigation iterations with the data collected and a satisfactory amount of time.

If this project were to be done again, there would need to be huge consideration to start the proper project as early as possible as time is of essence with any project. This project has taught the author mostly that it is much needed to allow time and keep tasks tracked to be efficient.

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Introduction

Multimedia learning and MOOCs

It is known that people learn in different ways to support their needs and tend to ‘learn by doing’. People have many resources to learn from and using texts to facilitate learning is not ideal. With the increase in multimedia interfaces there has been space to represent topics in different ways that are more interactive opposed to typical ‘traditional’ methods such as reading instructions (Preece et al, 2015). In turn, there has been a proliferation of different technologies to accommodate learning such as ‘massive open online courses’ (MOOC) in the last decade (Porter, 2015).

As Porter (2015) describes MOOCs are e-learning environments that are typically available to an unlimited amount of people by an institution. Furthermore, as the name suggests MOOCs offer ‘traditional’ courses that are expected to reach a multitude of people, through a platform that is open to all through an online platform. Examples of MOOCs are Udacity, Khan Academy and EdX, however, commercial providers such as Lynda.com and Codecademy do exist showing how MOOC types are diverse and not so open. There are two established types of MOOCs (Yuan et al cited in Porter, 2015): (1) cMOOC: more open, for communities to share knowledge and understanding. (2) xMOOC: restricted used to learn knowledge and skills. There are a lot more, but this basic understanding is enough to express the idea of MOOCs.

Within these systems there are videos used to explain how concepts work, for example an expert can explain object orientated programming in their own fashion. However, research has not investigated the effectiveness of remote collaborative video and this may be of immense use since it brings up people together like the cMOOC concept wants to live up to. Instead, discussion forums are used by MOOCs to be social. Those methods may not be effective as seeing a person as a ‘talking head’ through a webcam and content being shown on a synchronised video that is being viewed concurrently and this research wants to study that.

Aims, objectives, scope and beneficiaries

This project proposes to entertain the idea of a ‘distributed’ collaborative video experience that can be of use on MOOCs. The aim of this research is to suggest new ways for people who may want to collaborate synchronously at the same time and different place on MOOCs. Thus, potentially enhancing the MOOC environment’s interaction for the better through a user-centred method that allows collaboration for people with other peers or students (etc) who are on the same course/have same interest. Thus, the scope of this study is to understand how people work in a group with video as the main artefact for communication in lab settings. In turn, this will create a report with a set of guidelines explaining how participants want to interact with video as the sole modality for learning. These new guidelines could be of use for designers of such courses. The guidelines will also be tested to prove if they have worked. As this project runtime is during a short period the test will only run on desktops to allow ease in planning and recording of sessions and unneeded complexity.

The main purpose of the project is to investigate possible features for a collaborative video experience for distributed MOOCs. The idea is to create features for a system that is useful, effective and satisfactory to live up to concepts of usability and if the user experience is worthwhile and a worthy addition to MOOCs.

Beneficiaries of this project supposedly are researchers in computer science, human-computer-interaction and interaction design professionals who are interested in collaborative

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environments. Also, end participants of MOOCs as their product is potentially being altered for a better experience. It may help more people delve into MOOCs as video may be there optimised mode of learning (e.g using YouTube with friends) and extend the user population.

Critical Context

Background & Motivation

According to Zhang et al cited in O'Donnell (2015) e-learning research advocates say there is room for flexibility in such systems where people can use systems at different times and dates. Also. potential to saving costs, letting people work at their pace, with unlimited access and finally having useful updated and maintained content. This means there is much room for collaborative systems within MOOCs both co-located and distributed.

Past research exists on how collaboration is supported with MOOCs. Li et al (2014) noted how people work well using MOOC in co-located groups and instead of open networks (remotely). Their study showed how people watching MOOC videos together generated high level satisfaction as there was 'increased levels of attentiveness and engagement' especially when there were 'distributed' controls to watch a video on a single display. This shows the power a central focal point can have for good discussion about topics students face with fellow peers. Academics have used e-learning platforms (Fita et al, 2016) to make collaborative environments by allowing their machine's IDE to be accessed via remote control/screen sharing to 'fix' Java code filled with errors by students studying an Algorithms and Data structure class. This is another example of how a focal point can allow participants to be engaged with the system and collaborate. However, people used chat opposed to other communications like audio and video because of connection problems and this is more of a technological problem.

Established collaborative systems *used* in learning settings exist. In Google Docs participants can collaboratively write documents. Findings from Yim et al, 2017 discovered there are different types of writing strategies in classrooms that use Docs, for example 'Cooperative Revision' and this shows how well the system can accommodate groupwork. People intuitively assign each other roles and get their writing (sections) done with 'comments' to show cues on what should be edited, and Google have iterated their systems to make this feature friendly and social rather than judgemental (ibid). Participants in the Pandey et al (2015) study took part in an active learning task to collaborate and share answers with peers in a 'think-pair-share' framework where participants jotted their answers after listening to a speaker, then co-op with fellow students to ultimately share a concrete answer with the whole class. The idea somewhat is a variant of discussions in asynchronous discussion with forums (see below). However, based on this primary research no studies use video explicitly where participants view content at the same time synchronously at different places.

Other models exist for collaborative systems such as the 3C model developed by Fuks et al (2007). As the name suggests, collaboration is broken down into three elements: communication, coordination and cooperation. The three elements work together in a cycle, helping each other in turn. People communicate and negotiate work then make decisions and this calls for coordination between people to cooperate through a shared environment that fosters awareness. Commitments can get reviewed and then the cycle restarts if need be. Based on this model Citadin et al (cited in Ramírez-Donoso et al, 2017) ran a literature review to discover most asynchronous collaborative systems have poor interactivity as platforms mainly use forums, messaging, emails, wikis and peer reviews. As a response Ramirez-Donoso et al (2017) used literature, gamification and a mobile platform to create their own MOOC with an intense software development method that was successful

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according to their evaluation. This also shows how MOOCs have room for more interesting projects.

Another literature review based on papers from 2000 to 2013 (where many articles about collaborative learning emerged) was conducted and concluded that virtual discussions, using forums, is what was mostly used in ‘large groups’ collaborating so the theme of communication being through text is actually common for groups (and asynchronously) (Manathinga & Hernández-Leo, 2015). Therefore, interactive modalities are needed.

Novelty of proposed research

MOOCs are evolving, and research from the last few years are continuously trying to create collaborative learning environments as shown in the previous sub-section. Collaborative systems are being created but the use of video multimedia being used synchronously has not been the forefront of collaborative systems. Nor is video seen as an asynchronous tool, this research proposes to help the integration of video in MOOCs in new ways by providing features through a user centred approach to gather behaviours. There has not been research until the recent past and this research will add to the domain. A literature review by Poquet et al (2018) describes how there is a lot of findings to do with video effects such as improving student recall but also go on to say how there isn’t much done to support asynchronous video viewing and applying psychological aspects to user’s action is not explored. The latter is more possible therefore will be incorporated into this project, and the former is still very much in its infancy and may be hard to conceptualise with such little literature according to the review (see approach).

The CSCW (computer supported collaborative work) matrix (Johansen 1988 cited in Baecker 1995) draws out the four possibilities in building systems in which people collaborate. Below shows the matrix and its quadrants.

	Same time (synchronous)	Different time (asynchronous)
Same place (co-located)	Face to face interactions (decision rooms, shared table, wall displays)	Continuous tasks (team-rooms, bulletin boards)
Different place (remote)	Remote interactions (video conferencing, instant messages, shared screens, multi-user editors)	Communication + coordination (email, group calendars, wikis, version control)

The use of video allows effective use of video conferencing to allow a synchronous remote communication and co-located communication. A study of learning content with video at the same time synchronously at a different place and its guidelines for such a situation isn’t out there and the project wants to Figureure this out and add on top of video conferencing features. Video content can show ‘situational awareness’ (Preece et al, 2015, p. 119) easily as it stops and starts playing when you stop and play the video and may be useful for a collaborative environment between a group of people like the Google Docs example above as participants can stop and discuss issues they may face with issues etc.

Approaches

The following section tries to detail what will be done to help meet the aim and objective of this research which is to help give guidance to improve MOOCs.

Work Plan and Risks

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To stay in track with the projects deadlines a visual work plan has been created to help keep on schedule with the project. Also, the potential risks have been identified through a table. These two tools can be seen at the end of the document. A lot of time has been given for report writing that can be overridden to see if tasks take longer than planned.

Literature Review

A preliminary literature review has been completed using the City, University of London online library, its resources provided on its VLE (Moodle), Google Scholar, Wiley Online Library, Research Gate and the ACM digital library. In turn, this found the gap in the domain as well as gather depth in knowledge about it. During the completion of the project it would be ideal to find relevant information on the topic continuously to inform ideas and methods as well as increase the research quality.

Initial Test preparation

The study will run an observational study on a website that is created with HTML, CSS and JavaScript etc that has videos and polls for groups of participants to complete together whilst they watch the video(s). Due to programming skill of the author, Skype will be used for participants to talk and see each other. Or with guidance of a supervisor, a ‘full’ interface can be created that incorporates synchronised video and have a feel of a MOOC. The idea is that people will figure out how to watch videos together and rich-data about how they view video together to answer questions (polls) collaboratively will pan out.

Participant recruitment

Ideally the participants taking part in these observations are those who use videos to learn concepts. So, this targets a wide range of participants such as programmers learning Python, Mathematicians revising decision maths or Engineering students learning CAD design etc. The domain experts will be recruited using social media or talking to personal contacts who are interested in learning through videos if necessary. In terms of ethics participants will be recruited while being sensitive to people who are underage or have medical conditions etc and exclude them from being part of the test for their own safety.

Test plan

Iteration 1 – collecting qualitative data to inform a video MOOC

Once the participants are recruited they will be told about the test, so they understand what its purpose is clearly. Then a consent form will be completed and scanned, a copy will be sent to the participant and the original will be kept with the moderator.

Before the day of the session participants will have to provide their details to the facilitator through some form of a questionnaire. Details may include the user’s age, education status, internet usage and highest level of attainment in education etc. This will help inform the participants involved during the analysis and reporting process.

On the day of the test participants will come to the agreed location and be greeted by the facilitator and told what they will do to refresh them about the test. A concrete number for a group is not stated in the reading cited but 3 members per group may be sufficient due to the resources required and scheduling issues that may happen in larger groups.

Once this introduction is completed, participants will be put into their allocated room to emulate how a person may use a video MOOC at home (independently with not much distraction). Note: to keep participants unknown to each other, participants will be told to

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enter the agreed location at different times and only know who they are working with when the Skype call starts as if they were joining a virtual environment.

The Skype call will be started by the moderator and from there participants have an instruction sheet to follow and help them complete their ‘MOOC video course’.

Following these observations participants will be put into a short focus group to give their thoughts on how they felt about the experience.

Observations ‘in a lab setting’

The purpose of participants being segregated into rooms allows the context of use to be emulated as mentioned beforehand. Contextual inquiry requires multiple facilitators; therefore, observations are suitable for the constraints this individual project faces. Participants will not be interrupted as the facilitator takes an outsider approach. The idea is that qualitative data/observations is accumulated then analysed rigorously (see below). All sessions will be roughly summarised after the day completes to help keep a record of what happened and know of patterns that occurs.

Focus Groups

After the sessions are completed the groups will be sat into one room to hear what each of them thought about using video and this would gather more qualitative data. Also, this helps clarify peculiar actions that observations alone cannot confirm. The facilitator will run the focus group based on questions and retrospectives to help encourage good rapport from participants. With the data collected here and from the observations, ‘methodical triangulation’ (Preece et al, 2015) can be used to confirm points/arguments made by the user(s). Points made could be segregated into themes during the analysis process and in turn this could inform concrete design guidelines.

Situated Cognition & Resource Competition Frameworks

Through the observation sessions participants will provide some qualitative data to do with working with video as the main modality to ‘complete’ a course. With the data collected two analytical frameworks called Situated Cognition (SC) and Resource Competition Framework (RCF) could be of use for further analysis.

Participants employ their own plans to achieve goals composed with many steps and sub-steps. However, the environment can affect how the plan works. This is the idea of situated cognition where actions are incremental based on continuous dialogue with the environment. The actions in the observation study could show how participants are influenced using the SC framework where participants construct a goal then gather possibilities of actions (affordances), things that constrains actions (constraints) and things that don’t change (invariants).

RCF created by Oulasvitra et al (2005) states how people have limited cognitive resources (motor control, sensation, perception, attention, central execution, working memory, prospective memory, episodic memory, semantic and reasoning) that are used in different rates. The resources used are put against tasks participants do and through this overload of a resource can be picked out and inform the design.

The frameworks would also allow the study to have trustworthy data rather than a sea of subjective findings as these frameworks provide common actions to look out for and have

Appendix A – Project Proposal

been tested by other researchers. It also fulfils using psychological aspects as recommended by Poquet et al (2018).

Data Collection Protocol

To be able to get the most qualitative data for analysis and the SC and RCF frameworks, there would need to be recording technologies on the screen of the user's computer as well as their work area. So, screen recorders and video cameras may be of use here (with the user's permission) but it needs to be unobtrusive. Thus, the author can review this data many times if need be for clarification etc. Written notes can also be reused to recall situations that panned out. Transcripts can also be created to see descriptions of actions rather than having to search for small snippets of video multiple times to make interpretations.

Iteration 2 – Redesign with design guidelines and usability testing

Through the data collected in the first iteration or phase it should become obvious what domain experts like or prefer when trying to watch video with others. With cooperation with the supervisor a set of guidelines will be created.

The guidelines will then go on to inform another iteration of the website. Once the website is redesigned it will need to be tested for quantitative usability measures for effectiveness, efficiency and satisfaction. Qualitative measures could come from analysing utterances in sessions and gathering feedback from post sessions scenarios. Severity scales can be used to see problems effecting the system and prioritise important fixes that are needed. Scales such as Dumas and Redish's (1999) 1-4 level system can be used to rate severity of problems. This will then inform the final version of the website to be tested using the test plan noted above and the next section provides more details.

Iteration 3 – A/B testing

The final stage aims to provide evidence that the guidelines have informed a good website that uses video as the main modality for learning. A hypothesis would be along the lines of: "*Participants feel that synchronised video modality is better than traditional MOOC modalities*".

To do this, two versions of the website will be shown to participants. One version will include videos showing content for learning and another version of the website will use traditional content such as text. The first version presented will be flipped (counter-balanced) between groups to not influence video preference because it was first or vice versa. This is known as a within-subjects approach and is preferred due to time length of this project and possible scheduling issues.

Using similar but more structured measures explained above (iteration 2), data from the studies will be collected and through comparison it will be determined if the hypothesis is true. This would be a formative session to inform a report as the final deliverable where there will discussion about the project working or not.

Possible enhancements to proposal

It is apparent there is no test plan for asynchronous viewing from the onset of this proposal. However, if this proposal is approved by the supervisor an iterated plan may include participants being recruited to work with video at different times to help their 'peer' understand a topic. For example, videos will be viewed and edited by one person and someone lese uses it for their insight to complete a 'project'. Instead of focus groups and such, the students (peers) can be given a structured interview to see if an (asynchronously)

Appendix A – Project Proposal

‘edited’ video can help them more opposed to discussion forms etc discussed above. This proposal is more defined for a synchronous study and may not be explorative as possible but discussion with the supervisor can allow a more ‘full’ study.

Work Plan (X marks meeting with supervisor on Tuesdays during their contact hours). Critical path and background tasks shown clearly.

	June	July				August				September			
	04/06 – 01/07	02/07 – 08/07	09/07 – 15/07	16/07 – 22/07	23/07 – 29/07	06/08 – 12/08	12/08 – 18/08	18/08 – 26/08	27/08 – 02/09	27/08 – 02/09	03/09 – 09/09	10/09-16/09	17/09 -22/09
Literature Review													
Plan testing		X											
Run pilot observation			X										
Redesign observation													
Run observation				X									
Analyse findings (1)					X	X							
Generate Design guidelines							X						
Usability testing								X					
Analyse findings (2)									X				
A/B testing										X			
Analyse findings (3)											X		
Report writing draft 1												X	
Report writing draft 2													X
Submit final report													
Website implementation													
Participant recruitment													

Appendix A – Submitted Project Proposal

Risks

Below shows a table outlining risks that may happen during the completion of the project. The impact is calculated by the likelihood multiplied by the consequence.

High risk = > 10 | Medium risk = 6-9 | Low risk = 1-5

Risk Description	Likelihood (1-3)	Consequence (1-5)	Impact (L x C)	Plan for Mitigation
Loss of data collected during the process: e.g video and audio recording, transcripts, screen recordings and consent forms etc.	2	5	10	Back up all data, scanning written notes and saving <u>all</u> digital accumulated files on the cloud and hard-drive or USB to ensure safety of data through multitude of backups.
Failure to recruit participants or the possibility the participant doesn't attend	2	4	8	Recruitment of participants conducted well before the planned observation. Frequent contact with recruited participants would be needed to ensure attendance. Recruit participants from HCID cohort at City, University of London as final fall-back.
Sensitive data about participants lost or stolen	2	3	6	Ensure data is always saved in a safe place. As well as back up to cloud that is password protected.
Researcher or supervisor falling ill in such a way that puts the process into danger.	1	5	5	Apply for extenuating circumstances or speak to course leader for HCID about remedies.
Difficulty in finding test area.	2	5	10	Speak with university team responsible for possibility of booking rooms well ahead.
Video technologies such as camera and audio fail to record.	2	4	8	Having a back up camera always would be useful. Headsets could be encouraged to be bought in by participants.

Appendix A – Submitted Project Proposal

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Appendix B – DiCot facets and principles

Physical layout is about how things are physically structured in the environment . There are seven principles.

- Space and cognition: how the physical arrangement support or inhibit cognition amongst members of a team.
- Perceptual principle: how spatial arrangement supports cognition.
- Naturalness principle: how does something's form represent abstract concepts using similar properties in representations. i.e whether people respond well to stimulus.
- Subtle bodily supports: how people use their body to interact with the environment and support cognition.
- Situation awareness: how are people informed about what is going on.
- Horizon of observation: what members of a team can see or hear depending on their position.
- Arrangement of equipment: how the access of information is for team members based on physical layout.

Information flow also has seven principles, these principles let researchers explore how communication happens between members (including roles) and the sequences of events that define the mechanics of the system. There are seven principles.

- Information movement: how information moves through the system. This can happen in a multitude of ways.
- Information transformation: exploring how information changes. Information can often be represented differently, once a representation of information happens a transformation occurs.
- Hubs: where does information get together, how does different sources of information get processed together.
- Buffering: As information piles in hubs there needs to be buffers. These need to be identified.
- Communication bandwidth: different modes of communication 'impart' different amount of information. The richness needs to be identified within the system.
- Informal communication: what communication happens outside of the system and how it effects the systems behaviour.
- Behavioural trigger factors: how people react to certain situations without planning or communication.

The artefacts facet has four principles; these help researchers understand how artefacts support cognition. There are four principles.

- Mediating artefacts: how artefacts support activities by coordinating tasks. For example, tickets are used in ambulance control to show an incident and they get annotated to keep track of the incident.
- Scaffolding: how people help their tasks with external artefacts.
- Goal representation: how people use artefacts to remind themselves of the current goal rate.
- Coordination of resources: how resources are internally and externally coordinated to aid cognition.

PARTICIPANT INFORMATION SHEET

How do people learn synchronously/asynchronously with distributed video?

Researcher: Aminul Islam

Supervisor: Dr Radu Jianu

We would like to invite you to take part in a research study. Before you decide whether you would like to take part it is important that you understand why the research is being done and what it would involve for you. Please take time to read the following information carefully and discuss it with others if you wish. Ask the researcher if there is anything that is not clear or if you would like more information.

What is the purpose of the study?

This study is being taken as part of the researcher's Master's degree in Human-Computer Interaction Design at City, University of London. The researcher aims to discover how multiple people learn from video remotely (i.e in different locations) at the same and different times.

This study aims to uncover how learners in a Massive Online Open Course (MOOC)/Online course could use video content as a collaboration tool in remote settings at the same time and different times. In turn, the findings can potentially help research and design of such systems and provide initial steps in a new solution for online learners to enhance social learning.

Why have I been invited?

Online courses are typically accessible to all people around the world. Courses are providing low barriers to entry, becoming open to different cultures and enabling diversity etc. Therefore, the use of online courses is used by a range of people. The participants of this study will uncover how different people approach collaboration with video and essentially see if the concept works. More specifically, higher education students and graduates like you are very widespread in MOOCs.

Do I have to take part?

Participation in the project is voluntary, and you can choose not to participate in part or all of the project. It is up to you to decide whether to take part or not. If you do decide to take part you will be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason. Once the data has been anonymised you will no longer be able to withdraw your data.

What will happen if I take part?

You will be asked to take part in a data capturing session and an informal debriefing alongside another learner (participant) remotely at City, University of London. The researcher will be present in person before the session starts, remotely in the data capturing session and in person during the debriefing. These activities will last a maximum of 2 hours depending on actions during the day. If required, the researcher may contact you via social media for clarification or further questions on a later date.



You will be asked to learn about HTML and/or CSS (web programming) concepts with video followed by questions based on your actions.

Expenses and Payments

You will not be paid for taking part in this study, but the researcher is very grateful for your help.

What do I have to do?

During the data capturing sessions, you and your partner will be asked to learn about the HTML and/or CSS programming languages using videos and use the knowledge acquired to create a web page.

You should collaborate using the video content over Skype. Other/alternative tools, websites, software or technology supporting the video is up to you. You are expected to establish your own set of rules with your partner. You will be provided with: a laptop, pen, paper and somewhere to code via a link. Your activity (including your screen) will be audio and video recorded with software and a camera.

You will be communicating with your partner as they sit in another room and work with you on creating a web page. You will be asked to either work with your partner at the same time or at different times. The researcher will tell you how you will work with your partner at the beginning of the session: at the same time or at different times.

If you are communicating with your partner at the same time then you will watch a playlist, communicate, and construct a web page in real time on an online code editor using videos and other tools you wish to facilitate the process.

If you are communicating with your partner at different times then you and your partner will work in alternating time slots. That is, you will never be online and working at the same time. You will still have to watch videos, just at different times, and create a website together. You are free to use other tools to facilitate communication.

We ask you to do the activities as you would in your daily life, this session is not about you rather it is about whether a video collaboration system works or not, what it could entail etc.

Following the data capturing there will be an informal debriefing. You will be asked questions based on your actions and experience. You may also be contacted by the researcher through social media showing snippets from the data capturing session and answer questions. This will help the researcher understand the data in detail.

What are the possible disadvantages and risks of taking part?

No risks have been identified. However, let the researcher know if you feel uncomfortable at any time or wish to stop the study.

What are the possible benefits of taking part?

This study could benefit researchers in computer science, human-computer interaction, interaction design and professionals who are interested in creation of computer supported collaborative environments. The results for this study could help create a new collaborative learning environment that can be used in MOOCs and open new research questions and studies about such environments. This study will inform creation of collaborative video viewing systems that could help people (students) learn more effectively through social learning.

What will happen when the research study stops?

Findings will be described in a report as part of the individual project module in the Human-Computer Interaction Design program at City, University of London. All participants information will be anonymized during the data analysis process. Anonymized raw data, transcripts, and research findings may be stored, submitted as coursework, and published.

Will my taking part in the study be kept confidential?

Data regarding your participation in the study will be kept confidential to people out of the study. Only the researcher and the supervisor will access the information before the information is anonymized. Due to moderation other markers at City, University of London may look at your data for validation during the marking process. Digital data will be stored on the researcher's personal computer under password protection. Physical files etc will be placed in a locked cabinet. All observations and interview notes will remain relevant to the study, otherwise information will be confidential. However, if there is critical information collected (such as: reporting of violence, abuse, self-harm, harm to others or criminal activity) confidentiality will be dismissed and the information may be reported to appropriate parties.

What will happen to results of the research study?

As mentioned previously a report will be created and submitted as part of the Human-Computer Interaction Design program at City, University of London. The researcher and supervisor reserve the right to publish results elsewhere (such as journals). As always, your personal details will be made anonymous.

What will happen if I do not want to carry on with the study?

You can withdraw at any stage of the project without being penalised or disadvantaged in any way. Please contact the researcher (aminul.islam@city.ac.uk) or supervisor (radu.jianu@city.ac.uk) to withdraw from the study.

Who has reviewed the study?

This study has been approved by City, University of London Computer Science Research Ethics Committee (CSREC).

Further information and contact details

To get into contact with the researcher about further information, please email aminul.islam@city.ac.uk. To get into contact with the supervisor about further information, please email radu.jianu@city.ac.uk.



What if there is a problem?

If you have any problems, concerns or questions about this study, you should ask to speak to a member of the research team. If you remain unhappy and wish to complain formally, you can do this through City's complaints procedure. To complain about the study, you need to phone 020 7040 3040. You can then ask to speak to the Secretary to Senate Research Ethics Committee and inform them that the name of the project is: **How do people learn synchronously/asynchronously with distributed video?**

You could also write to the Secretary at:

Anna Ramberg
Research Governance & Integrity Manager
Research & Enterprise
City, University of London
Northampton Square
London
EC1V 0HB
Email: Anna.Ramberg.1@city.ac.uk

City holds insurance policies which apply to this study. If you feel you have been harmed or injured by taking part in this study you may be eligible to claim compensation. This does not affect your legal rights to seek compensation. If you are harmed due to someone's negligence, then you may have grounds for legal action.

Thank you for taking the time to read this information sheet.

10th August 2018 (version 1)

CONSENT FORM

How do people learn synchronously/asynchronously with distributed video?

Please initial box

1	<p>I confirm that I have had the project explained to me, and I have read the participant information sheet, which I may keep for my records.</p> <p>I understand this will involve:</p> <ul style="list-style-type: none"> • using a computer to remotely create a web page. • be interviewed by the researcher • allowing the data collection sessions, interview debriefing and post session messages to be videotaped, audiotaped and saved (screenshot). • making myself available for further contact if need be. 	
2	<p>This information will be held by City as the data controller and processed for the following purposes:</p> <ul style="list-style-type: none"> • MSc individual project (dissertation/thesis) for submission as part of the Human-Computer Interaction Design program run by the Department of Computer Science. • Any future publications. • Future students who are interested in the project. 	
3	<p>I understand that any information I provide is confidential, and that no information that could lead to the identification of any individual will be disclosed in any reports on the project, or to any other party. No identifiable personal data will be published. The identifiable data will not be shared with any other organisation.</p> <p>I consent to anonymous records being shared with moderators (markers) at City, University of London.</p> <p>I consent to transcribed information being shown to other researchers and interested professionals/students.</p>	
4	<p>I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.</p>	
5	<p>I agree to City recording and processing this information about me. I understand that this information will be used only for the purpose(s) set out in this statement and my consent is conditional on City complying with its duties and obligations under the General Data Protection Regulation (GDPR).</p>	
6.	<p>I agree to the arrangements for data storage, archiving, sharing.</p>	



Appendix D: Consent Form

CITY
UNIVERSITY OF LONDON
EST 1894

7	I agree to the use of anonymised quotes in publications/reports.	
8	I agree to take part in the above study.	

Name of Participant

Signature

Date

Aminul Islam

Name of Researcher
HCID Student

Signature

Date

When completed, 1 copy for participant; 1 copy for researcher file.

Appendix E: Researcher Script

Introduction to session

Hello **Participant1** and **Participant2**

As you know, my name is Aminul and I'll be running this session with you today. Funnily, I am the facilitator, observer and note taker so you don't need to worry about other people watching you! I have a script to follow so I don't miss out on vital information. Please allow me to proceed.

First, I would like to say thank you for agreeing to do the session for me. I really appreciate it. In terms of time, I think it will take a maximum of 2 hours to complete the session. It may take longer or be a lot shorter. It depends on what you do, you can take as long as you want. There is no need to rush.

I will be seeing how you collaborate together using video content. My aim is to find out how the concept works with real participants. You may be familiar with collaboration through group work during your university course so try use skills or techniques from those experiences into this setting.

You will be working with each other from different rooms imitating an online experience. I will give more details in a few moments.

I want to stress this test is not about you or if you like - your actions, there is no right or wrong answers. Instead you are helping to uncover the idea of collaboration with video content. View the content and collaborate as you see fit. Honest reactions let this test be real as possible.

Before we start the proper session, I've got a little bit of paperwork to do.

GET CONSENT FORM AND GIVE TO PARTICIPANT

This is the participant information sheet and consent form, you may have seen it before the session when I was reaching out to you in the recruitment process. The documents states what we will do, it also states what will happen with the information you give us today. Please read it through and then sign the consent form. Today's date is **SAY DATE**.

LET THE PARTICIPANT FILL IN THE FORM THEN COMMENCE NEXT SECTION

As you can probably tell we are going to record audio and video of the screen. I am also going to be recording you with a camera. What this data capture does is allow me to go over the stuff you did and not have to fuss with making many notes. Just to confirm, are you fine with this?

Appendix E: Researcher Script

**Make sure User 1 and User 2 message the Skype chat to say they are ready
THEN start the call**

Overview of observation (synchronous)

Okay, you guys will be viewing video at the same time and programming a web page with HTML and CSS. Let me stress the concepts the videos will cover is for beginners and there is no need for prior experience in development.

I would like to let you know there are no breaks available to you as time is quite constrained.

I will provide the task sheet on a Skype chat. When you go into your work spaces you will see the Skype chat open with the link to it on the laptop. Message the chat when you are ready to start. I will start a call and from there you guys will go through the task sheet and work together.

I will sit back and watch you do the task, go as far as you would if you were working together on your own. I do expect you to complete the task. If you feel like you don't know how to solve an issue together after many efforts, particularly programming issues then message for me. I encourage you not to rely on me though.

Please remember to work together. It is up to you guys to make your own rules about video viewing. Collaborate using the materials provided and you can introduce your own software or strategies. This work is all about seeing what online learners could do in such settings. Remember there is no right or wrong way of doing things.

So I can hear what you are saying and the recording can pick it up, please speak as clear as possible.

Does everything make sense?

Cool, so now I will put you into your work spaces and we can start...

---TAKE PARTICIPANTS INTO ROOMS AND COMMENCE OBSERVATIONS---

Appendix E: Researcher Script

Make sure User 1 and User 2 message the Skype chat to say they are ready THEN start

Overview of observation (asynchronous)

Okay, you will be viewing a video at different times and programming a small web page with HTML and mostly CSS. You will work collaboratively with your partner, but you will never be available to each other at the same time.

I would like to let you know there are no breaks available to you as time is quite constrained.

The setting you will be in mimics an online experience where you message each other at different times. It's like replying to or messaging someone on Facebook or WhatsApp when their offline. Instead, you have to refer to video content instead of having plain text messages. You could use text but you're not limited to that, try use what you feel is appropriate.

You will have allocated time slots to watch videos and post whatever you seem is right to help create the desired web page on the skype chat.

So for example, if the session starts at 1pm, the first person will have 15minutes to watch a video and post something that contributes to the web page creation. Then at 1:15pm the person would do the same for 15mins for the same video.

I will provide the task sheet on a Skype chat. When you go into your work spaces you will see the Skype chat open with the link to it on the laptop. Once you are both ready to start, message each other on Skype and start to follow the sheet for further instructions

I will sit back and watch you do the task, go as far as you would if you were working together on your own. I do expect you to complete the task. If you feel like you don't know how to solve an issue together after many efforts, particularly programming issues then message for me. I encourage you not to rely on me though.

I will be in the room with the user who is making the notes. So I will be going in and out of rooms

Please remember to work together, so reference videos in a way another person can understand you.

So I can hear what you are saying and the recording can pick it up, please speak as clear as possible.

Does everything make sense?

Cool, so now I will put you into your work spaces and we can start...

---TAKE PARTICIPANTS INTO ROOMS AND COMMENCE OBSERVATIONS---

Allocate user 1 to someone and allocate user 2 someone.

Appendix F: Synchronous task sheet

Below are guidelines and best practices for productive collaboration and discussion in your video course.

Participate - It will enhance your learning experience for sure.

Help each other! - We encourage you to reply to your peers' questions and comments.

Be polite - Opinions are good, but please respect others' opinions as well.

Task – creating a web page together

Video playlist (YouTube): <https://goo.gl/RQaou6>

Online code editor: <https://goo.gl/ueDHDU>

You and your partner will be creating a beginner's web page using two foundational web programming languages: HTML and CSS.

Your web page needs to be about a European city, for example: Barcelona, Lisbon, London, Paris or Amsterdam etc.

Mainly, your web page should include some facts about the city. Facts can be found through simple Google searches. Do not get wound up on this, this is not the main purpose of the task.

Your web page needs to implement (create) the following using HTML and CSS.

- Nicely formatted titles (i.e show a distinct hierarchy between sections).
- Three chunks of texts.
- Good use of images (you can use online image paths, i.e links that end in .jpg etc). Make the image fit the width of the browser or what feels appropriate.
- Styled text in whatever way you like.
- Bonus: Figure out how to make bullet points!!

Use the video playlist provided above to learn how to create these features.

An example solution can be seen here: <https://goo.gl/LFcNT0>. Do not use the example to cheat using the 'view source' function on browsers. Such actions will defeat the purpose of learning. Try to do better than the example.

The way you view the videos and collaborate is entirely up to you. Other/alternative tools, websites, software or technology supporting the video is up to you. You are expected to establish your own set of rules with your partner.

You are free to ignore mentions of JavaScript as we are not interested with that programming language today. You can also miss content that feels irrelevant but be wary.

Code your web page using the editor provided through the link above. The output of your code should generate automatically (if not – press run on the top left). You do not need to link CSS files as the editor does it for you. The editor allows you to collaborate with your partner. However, you cannot type at the same time due to technical issues.

Once you think you are done, let Aminul know through a message on Skype.

Remember to work together!

Thanks, and enjoy.

Note: videos are collated by the researcher and not part of the same video series. Do not expect continuity in the videos.

Appendix G: Asynchronous task sheets (copied and pasted in due to formatting issues)

Below are guidelines and best practices for productive collaboration and discussion in your video course.

Participate - It will enhance your learning experience for sure.
Help each other! - We encourage you to reply to your peers' questions and comments.
Be polite - Opinions are good, but please respect others' opinions as well.

Task – creating a web page together

Online code editor: <https://goo.gl/yuF5vL>
Video (YouTube): <https://www.youtube.com/watch?v=dsHjYHkoGIE>

You and your partner will be editing a web page prototype using CSS. You are user 1.

Your web page is about London but it's in a mess at the moment, you want it to be more structured. This can be done with 'CSS grids'.

Using CSS grids make a similar layout seen on this link: <https://goo.gl/a9A6hu>. Do not use the example to cheat using the 'view source' function on browsers. Such actions will defeat the purpose of learning and the study.

Code your web page using the editor provided through the link above. The output of your code should generate automatically (if not – press run on the top left). You do not need to link CSS files as the editor does it for you. The editor allows you to collaborate with your partner. However, you cannot type at the same time due to technical issues.

Use the video provided above to learn how to implement this feature.

You and your partner will view the videos separately and collaborate by posting to the Skype chat at different times. Look below to see the schedule.

You are not limited to using text for notes about videos. Other/alternative tools, websites, software or technology supporting the video is up to you

Please stick to this schedule as you post about video and collaborate.
Remember to work together! Reference videos appropriately.

Thanks, and enjoy

Up to 10 minutes

Watch the first 4:30s of the video. Make your 'notes' about how CSS Grids are implemented and how it works with HTML elements. Send your 'notes' to the Skype chat.

Up to 10 minutes

Just sit back and wait for User 2 to send their notes.

Up to 10 minutes

Get together and implement CSS grids into the website using only the notes you guys have.

Collaborate through a Skype call, the tools provided on the editor or whatever you like.

Up to 10 minutes

Watch from 4:30 – 8:30 of the video. Make notes about how to make use of the grid-column-start, grid-column-end, grid-template-columns and grid-template-rows properties. Send your 'notes' to the Skype chat.

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Up to 10 minutes

Just sit back and wait for User 2 to send their notes.

Up to 10 minutes

Watch from 8:30 – 12:32 and make notes about how to use the grid-row start and grid-row-end properties.

Up to 10 minutes

Just sit back and wait for User 2 to send their notes.

Up to 15 minutes

The rest of the video repeats properties previously discussed. Exit the video.

Get together and implement the page to similar to <https://goo.gl/a9A6hu> using only the notes you guys have.

Collaborate through a Skype call, the tools provided on the editor or whatever you like.

If you are struggling to fix the row and column spacing, remember to use the *grid-template-columns* and *grid-template-rows* properties.

Your page needs to look *like* the example page.

Once you think you are done, let Aminul know through a message on Skype.

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You and your partner will be editing a web page prototype using CSS. You are user 2.

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Using CSS grids make a similar layout seen on this link: <https://goo.gl/a9A6hu>. Do not use the example to cheat using the 'view source' function on browsers. Such actions will defeat the purpose of learning and the study.

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You are not limited to using text for notes about videos. Other/alternative tools, websites, software or technology supporting the video is up to you

Please stick to this schedule as you post about video and collaborate.

Remember to work together! Reference videos appropriately.

Thanks, and enjoy

Up to 10 minutes

Just sit back and wait for User 1 to send their notes.

Up to 10 minutes

Watch the first 4:30s of the video. Make your 'notes' about how CSS Grids are implemented and how it works with HTML elements. Send your 'notes' to the Skype chat.

Up to 10 minutes

Get together and implement CSS grids into the website using only the notes you guys have.

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Just sit back and wait for User 1 to send their notes.

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Collaborate through a Skype call, the tools provided on the editor or whatever you like.

If you are struggling to fix the row and column spacing, remember to use the *grid-template-columns* and *grid-template-rows* properties.

Your page needs to look *like* the example page.

Once you think you are done, let Aminul know through a message on Skype.

Appendix H: Interview questions

Start off by thanking participants then proceed to questions.

How was your experience, how would you personally describe it? *About the collaboration...*

What was the worst thing about this situation for learning? *Focus on collaboration...*

What was the best thing about this situation for learning? *Focus on collaboration...*

Do you feel like you learned anything? How did you learn it? *Figure out what made it work....*

What made you guys communicate well? *How did they collaborate?*

Other than video, how did you make sense of someone else digitally? *What felt natural...*

How did you coordinate?

How did you monitor each other?

How did you deliver information that is helpful for the conversation?

Ask about these awareness things below...How did you have...

Awareness: knowing who is around, what is happening (moods, conversational cues, etc.), who is talking with whom:

Situational awareness: "the up-to-the-moment understanding of a person's interaction with the shared workspace"

Social awareness: who else is present; what are their moods; what are their agendas

Workspace awareness: what others are doing

Team awareness: how the team as a whole is performing

Awareness about status and expertise

Awareness happens through a combination of:

Direct observation: one focuses on a particular aspect of the environment intently

Peripheral awareness: keeping track (registering) of what is going on without focusing directly on it

What cues did you use? What was implicit (suggestive – emojis) and what was explicit?

Did anything impede communication?

Did you wish you could do something, but the technology was not available to you?

How were you referring to specific content in the video (e.g., minute/sec ref)?

Talk about things the participant may have struggled with...

Talk about thing peculiar things a participant may have done...

Focus on collaboration

Appendix I

Observation session and informal debriefing transcripts/summaries

Legend: Normal text = speech | *Italics* = actions of participant AND/OR context | [emotion/expression] = [emotion/expression] | **Researcher intervention** | **Space and Cognition** | **Perceptual** | **Naturalness** | **Subtle bodily supports** | **Arrangement of Equipment** |

Please note not all codes are provided/shown here. The overlays were done to help the researcher until it got too cluttered and coding continued without highlighting.

Session 1 (held on 24/8/18) – Synchronous

Participants: 'P1' and 'P2'

Call starts

P1: **Alright, lets open up this file (task sheet)**, shall we?

P1 looks at their Skype call window and awaits a response from P2.

P2: **Yeah.**

P1: Alright, let's do this.

Task sheet file loads on browser (Microsoft Edge) for P1 and Adobe Reader for P2.

Okay shall we read through it?

P2: Yeah, cool.

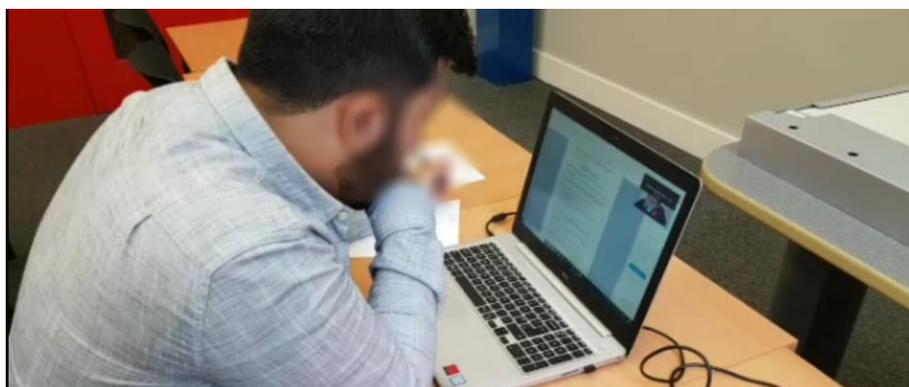
Both participants read through the task sheets independently on their screens.

P2 starts to think about how to complete the task by discussing one of its requirements with P1.

P2: What city do you think that we should do?

*P2 gets the pieces of plain paper with his left hand and looks directly into the screen. The paper is **placed on his left-hand side** to accommodate his writing. He is waiting to write the location of the city.*

P2 moves their physical task sheet to the far left as it's in the way if he doesn't. It's no longer in his direct view. The recording snippet below shows P2's typical workspace.



P2's work space set up.

P1: I'm thinking London, might as well.

*P1 writes **notes** about London being the focus of the web site they need to create. The notes were written down on the physical paper provided. **P1 did not change the provided set-up.***

*P2 also **notes** down on their physical paper the focus of the web site is on London. They start writing down what the task requires but doesn't communicate this with P1. Its more for personal use.*

So, we need to write facts about the city.

*P1 **notes** down there needs to be use of facts regarding London when completing the task.*

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Observation session and informal debriefing transcripts/summaries

P2: Your just taking notes of what its (the task) asking? (*As he speaks he's not looking at the webcam video of P1*).

P1: Yeah.

P2: Alright.

P1: Hold on, let me share my screen. I think we need to do that as well.

P2: Yeah.

If you can, try share your sound as well. I think there's an option now.

P1: *Preparing screen share.*

Share computer sound...It stopped! It's not working.

P2: Okay...cool.

P1: Let's try that again.

P1 attempts to set up screen (& audio) sharing again...but doesn't succeed.

They wait for some help from the researcher.

P1 was asked if the sharing works on their end. Through some prompts the screen share worked properly.

Participants go back to reading the task sheet independently. Also, it's been gathered that the person who shares their screen doesn't have their webcam shared, in this case its P1.

P1 says aloud what he is currently reading and understanding to P2.

P1: So, titles, three chunks of text. Good use of images. Ignore JavaScript.

P2: *Still writing what is required for the task but doesn't communicate this to P1 at all. He responds to P1's previous comments to let him know he is listening.*

Yeah.

Inaudible sound but seems like he is taking some time to understand the task.

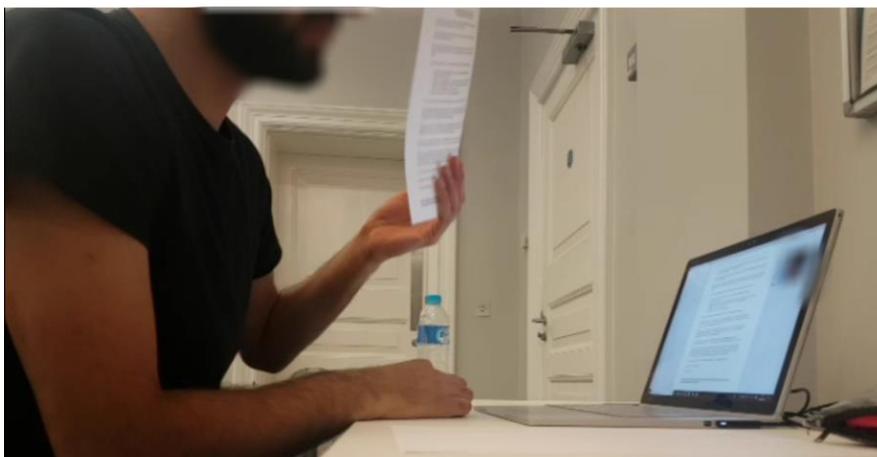
P1 speeds up the process a bit by trying to move the session on from just reading the task sheet.

P1: We got it on here anyway! (the task sheet) So if we need to look back...we got it on paper. So that should be fine. (see recording snippet below).

P1 shows their task sheet to the screen, but P2 cannot see it as P1's camera is off due to the screen sharing feature being used.

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Observation session and informal debriefing transcripts/summaries



P1 'showing' the task sheet to P2.

So, shall we open up the video?

P2: Yeah.

P1: So, lets click the link then.

P1 takes control of what will be seen during the session as he is sharing screens.

Hold on let me open it and go on a new tab.

P2: Alright, yeah.

P1 copies and pastes the video playlist link from the task sheet on to a new tab in order to keep the task sheet open on another tab and refer back to it during the completion of the task.

During this time P2 waits and is silent until P1 speaks. He also moves the task sheet from the far left to his right-hand side. This makes his work space slightly more organised and similar to the workspace in the beginning of the session instead the artefacts have switched.

P1: Alright, I'm going to start playing it (the videos) yeah?

P2: Yeah, cool...the first (referring to video)? Cool.

P2 writes the title of the first video on his notes and tries to establish rules.

Wait! Do you want to set a few rules? So, if we are both taking notes...you pause the video or?

P1: Yeah.

P1 starts playing the video titled 'What is HTML?' from the playlist provided on the task sheet. He briefly pauses the video to let P2 know the video looks like it is slow.

Okay its (the browser) moving very slow right now.

P2: Yeah.

P1: I'm not going to full screen it.

P2: Yeah...its cool.

P1 pauses the video to re-establish rules again with P2.

P1: Hold on...if you need me to pause it let me know?

P2: Yeah...cool.

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Observation session and informal debriefing transcripts/summaries

P1 resumes the video.

Both participants watch their first video about what HTML is and briefly about what CSS is.

P1 looks back and forth between the printed task sheet and video playing on the laptop.

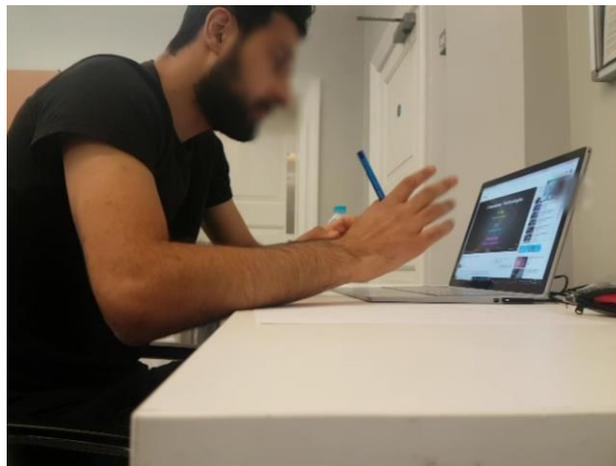
P2 makes note about what HTML and CSS does in their physical notes.

P2 asks for a pause to clarify about HTML and CSS with P1...

P2: Cool. So just as a note...CSS is meant for colouring and images and that. HTML is for formatting.

P1: Yeah.

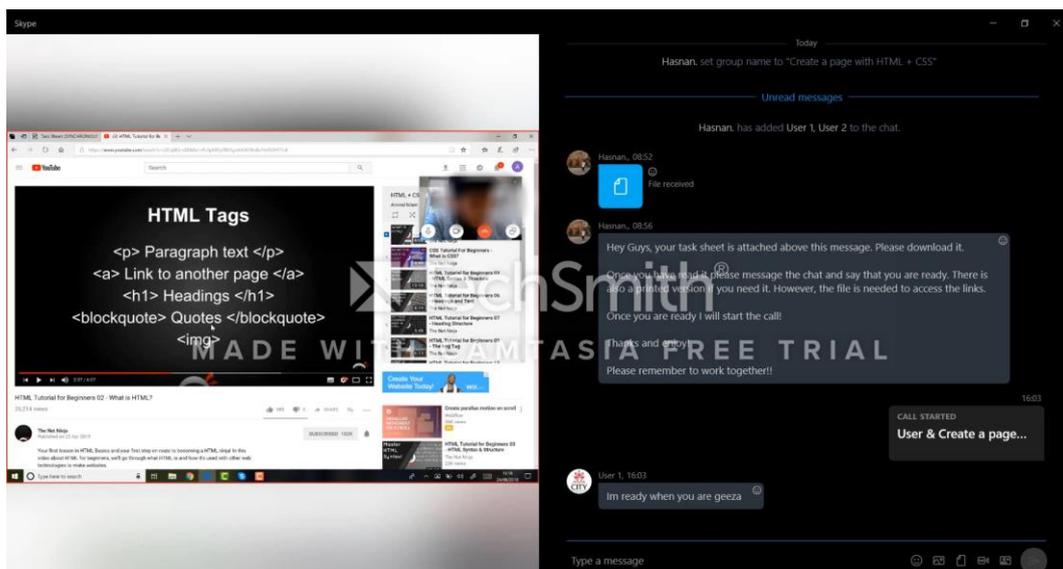
P1 then proceeds to write notes on what P2 has just said about CSS and HTML. Under the heading of 'vid 1'. They are using their physical paper and pen to write these notes. P1 skips the JavaScript section of video without permission from P2. He makes a shooing gesture with his hand whilst he does this. P2 does not mind this as this happens and cannot see P1 due to the screen sharing constraints.



P1 using gestures P2 can't really see.

P2 calls for P1 to pause the video to discuss and note down some basic HTML tags that are being explained in the video.

P2: One sec let me take (note) down a few (HTML tags). (see screenshot below for P2's screen as he takes notes).



P2's viewpoint of the screen when asking P1 to pause the video to see HTML tags and note them down.

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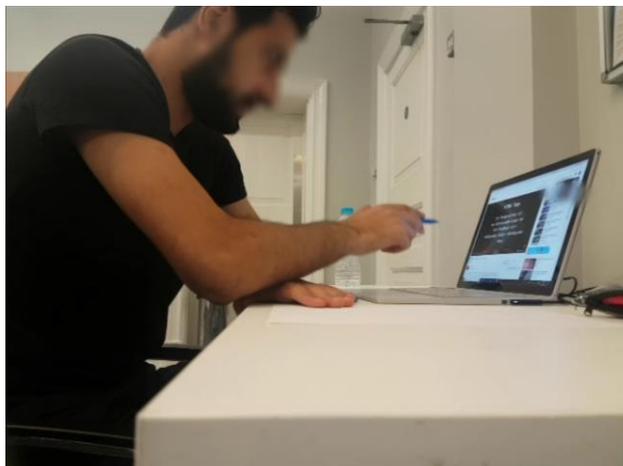
Observation session and informal debriefing transcripts/summaries

P1: Cool.

Based on P2s actions, P1 writes down notes on HTML tags too.

P2: So, the paragraph tags help for three chunks of text?

P1: Yeah, so paragraphs/text you have that (*pointing at screen with pen*). P and a slash p isn't it? That's how you close it.



P1 pointing at screen when explaining paragraph tags to P2.

P2: Yeah.

P1: Let me write that down as well.

P1 writes down notes on HTML tags.

P2: The link to another page, I don't think its relevant for this task. I didn't see it anyway (on the task sheet). (*P2 is referring to what is being shown to them on the video content. See screenshot above*).

P1: Yeah, we need titles and headings, so H1 (*whilst looking at the physical task sheet provided and screen with video, left to right*).

P1 is also making notes about HTML tags as P2 speaks.

P2: Blockquote we could do for formatting (*looking at screen content*).

P2 looks back and forth between his laptop and notes whilst writing.

P1: What? blockquote, do you reckon we need that? (*Looking at the screen content*).

P2: Maybe for styling. I just wrote it down.

P1: Yeah, I will write it down.

Writes notes on to paper about block quotes tag.

P2: Yeah, cool.

P1: (*Looking at screen content*) Images is just images, right?

P1 completes his notes on this video by writing about the tag.

P2: Yeah.

P1: Okay, lets continue.

P1 resumes video and stops making notes.

P1 often nods his head after the video tutor mentions some content. P2 does the exact same

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Observation session and informal debriefing transcripts/summaries

but there is no discussion between the two participants.

P2 makes a request to pause to talk about HTML headings being discussed by the video tutor.

P2: Oh wait, one sec, he said it ranges from H1 to H5. You know how it (the task sheet) said something about hierarchy of titles.

P2 writes down notes about the headers/headings based on the previous statement.

P1: (Looking at the task sheet) Oh yeah!

P2: I guess we can use it for that.

P2 makes notes of the HTML tags about headings in their physical notes.

Skype randomly stops working properly so the session is disrupted slightly and continues swiftly after a fix by the researcher on P1's computer.

P1 reopens his browser with the task sheet as it also stopped with Skype. Then he reopens the video that was being viewed synchronously ('What is HTML?').

P1: We were somewhere in the middle (of the video about HTML and CSS). I can't remember where exactly.

P2: Alright, I'm going to timestamp it (content about HTML tags). All of the rules, just in case.

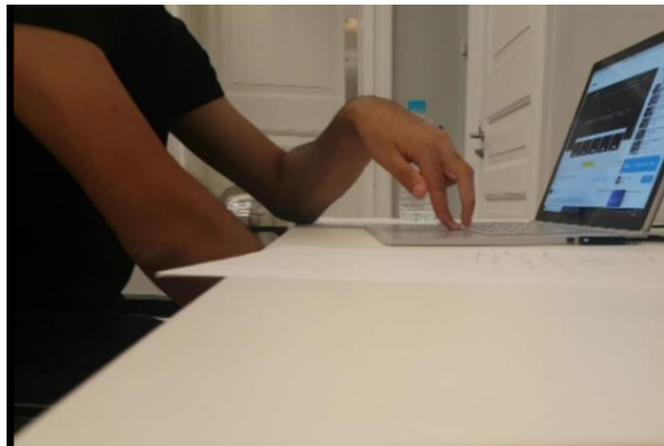
P2 writes notes that enhances notes that have already been written. He is writing the time the tags are discussed in the video.

P1: Yeah, cool.

P1 presses the space bar to restart video from the previous position before Skype crashed (3:30).

P1 continues making notes but not collaborating with P2 by telling him about them. P1 probably writes notes about timestamps here too but it's not clear on the recording.

P1 often readily has his finger on top of the space bar to pause the video playing.



P1 is ready to pause the video and discuss with P2

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P2: Bullet points? No I don't think that's bullet points.

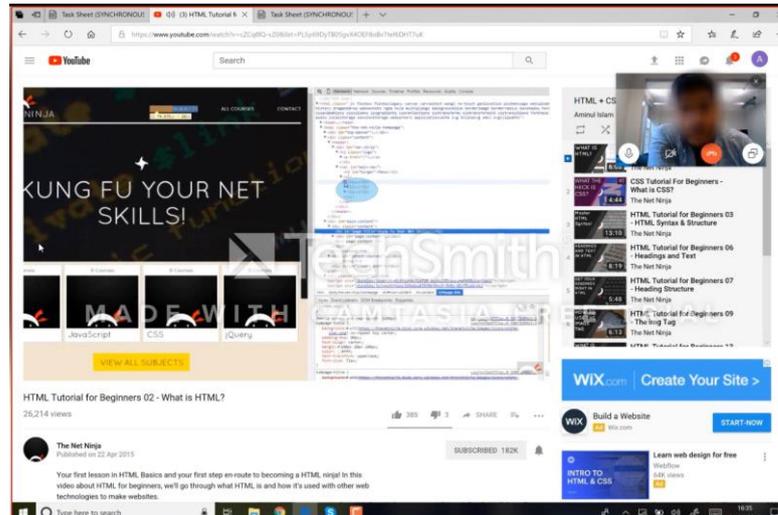
P1: Okay so this is list tags?

P2: Yeah.

P2 goes back to talking about heading tags.

The higher the H's go the smaller the writing bits. He said the top ones are H2.

P1: Yeah, true.



P2's view when P1 is referring to tags.

P1 makes **note** of P2's findings discussed above and includes the timestamp of when the video tutor talks about different types of headings.

P2 also makes **notes** that adds to his notes about headings.

Then P1 suggests moving onto another video because it seems like the main content of the video has ended.

Let's go to the next one?

P2: Cool. Do you want to go over the HTML videos first then CSS? Or do you want to go in the playlist order?

P1: Let's just do the playlist, right (go in order)?

P2: Cool.

*2nd video of the playlist ('CSS tutorial for Beginners – What is CSS?') is played and P1 instantly makes **notes** about CSS being about presentation but doesn't share/discuss them with P2. P2 also makes **notes** but doesn't discuss them with P1.*

P1 and P2 then watch the video without much discussion.

P2 says the content isn't so useful and P1 pauses the video to hear them.

He's just saying irrelevant stuff!

P1: True.

However, they continue to watch the video until P2 questions the video again.

P1 does skip sections of the video without telling P2. However, P2 doesn't seem fussed about this based on his previous comments.

*P2 barely makes **notes**.*

P1 pauses the video to hear what P2 has to say.

P2: Does he explain the basics of CSS?

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P1: I guess so, but he hasn't explained it yet. All the other videos are (about) HTML. I guess we just follow the playlist. *(Says this while looking at YouTube playlist and pointing at it using his cursor).*

P1 resumes the video and both participants view it in a typical fashion. Until P2 is adamant this video is useless.

P2: I think we should skip this video.

P1: Yeah, he's just chatting rubbish. Hold on.

P1 tabs through the video and moves onto the 3rd video ('HTML Syntax & Structure').

P2 notes down the name of the video he is watching.

P1 instantly makes note of video 3 in his notes.

Whilst watching, P1 tabs through the video to skip useless content.

P1 then has a question in regard to completing the task and pauses the video.

Hold on, I got a question right. You see how we are meant to be making this thing yeah? Shall we do it as the video is going? So, you see how you got the online code editor?

P2: Yeah...

P1: Okay. Do we both make one? Or do I just make it.

P2: Because we are watching the videos together. I'm guessing we're allowed to work on it together as well.

P1: Makes sense.

P2: It's in the task sheet.

P1 goes to task sheet he had open and opens the online code editor with the link provided.

P1: So, we can both edit this?

Hold on let me send it to the chat (Skype) for you.

P1 sends the link to the code editor on the Skype chat. (Although it is already on the task sheet).

P2 tries to access the collaborative link provided on the task sheet.

Due to further technical issues, the collaborative coding aspect did not work. So, the researcher told the participants to work without the collaborative aspect. The feature on the code editor just didn't seem to work. The session continues with participants figuring another way to collaborate.

P2: You know how your sharing your screen? I'll just look at it (the coding) through that?

P1: Yeah, that's fine. So, you can see my screen right now? *(P1 makes another gesture to the screen as if P2 can see him).*

Both resumes viewing the video again.

P1 and P2 just views the video conventionally (normally) with their screen in front of them.

P2 requests to pause the video and use it to implement text. P2 waves his fingers and pen to get P1s attention.

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P2 waving his pen to get P1s attention to code something. P1 does not notice this but hears him instead.

P2: Do you want to test out the `<p>` tag like he has done on the YouTube video? Just to see if it works.

P1: Alright, cool.

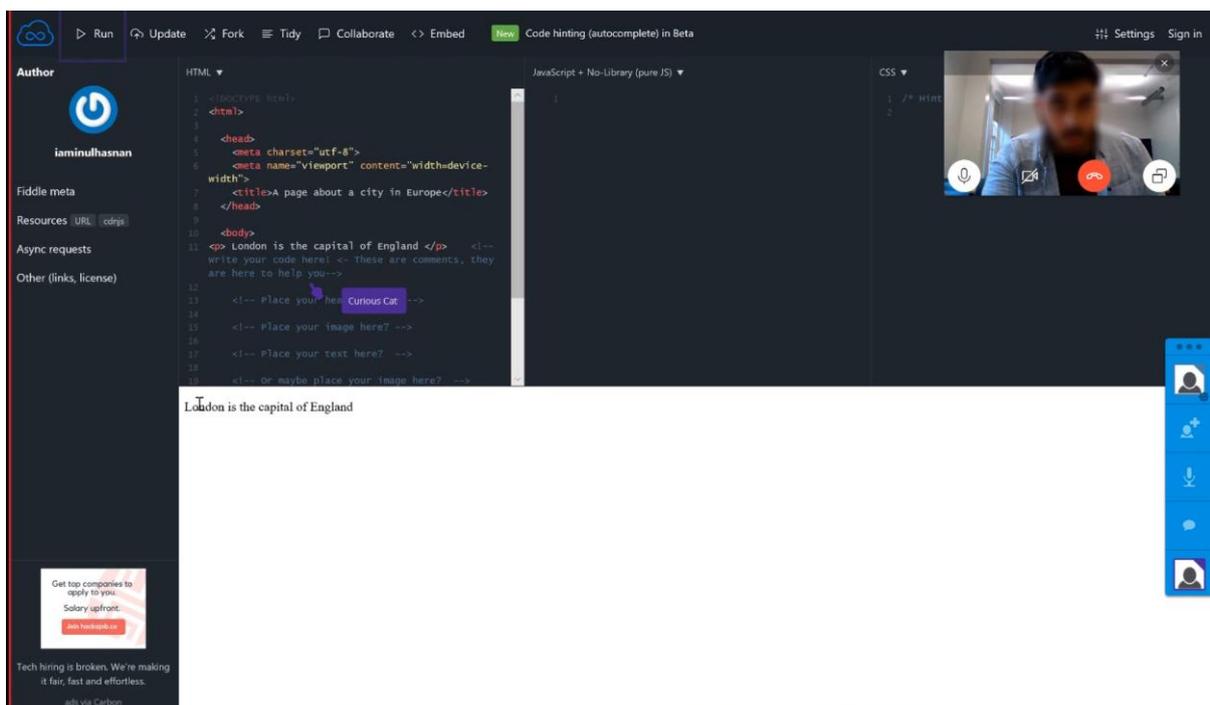
P2: I think it's on the (after the) HTML section (tag) (referring to where to code on the editor).

Participants told to write within the body tag because the videos do not state this. They did not make use of the comments trying to help them.

P1: So, p, how many paragraphs do we need?

P2: Three.

P1 proceeds to type some HTML code using the `<p>` tag on the online editor and runs it awaiting a response from P2 who is using the screen share feature and collaboration tool to see the code. Although in this case the latter is not really being used. There was no reference to video content. See below for screenshot of P1's screen whilst doing this.



P1s screen when implementing code with the `<p>` tag. The participants did not refer to video.

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Okay so we know how to do that, cool.

P1: Okay.

P1 goes back to the viewing the video then skips some video content and barely speaks with P2 about it. No agreement was made on skipping video. P1 makes some comments as he does this (he doesn't pause the video).

He's just waffling.

Whilst the video is playing P2 says they should try to implement headings while the video tutor is talking about it. P1 pauses to listen to him finish his sentence.

P2: You want to try out the headers?

P1: Yeah.

P1 proceeds to type some HTML code using the <h1> tag on the online editor and runs it awaiting a response from P2 who is using the screen share feature and collaboration tool to see the code like previously.

P1: There you go, it works.

*They start viewing the video again. The video starts talking about attributes in HTML and P1 paused the video. Then P1 acknowledged it with P2 and made **note** of the feature and the time mark in their notes.*

Okay, so attributes...

P2: 3 minutes and 22 seconds (P2 makes **note** of the time stamp of when the video discusses attributes).

P1: Okay.

*They continue to watch the video regarding attributes. P1 and P2 watches the content in a normal viewing fashion. Barely any discussion and **note** taking happens until styling discussion comes up in the video. P2 makes succinct **notes** on how to colour text during the discussion.*

P2: So that changes the colour? Do you want to take down note of that? It's at the five-minute mark.

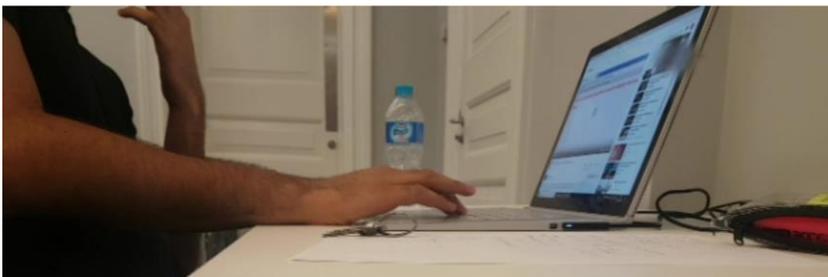
P1: Yeah, so this is how it looks.

*P1 turns the video backwards to show P2 and **points** to the screen as if they can see what they are **pointing** at. See screenshot and recording snippets below of P1 doing this.*

So, you see that's how it looks, style equals color.

P2: So, style equals color then a colon in between. Colours spelt the American way.

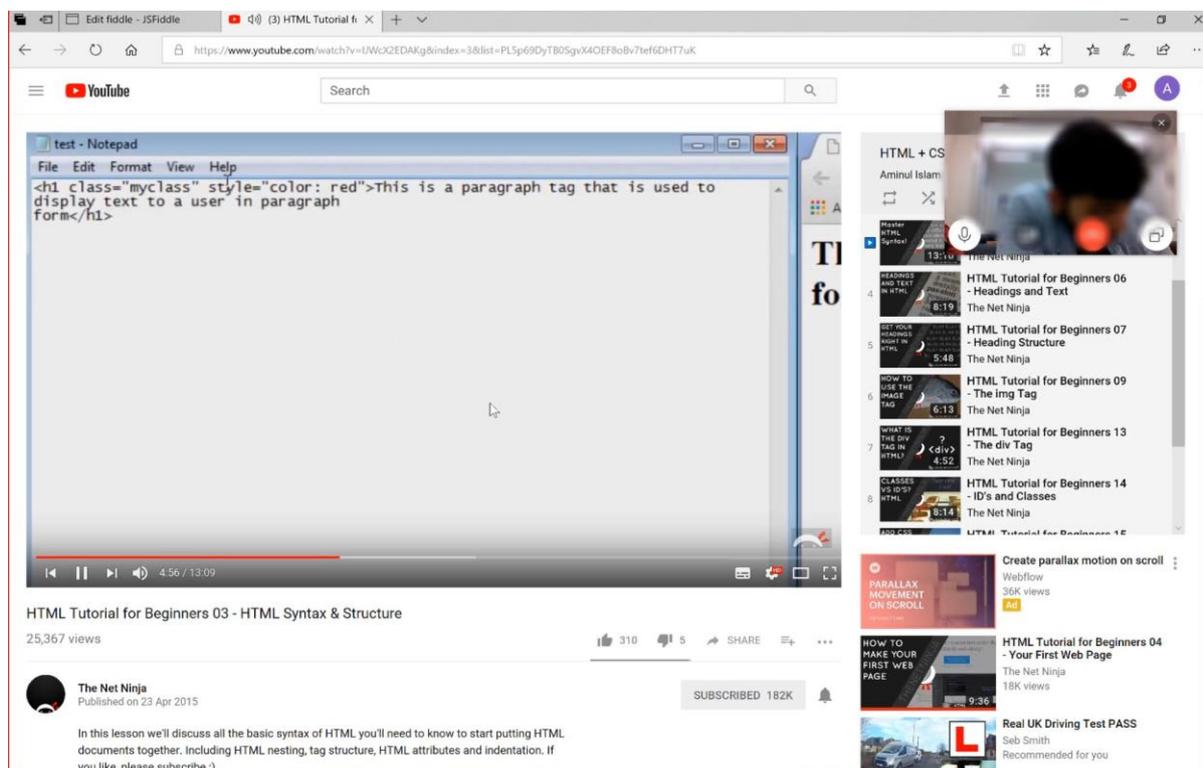
P1: Yeah.



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P1 going backwards on the video and 'showing' P2 how to implement inline CSS.



P1s screen when they were showing P2 how to style with inline CSS.

P1 goes back to the previous section and nothing is discussed between both participants until nesting and emphasis is spoken of in the video.

*P2 starts to **section his note** section according to the video he is watching by dividing his page with relatable headings/labels of each video. These notes are very succinct.*

*P1 mumbles 'nest' and **writes** about it on his notes and **writes** the time mark of the discussion in the video.*

P2 requests to pause to talk about the `` tag and nesting.

P2: Wait, pause it one second?

P1 pauses the video

So its `` yeah?

P1: Yeah.

P2: and its within the H1 yeah.

P1: Yeah, within the H1.

P2: Six-minute mark, cool. (*noting this down on his paper*).

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During this discussion P2 makes notes of the tag. The two participants look at the video just like they did in the previous screenshot. P1 doesn't reference content with their cursor.

P1: I think this is the longest video. Every other video is quite short.

Short discussion about is started on the video and both make notes about it and both do not write the timestamp this time.

Strong is to make it bold.

P2: Alright, cool.

Then the video talks about indentation in coding.

P2 wants to skip the video content as it seems irrelevant to the task.

Should we move it up (forward) a bit - the video? I don't know what he's going on about.

P1: Yeah, we don't really need that right?

The rest of the video is skipped through by P1 and barely any collaboration occurs. P2 is supposedly fine with this.

They proceed to viewing their 4th video ('Headings and Text') about headings and P1 makes small relevant notes but does not share them.

P2: Oh...headings, cool.

P1: This is an important one.

P1 stops the video and discusses what they need for the task briefly.

All we need is just titles, we need three paragraphs, we need images and style text whatever way we like. We can have it bold, we can have it italics and that. And then bullet points isn't it? I'm sure he will explain it.

P1 is looking at the physical task sheet provided on the right-hand side when talking about the implementation that needs to be done when completing the task.

P2: Yeah, this one is going to be a key one. *(talking about the heading video that is currently paused).*

P1 and P2 start to look at the playlist and discuss what else to watch. P1 is moving his trackpad to see the playlist with P2 who is viewing with the screen share tool provided by Skype. See below for screenshot of P1's screen.

P1: Heading is an important one, image is an important one. Div?

P2: What's div? I don't think we will need that one.

P1: We will go through it anyway, its only four minutes.

P2: Yeah, okay.

P1: ID's and Classes? I don't know.

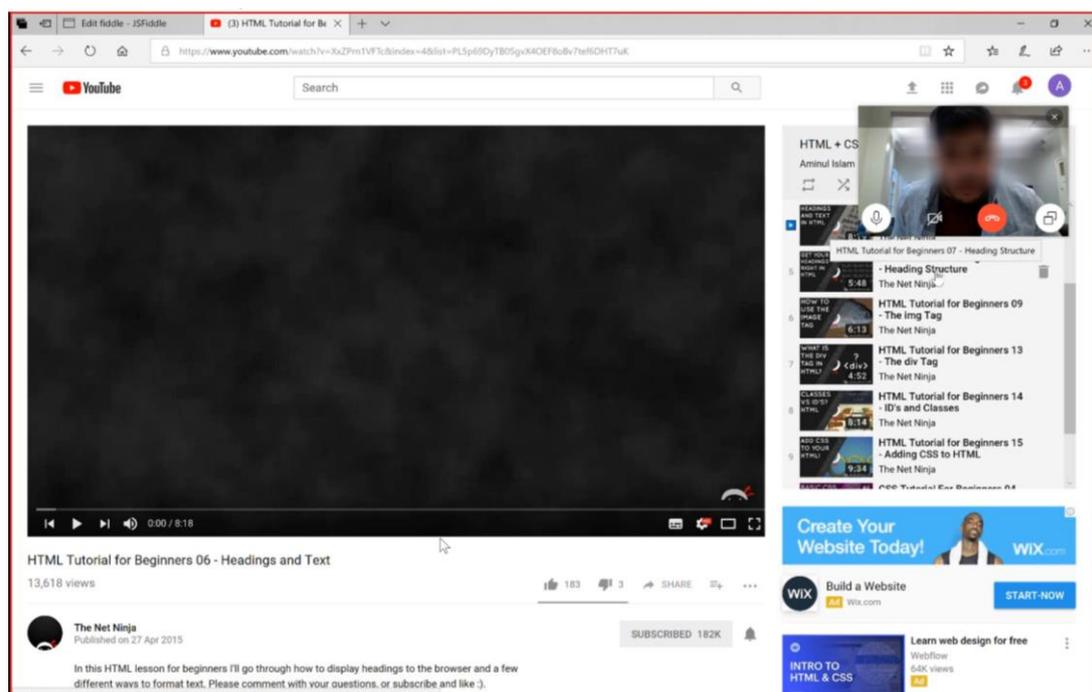
P2: I don't know about that one.

P1: I think this is important and (the) this last few (videos)

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Alright, let's go.



P1's screen when they were discussing what else they have to watch with P2.

They resume watching the playlist. P2 asks for a heading to be written on the code editor after watching a chunk of the video.

P2: The site title, just make it London with the H1.

P1: Should I do it now?

P2: Yeah. Might as well cover a few tasks.

P1: Exactly...get it done.

P1 deletes the previously written code adds a title in the code editor with a <h1> tag with 'London' within it.

P1: Cool, we got that.

P1 resumes the video and it talks about the range of headers and other tags that work with text.

Then P1 makes notes about text formatting with the <small> and <mark>. The notes are very succinct. P2 also makes notes about the <small>, <sub> and <sup> tags.

There wasn't much discussion on this video.

The video is then skipped through again by P1 and eventually moves on to the next video. P2 has no say in this and seems fine with this.

P1 moves his laptop slightly leaning towards the left but it doesn't necessarily cause a big change.

This video is about structuring headings ('Heading Structure' in playlist).

P1: Alright next video.

P2 prepares his notes section for this video.

This is important to our thing isn't it (the task).

P1 briefly pauses the video to state something about the content to P2 then continues the video. P2 is also making notes as the video plays and doesn't discuss it with P1.

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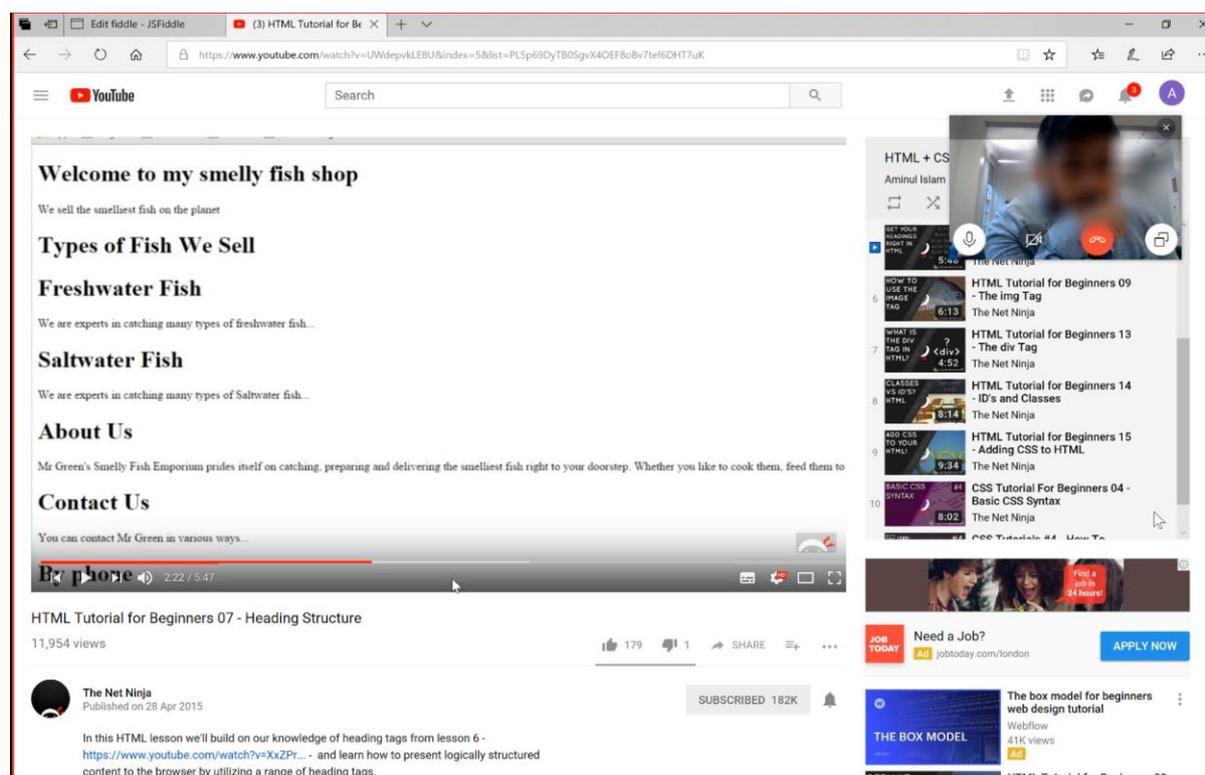
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So basically H1, H2... blah blah blah.

P2 requests to pause to talk about headers/headings to complete the task. They talked about how headings could be implemented.

P2: You see how he's got different headers, we can add three different ones and write paragraphs underneath them.

P1: Yeah exactly, so types of fish we sell will be a H1 or H2. Then, freshwater fish will be like a H3. And saltwater fish will be a H3, like that. (*referring to the video content being shown with P2, see screenshot below*).



P1's screen when explaining what tag each header could use to P2.

P1 then resumes the video and skips through video and listens to some sections of the video. P2 seems fine with this.

Alright, cool we know this!

Then P1 proceeds to the next video about the tag (video title: The img Tag).

P1: Alright, this is an important one.

P2 starts writing about the video on a new piece of paper with similar headings.

P1 makes notes about the source attributes in HTML as soon as he hears it in the video. He also pauses the video and lets P2 know what he is thinking.

Hold on, so we got source attribute....

P2: For image, its src.

There is a slight moment of silence, P1 waits for a further response from P2 but gets no response, so he resumes the video.

The participants often disregarded the task sheet and needed to be reminded they can use links to images opposed to using a file image path being shown in the videos. They were attempting to implement images incorrectly for this task. The researcher had to give hints that

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they were looking at the wrong implementation for the task.

P1 then identified the 'correct way' to implement images with the width and height attribute required for the task. P1 engaged by pausing the video when it talks about the relevant attributes for width and height. P1 pauses the video every time he spoke.

P1: That's what we need to do as well. That's what it (the task sheet) said.

Both participants proceed to listen to video about the relevant attributes.

Alright, we need to know that.

Both participants wrote notes about the syntax of the tag.

P1 starts making notes about the width attribute and writes down the time mark of when the video tutor talks about the width attribute.

P2: Equals, are those speech marks after the equals.

P2 is writing notes on how to implement images with a file path and includes a time stamp. P2 makes minimal notes on how to use the width attribute.

P1: Yeah.

So...width equals 100%. That's at 3:41. (P1 says this as they are writing notes about the named attribute).

Participants were told to skip the section about the alt attribute as it wasn't required for the task and time was running short, the participants had already shown what they do when they skip video content.

The next video was about the <div> tag (video title: 'The div Tag'). P1 skips the introduction as it wastes time.

P1: Do we need to know this? The div tag?

P2: Its 4 minutes, let's just go through it.

The participants went through the video and wrote minimal notes. They spoke about divs after it was explained. P1 paused the video whilst doing so.

P1 watched the video in a normal fashion. P2 looked closer to the screen to see the video content for a few seconds and notes divs are for sections.

P1: So, we do that (referring to the video content, see screenshot below. P1 has video paused whilst saying this).

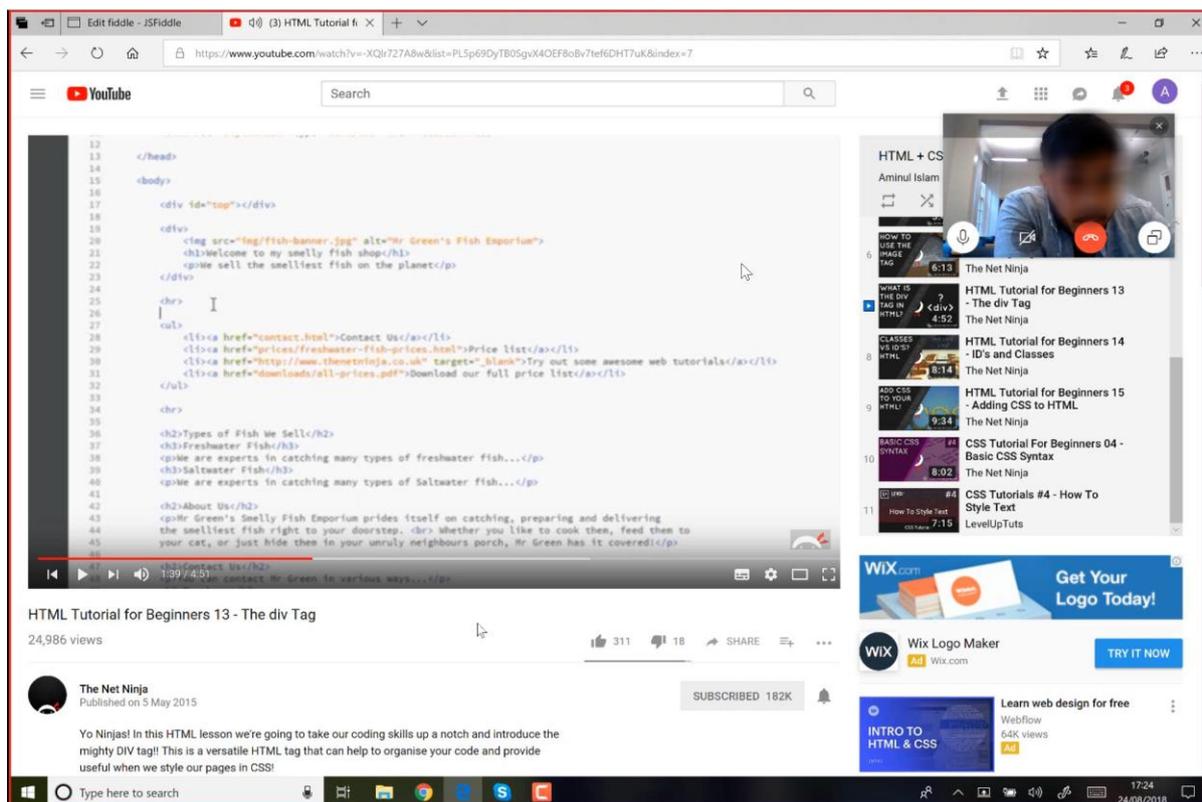
P2: So, the divs are just made for sections. (looks at notes beforehand, see recording snippet below).



P2 referring to notes on <div> tag before talking about it to P1.

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P1's screen when he was clarifying what the <div> tag was with P2.

P1: Yeah.

P1 skipped a lot of this video before continuing to the next video about IDs and classes.

At this stage it was clear participants have ignored the fact the video tutor has said 'div tags...have no visual impact on a page but when we combine these with CSS rules that's when it's going to come into play'. P1 also says <div> tags are useless and P2 agrees.

Alright mate, that was a pointless one (the video).

P2: Yeah.

Alright, IDs...I don't know if this one is going to be relevant.

P1: Yeah, I don't see this being.

P2: I don't think we need the ID one.

P1: We don't isn't it.

The participants then watched video on how to add IDs and classes in HTML with no peculiar viewing behaviours as most of the session. Viewing is 'conventional'.

During this video, participants barely spoke to each other again. Minimal notes were made by P1.

This video was also skipped often and not much collaboration occurred between participants. P2 barely spoke. P1 was getting annoyed that the content did not show how to code straight away and makes comments whilst the video plays.

Just show us what it is man. [slightly frustrated]

P1 skips to the 'coding section' of the video to see ID and classes implementation as soon as possible. He gives an idea that he knows what is going on.

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Makes sense (*P2 doesn't respond*).

Alright mate! [sarcastically] *P1 skips the rest of the video by tabbing through it using their keyboard. P2 makes minimal notes during this video.*

That's basically how to separate all the content. Make it easier for who evers coding it to see.

P2: Yeah.

P1: Now CSS and then we are done. Oh, three more (videos).

P1 makes minimal notes about id and class attributes when the CSS vid starts. (video title: 'Adding CSS to HTML').

P2 flips his notes page to have space to write about the video. He writes the ways CSS is implemented in very short notes but doesn't write anything else.

Participants barely spoke again when watching the video about how to add/link CSS to HTML code (video title: 'Adding CSS to HTML'). participants are just facing at the screen awaiting instructions in a normal fashion.

The video then talks about inline-styling first and the participants acknowledge this and know it from a previous video.

P2: Colour? Okay cool, just like last time.

P1: Yeah.

Then the video talks about adding the <style> tag in the head tag.

P2: He just shortened the way to code it.

P1: Yeah.

Participants were convinced they knew enough and wanted to skip the video content. They agreed they had enough to make the web page.

I don't think we need it for our website to be honest.

P2: Yeah, we don't have to do it.

P1: Literally all we need is: titles, which we know how to do; three chunks of texts, which we know how to do.

P2: Yeah.

An image?

P1: Image; which we know how to do now. Style text whatever way we like...that's the only thing. But we know how to make it bold, make it different. We know how to change colours as well.

P2 tries to figure out the bonus task by suggesting to just look for the relevant tag.

P2: You know how the bonus is to figure out how to make bullet points. You see how's there's bullet points there yeah. You know when he's continuing on the video...

P1: Yeah...let's have a look at what he's done.

Then P1 and P2 look at the content video for the correct tags. P1 has control because he is running the screen share and video.

P1 skims through the video and tries to show the correct code with his cursor to P2 (see screenshot below).

P1: How's he done it? Here...there you go. Are you seeing this?

P2 takes some time to respond.

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The screenshot shows a YouTube video player with the following details:

- Video title: HTML Tutorial for Beginners 15 - Adding CSS to HTML
- Views: 11,898
- Likes: 207
- Comments: 0
- Channel: The Net Ninja (Published on 6 May 2015)
- Video description: Yo ninjas, once again in this beginner HTML lesson we're diving deeper in to the realm of ninjaring our HTML document. In this tutorial we'll be adding our first CSS styles & stylesheet to the website, and we'll talk about the best ways of doing this.

The video content shows a code editor with the following HTML and CSS code:

```
<html>
<head>
  <meta charset="utf-8" />
  <meta name="keywords" content="fish, smelly, trout, salmon, shark" />
  <meta name="description" content="We sell the smelliest fish online, guaranteed!" />
  <title>Mr Green's Smelly Fish Emporium</title>
  <link rel="stylesheet" type="text/css" href="css/main.css">
  <style>
    #navigation a{
      color: red;
    }
  </style>
</head>
<body>
  <div id="top"></div>
  <div id="header">
    
    <h1>Welcome to my smelly fish shop!</h1>
    <p>We sell the smelliest fish on the planet!</p>
  </div>
  <hr>
  <div id="navigation">
    <a href="contact.html">Contact Us</a>
    <a href="prices/freshwater-fish-prices.html">Price List</a>
  </div>
```

P1 showing P2 what they think is needed to implement bullet points with his cursor.

P2: Where? li? Yeah its li. Cool. (P2 makes note of the tag).

P1: Let me double check that.

P2: Oh yeah, do you want to do it yourself (use the online code editor)?

For the facts we could do (use bullet points)?

Participants then work together on their web page and uses the li tag but without working with the video. Until P1 notices they could refer back to the video.

P1: Hold on, what did he do?

P1 proceeds to video and just sees what tags are used to clarify his use of .

So, he got li and then...we can just write...

P1 then types some code with P2 that was incorrect.

That didn't work! [surprised].

P2: Try remove the H1s, just try see without.

P1: Oh, I'll tell you why...I haven't closed it.

Alright hold on.

P1 then goes back to the video and tries to fix the 'error'. He refers back to the video as shown previously.

Yeah that's it, boom.

P1 then recodes and feels confident it is correct.

Let's have a look at this. [slightly unsure]

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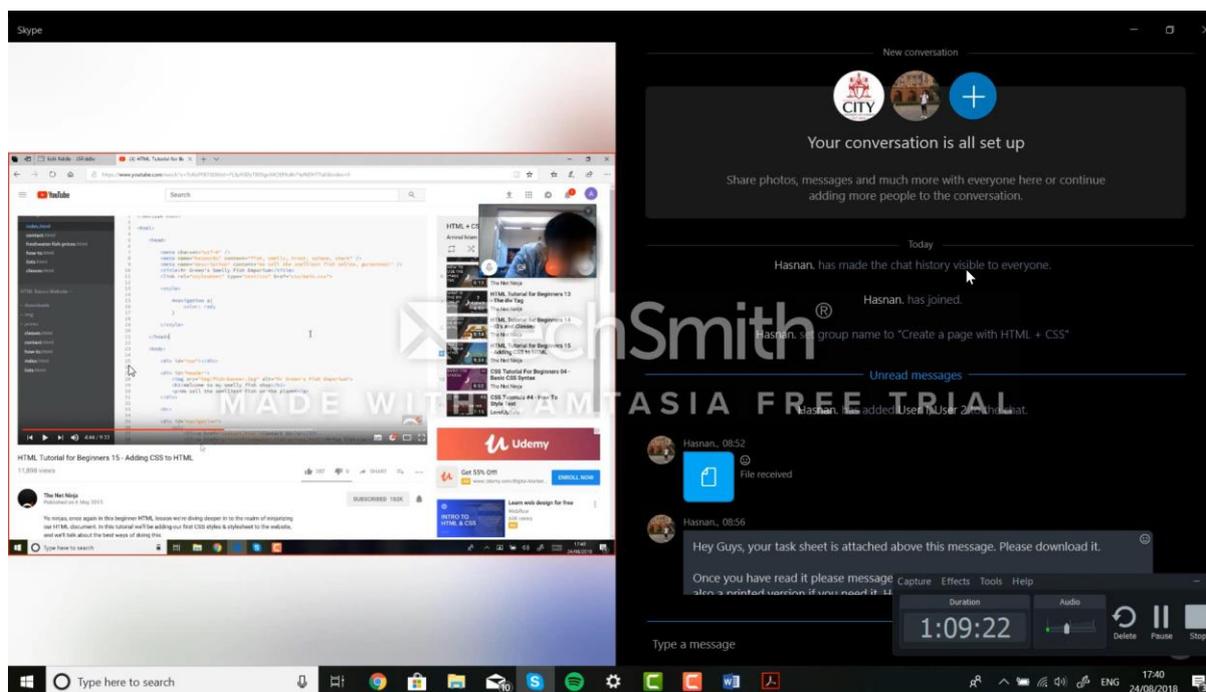
The code did not work again and P1 is determined to get this implemented

What did he do! So, he's written? (See screenshot below for screen capture of moment)

P2: li.

P1: Just li?

P2: [ponders] and then on the other side... (*looking for missing code*).



P1 and P2 looking for the correct code to fix their coding error. (P2's viewpoint)

After looking at the paused video, P1 writes some code...

P2 raises their arms in distress and P1 can see this through the web cam feed.

P1: This is annoying. What's this.

P1 tries another solution but fails.

No no no.

P2: Alright, cool, cool, cool. (*suggesting to P1 they should move on*).

P1: Alright forget it, it's a bonus anyway, don't have to.

They try to watch the rest of the video regarding how to add CSS until P1 stops the video and P2 responds.

P2: I don't think we need this.

P1 ignores the comment and is still searching for the bullet point implementation. He finds the relevant parent tag ().

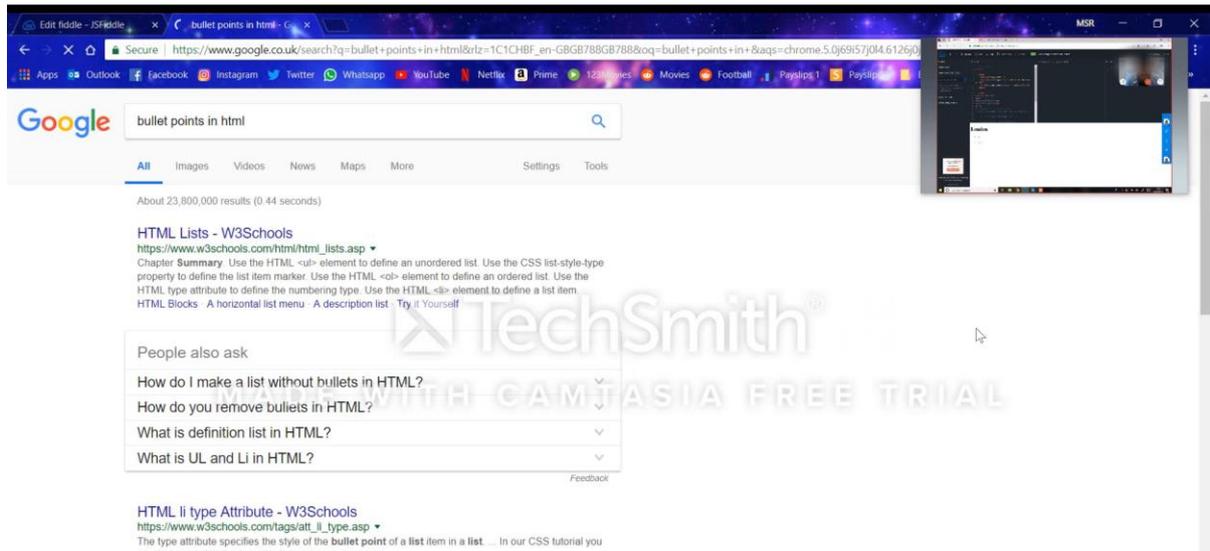
P1: Hold on, why does this say ul? Do you reckon that's bullet points? Let's try it.

P2: You know what, I'm going to Google it quickly. It says your allowed to use alternatives.

P1 is coding away his idea of what is correct whilst P2 says this. This stops P2 from having to Google 'the answer'.

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P2 resorting to Google just before P1 figures out how to implement bullet points.

P1: I got it! ul, told you! There you go! [excited]

Then they finish viewing the rest of the video and P1 proposes to finish the task. The video is talking about separate style sheets but is ignored by the participants.

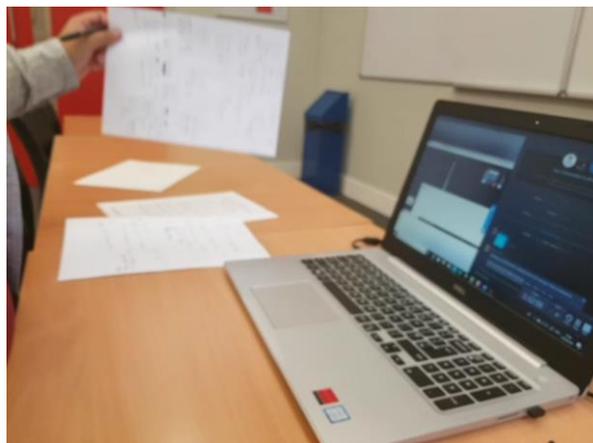
Shall we just do it? I think we should just do the website now.

P2: Alright, yeah.

P1: I don't think we need to know the other videos.

It's about London, right? Find some facts and send it on the chat?

P2 prepares his notes in order of what was written first for reference during the website creation (see recording snippet below).



P2 preparing his notes for reference during the website creation.

P2: Do you want to make a mini-subheading?

P1: Facts? Facts...!

P2: What was the last video about?

P1: It was just about CSS and that but...

P2: How to style text? What if it tells us how to underline and that.

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P1: We don't need that though, do we?

P2: I mean, we don't have to but maybe for subheadings.

P1: It's alright man.

P2: Cool cool.

What's it gonna be about? Quick key facts?

P1: Yeah, let's do facts about London.

Participants start constructing the page but seem to not refer to videos and notes in their discussion.

P1 notes down the use of though on his sheet after deleting it from the code.

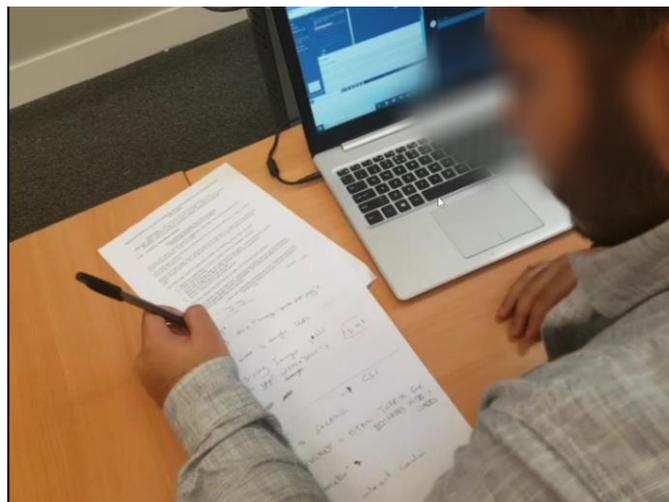
The participants spent some time being wound up about the content their web page would include.

P2 also wrote a checklist about the task again for their thought track.

Participants started to refer to notes to see how to implement images. Beforehand they used their knowledge gained to complete the required implementation.

P1: We just need an image and that's it man...How do we do images again? How do I do it here?

P2: You do the open bracket, write i.m.g then s.r.c (referring to notes, see recording snippet below).



P2 referring to his notes about the tag.

P1: What? In one go?

P2: You do a space, equals, speech marks and then I think you copy and paste the url. I sent it on the group chat, so it comes as a JPEG.

P1 tried to add the 'correct code' but it didn't work.

The participants often disregarded the task sheet and needed to be reminded they can use links to images opposed to using an image path being shown in the video. So, the participants were advised to use links that end in .jpg or .png etc. This stopped time wasting that was already happening. Then P2 tried to find the correct image.

P1: Did you send me the image yeah? Let's add that.

P1 adds the images link to the code editor.

How do I close it? Just like that?

P2: Yeah, just like that. (the participants are referring to a closed bracket).

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P1: Oh, there we go.

Then the participants go on to implement small scale CSS to finish their page but with no use of videos.

P2: Now we need to style. You just want to pick out words within the text?

P2 starts to write down styling options in his notes as a reminder on what options he has (see recording snippet on right).

P1: Should I make subheadings for each paragraph?

P2: Yeah, if you want.

P1: I'll do H3 (as subheadings).

P2: Do you want to make it a different colour?

P1: We should, hold on. Let me just add them quickly (heading elements of HTML). *(P1 adds the content to the page and runs it).*

P2: Now we just need colours, bold...emphasise. [very adamant]

P1: What was the stuff that we could use (while flipping notes page written down beforehand).

P2: For colour within the subheadings...do you want the heading or not?

P1: Let's make it colours of England.

For the sake of time the researcher asked the participants to only do one implementation of styling. The session was done late in the day and the University was closing and the rooms needed to be cleared.

P2: Okay, space bar (and type) style within the h1 or whatever.

P1: H3 yeah?

P2: Yeah H3 my bad. So, its within it.

P1: So, I don't close it? I open it and say what?

P2: You backspace twice.

P1: I remove this as well? (the closing angled bracket). [dubious]

P2: Yeah then space then style and then equals sign and then speech marks and then space colon red and close.

P2 did not use notes to help P1 with this implementation. He seemed confident he is correct.

The page then comes up with its relevant styling.

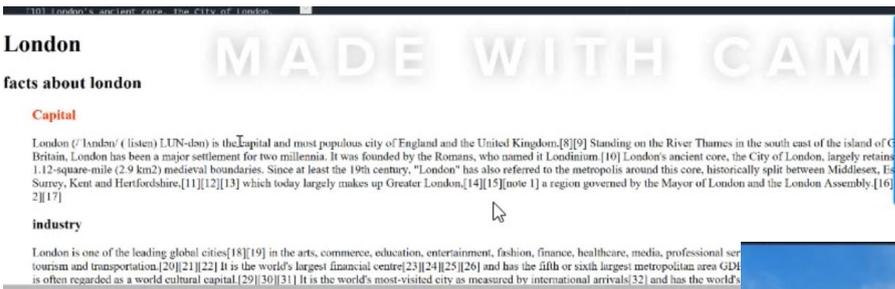
P1: We are done man that's it!



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Session completes...below shows snippets of completed code.



Informal debriefing for Session 1

Researcher: Obviously we done the session now. First of all, are you happy with what you made?

Both participants: Yes.

P1: Very happy.

Researcher: Based on that, how was your experience and how would you personally describe it? Whoever wants to go first. Base it on how you guys worked together.

P1: I think the use of Skype definitely helped because they could exactly see what I was doing. Also, I found communication to be very effective, it was smooth and there weren't too many complications.

Researcher: What specifically about Skype made the communication good?

P1: I could see him and his reactions. Whenever he was speaking I knew he was speaking even though I couldn't hear him properly. I could see him talking.

Researcher: I found out today, when someone shares screen you don't get to see their camera as well. So, for you P2, was that a problem?

P2: It wasn't too much of a problem. The new addition of the sharing screen and sound. I was not only hearing the YouTube video, I could also hear his voice there wasn't much delay in response.

Researcher: How was your experience based on the collaboration aspect?

P2: The collaboration, I didn't see any big problem with it. Again, with the sound it helped a lot that the fact I can simultaneously listen to him and the YouTube video. There wasn't much delay between the two. So, when I say stop the video, we'd take notes and then continue on after.

Researcher: Okay, so sounds good. What was the worst thing that happened in this situation? It might be the fact that it crashed but let's keep in mind that's not really part of the system.

P1: I would say, it could be...the fact that he (P2) couldn't actually control the screen.

P2: Yeah.

P1: So, it would take a bit longer for example to find what he was talking about.

P2: We both couldn't see each other's faces whilst watching the video. That's the only complaint I'd have. It's just a minor thing, by judging someone's facial expression you can see if their getting the same message as you. It just makes it easier.

Sound
encounter

→ Bodily
presence

→ voice presence

→ synchroneity
view

↓ Inability to Access
Screen.

↓ Inability to see
your screen.

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Aminul: What was the best thing?

P1: The fact that I could see him. He could see my screen, we could share everything at the same time.

Aminul: If I'm correct the video and the audio sound?.to P2

P2: Yeah.

Researcher: P2 took the listening role where P1 took the controller role? This happened in the beginning. Did it naturally happen? Did you feel like you can collaborate more?

P1: I feel like it naturally happened to be honest.

P2: I feel like at the start, when we found out we weren't able to edit together. It ended up naturally happening....it came about.

Researcher: do you feel like you learned anything?

P2: I learned how to code, it showed me how complex it is.

P1: I never knew how to code, so I thought it was good.

↑ Gratification upon completion.

Researcher: Was that an effective way in doing things?

Both participants: Yeah.

Researcher: what made you guys communicate well? It might repeat answers from before.

P1: I could see his face.

P2: The fact I could see his screen and what he was talking about. Rather than me trying to second guess. → again spontaneous speak.

Researcher: How did you guys make sense of each other digitally? Other than webcam video. How did you see each other digitally?

P2: The chat system helped when I tried to show him an image. The fact we can openly communicate through a chat system helped.

Aminul: So a chat system helps?

P1: Definitely.

Researcher: How do you feel like you coordinated? How would you say it happened?

P1: I think it went well.

P2: It went well because.... *doesn't finish sentence.*

Researcher: So what mechanisms did you import into this situation? You were watching videos, who did what?

P1: I was controlling, I was sharing screen but did ask him whenever you want me to pause to let me know. → mechanism

Researcher: So, is it okay to say you guys made up the rules in the beginning?

Both participants: Yeah.

Researcher: When you lot were looking at the video, how did you guys have awareness other than the webcam video?

P1: By their voice and coding screen when I could see his mouse.

↓ voice per cam

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Researcher: You guys responded well in terms of social awareness, so when you were speaking. How did you feel like that happened? Because of the voice?

P2: Yeah.

P1: Yeah.

Researcher: Was there any cues that you used that were implicit for P1? (to P2).

P2: I would give hints like 'I don't like think this is relevant'. He would take time to see if something is relevant or not.

Researcher: Did you wish you could use something, but the technology was not available to you? What would have helped you?

P2: I can't think of anything to do with a video sharing system.

P1: I think the computer was a bit slow.

Researcher: You were wanting to watch the whole playlist then code? P1 suggested to do it in parallel. Why did that not happen?

P2: We thought it would take a few minutes (to code).

P1: We thought let's get all the information and do it.

Researcher: If it were side by side, it would be quicker?

P2: We might have saved time watching the other videos to be honest.

P1: We did waste a bit of time because we knew exactly what we needed.

Researcher: You guys used paper and pen. You had a Skype chat and a mouse. But why use these things?

P1: It's the quickest option.

Researcher: Why didn't you transfer notes digitally?

P1: I didn't constantly think about that aspect to be honest.

Researcher: You didn't collaborate over videos sometimes. Is there a reason?

P2: I was worried if I speak over.

P1: Exactly. I was trying to get as much information as possible.

Researcher: P1 skipped videos often, was this fine? (to P2).

P2: Yeah.

Researcher: The collaboration wasn't there.

P1: True. It worked out in the end.

Researcher: Did you use minute marks?

P1: I used minute marks after he (P2) suggested it initially.

Researcher: P1 you could have pointed at when explaining it. Do you feel like that was a problem?

P2: I understood after, but I get what you're saying.

Researcher: Okay that was a few concerns I needed to get out the way. Thank you.

↗ Cautious Communication

↕ Cautious Communication.

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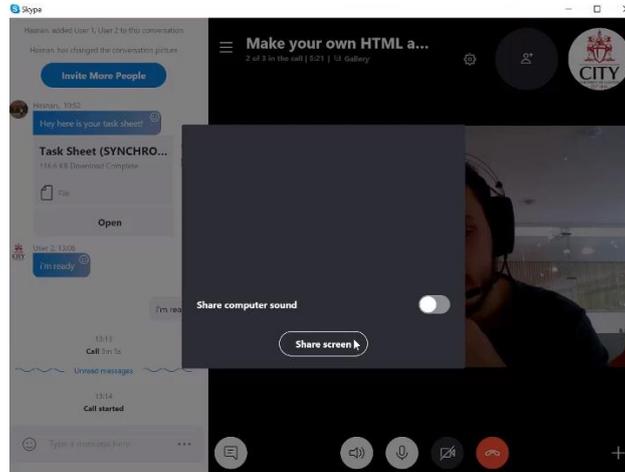
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Session 2 (held on 27/8/18) – Synchronous

Participants: 'P3' and 'P4'

Call starts

To the surprise of P3, P4 intuitively opens the share screen feature before even starting to talk about the task.



P4 starting the screen share when the call has just started.

Researcher tells the participants to start speaking first.

P3 speaks first.

P3: What city are we going to choose anyway.

P4: You choose.

P3: Should we just choose London because that's the one we know.

P4: Alright fine London.

Let's open up the video playlist. Do you want to watch the videos together or do you want one person to watch it? and you look up the information. That's not going to take long, so you might as well watch it with me.

Whilst P4 is speaking they open up the video playlist through the task sheet they have open in their browser. The task sheet doesn't open the playlist on a new tab. They also open up the first video which is titled 'What is HTML'.

P3: We might as well watch it together anyway. We both know enough about London anyway.

P4: Fair. Let's open up the online editor as well.

P4 opens the code editor through the task sheet. But the task sheet had to be opened again through Skype because a new tab didn't open when the YouTube playlist was opened. As the code editor opens, it opens on the same tab that the task sheet was on. Meaning the digital task sheet was gone from P4's sight again.

P4 then goes back to the window where the video is playing and an advertisement is playing. They start the proper video and try to establish some rules.

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P3 I can't hear you properly so if you want to speak, put your hand up and then I'll pause it.



P4 telling P3 what to do when they want to speak. P3 cannot see the gestures that P4 is making.

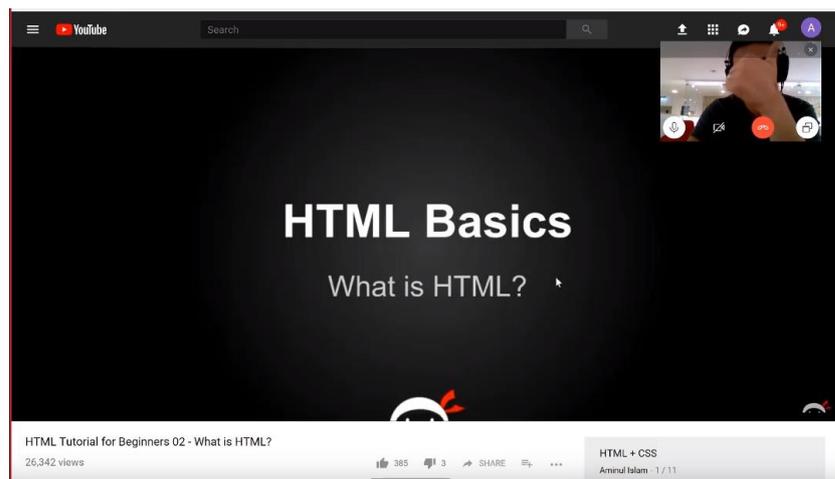
P3: Alright.

A few seconds in, P3 then suggests putting on audio sharing provided by Skype. P4 pauses the video in order to be able to hear what P3 has to say.

Can you share the audio because I can't really hear anything?

P4 gets confused about sharing audio and needed help from the researcher to set it up. They didn't know how to do it.

Once the fix happens, the participants start to view the video 'What is HTML' from the playlist. P3 gives a thumbs up to clarify that he can now hear audio.



P3 giving a thumbs up to P4 that they can hear the video. See the top right corner.

P4: I'm just going to skip some stuff.

As soon as the video starts P4 often skips the video forwards a bit and P3 doesn't question it.

P3 watches the video in a conventional manner.

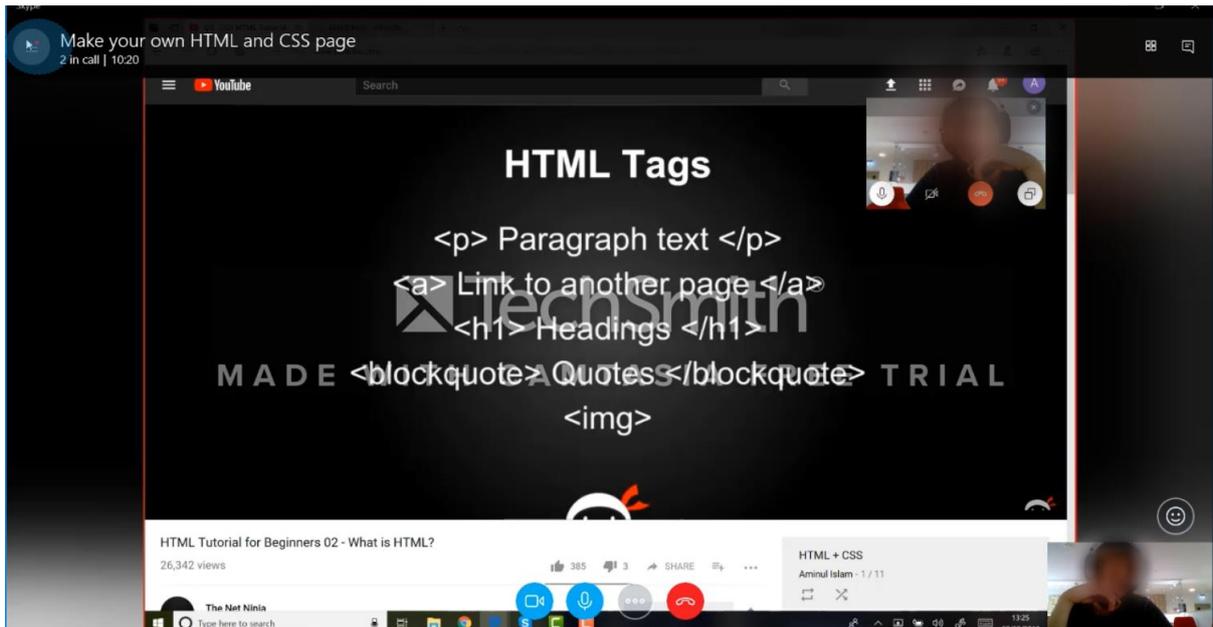
P4 also watches the video in a conventional manner.

Both participants are not taking notes or doing anything peculiar in opening moments of the video viewing.

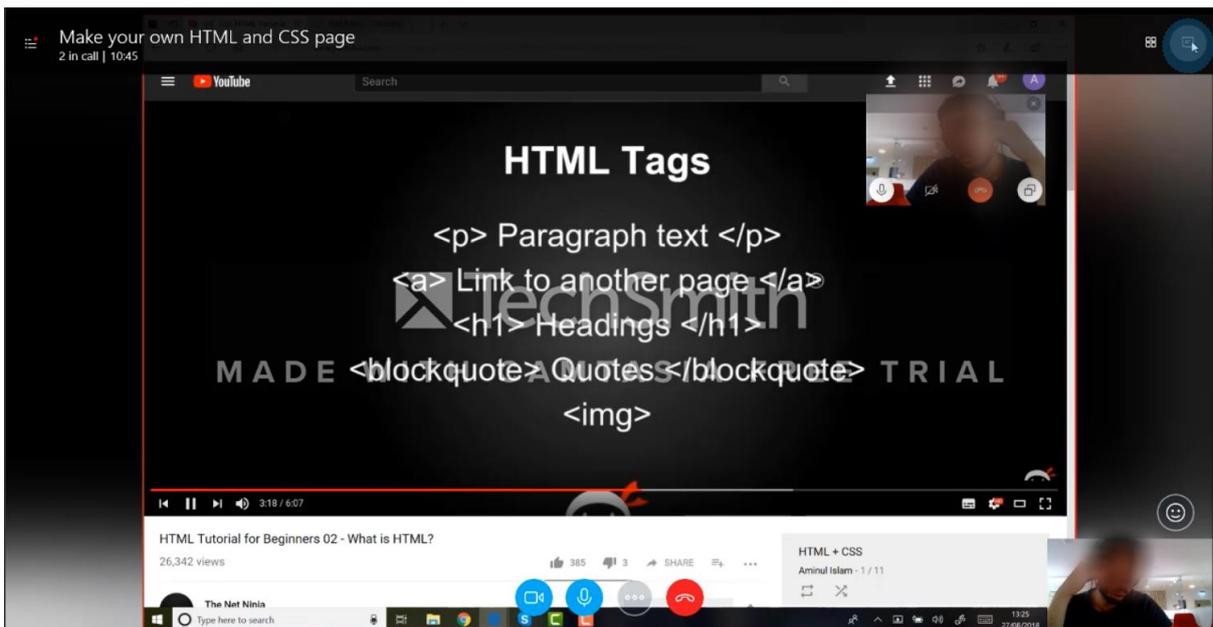
A third of the video in, P3 tends to the Skype chat to start making some notes (see screenshots below). He types about a few HTML tags. Specifically, the `<p>` and `<a>` tags.

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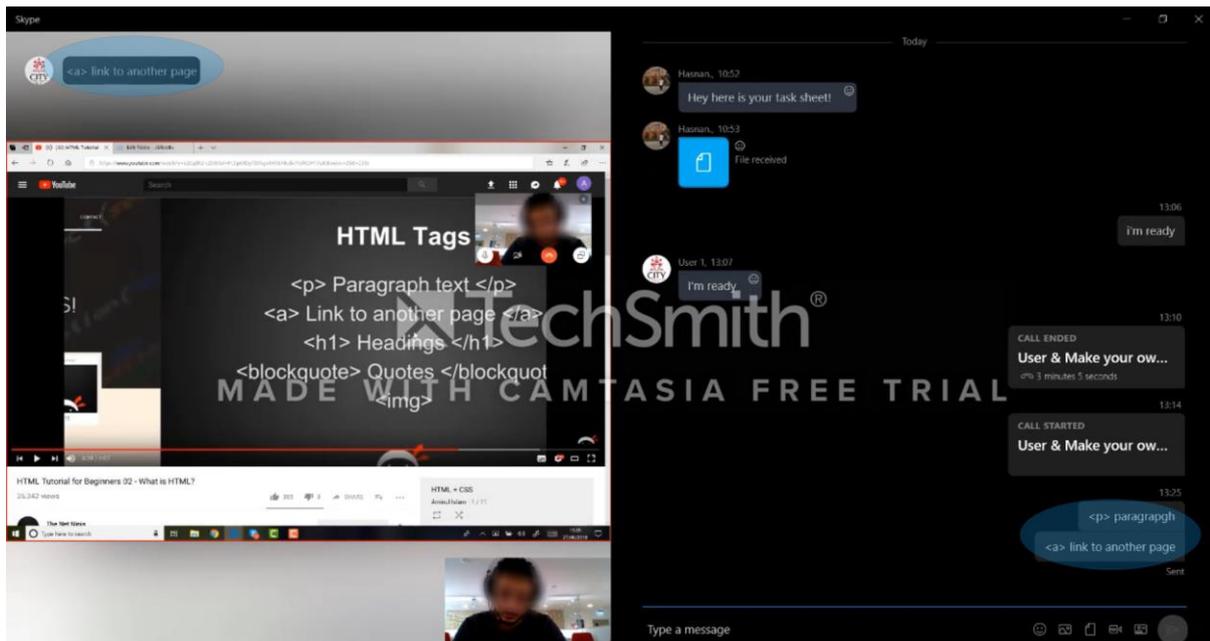


P3 attempting to open Skype chat but doesn't succeed as it is the wrong option (see blue circle on the top left corner).



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P3 eventually finds the correct icon (see top right corner in image in previous page) to open the chat feature and sends his relevant notes mentioned beforehand.

Whilst P3 is typing his notes on to the Skype chat, P4 is eager to move on.

P4: Do you want to move on?

P3: No, let me just write down the links (*referring to the <a> tag*).

P3 completes his notes then calls for P3 to pause the video.

Pause it.

P4: What's wrong?

P3: I just want to write down this stuff on the Skype chat, so we don't need to come back to the video.

P4: Oh.

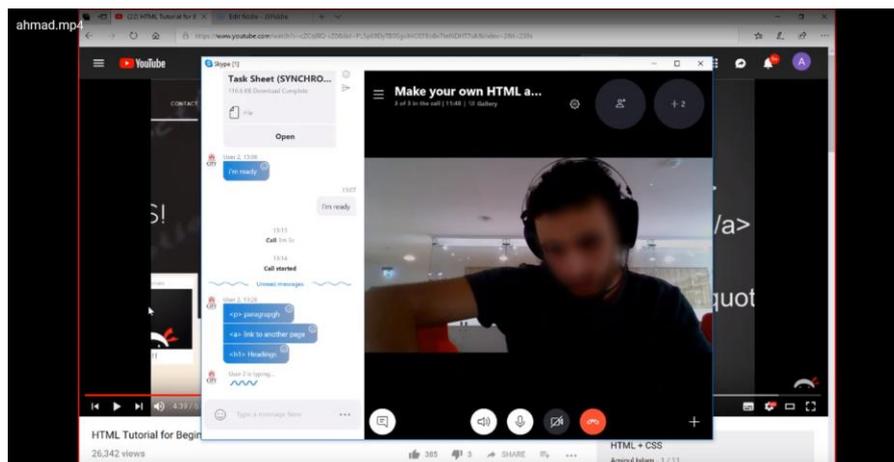
I mean, do you want to start a Google Doc?

P3 sends his notes about headings to the Skype chat and P4 glances at them quickly.

P3: Yeah, I just put it on the Skype chat for the moment. You start a Google Doc.

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P4 checking notes sent by P3.

P4 suggests skipping the rest of the video because it seemed like an advertisement. P3 doesn't reply and they watch the video for a few more seconds. P4 is eager to move on to the next video and pauses the video to tell P3 he is going to move on.

P4: I'm just going to the next video.

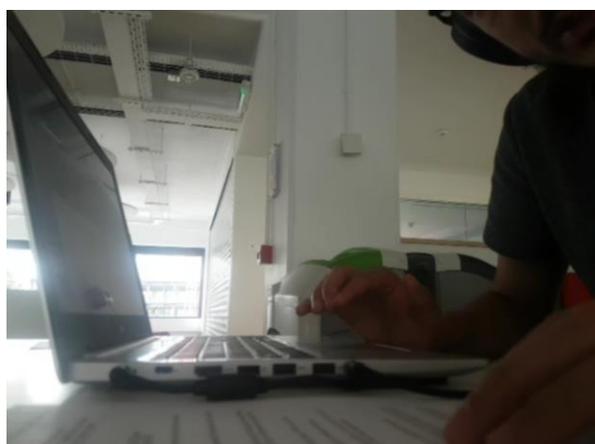
Before P4 gets to move on P3 starts to talk about the task they need to complete.

P3: So, we need four of these don't we.

P3 is looking at the physical task sheet provided when saying this.

P4: Yeah.

P3: *We need four sections, don't we? (referring to the bullet points of the task sheet)*



P3 looking at physical task sheet on his left hand side.

P4: Yeah.

This is an introduction so let's move on to the next (video).

P3: Yeah, next one lets go.

P4 then plays the video titled 'What is CSS' and the participants view the video together. P3 suggests watching the video in a quicker speed a few seconds into the video.

Play this at one and half I beg you.

P4 didn't change the player speed to 1.5 and doesn't say whether they misheard P3 or not.

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P4: We are not interested in CSS, right?

P3: We are, it's for presentation. Just play it in one and a half. We need to present it nicely. We just stop at the coding elements.

The video goes on to talk about CSS3 and P3 realises this may not be useful.

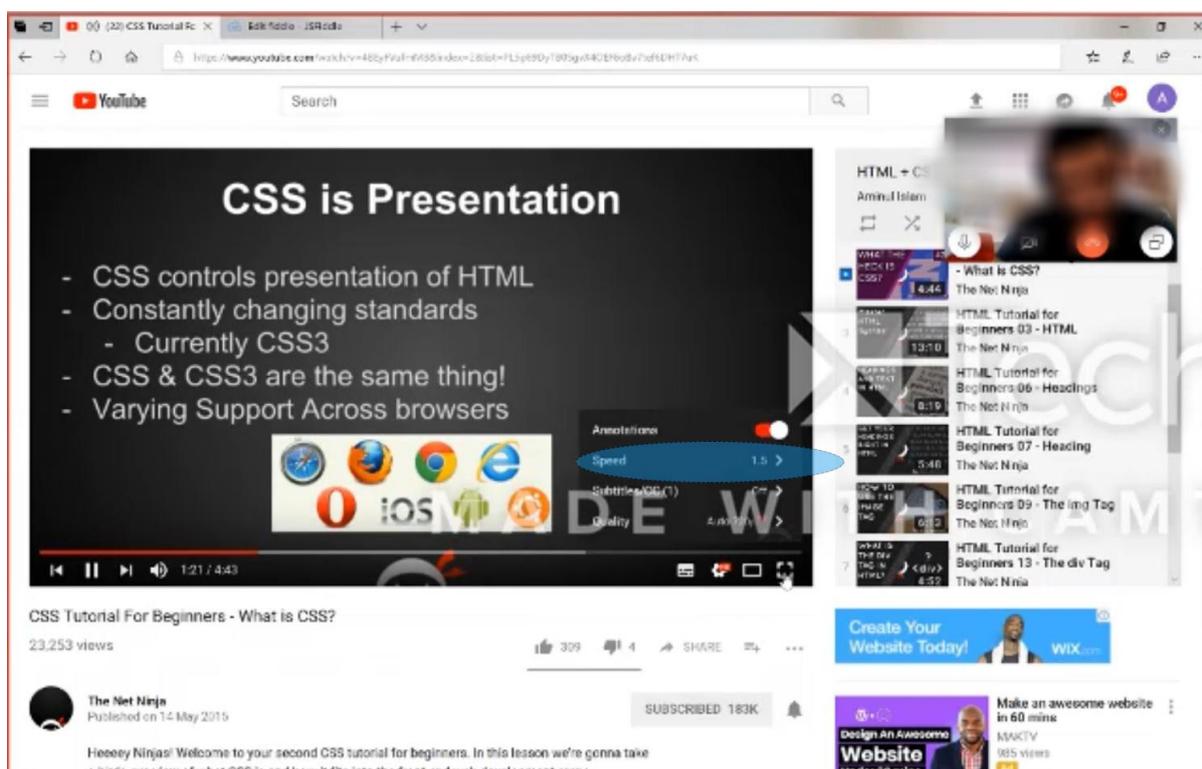
Fast-forward this bit, play it at a quicker rate. Play it two times or three times.

P4 doesn't hear what P3 is saying clearly and just resumes the video. He pauses a few seconds later.

P4: What did you say, sorry?

P3: Play it at a quicker rate. Play it at two or three times.

P4 plays the video and only changes the video speed to 1.5 (see screenshot below).



P4 changing video player speed to 1.5. They ignored the suggestion by P3 to play the video even quicker. (Screenshot is of P3's screen/screen share view)

P4 also puts the video into cinema mode for a wider screen.

Both participants then watch the video in a conventional manner.

No note-taking happens from both participants (physical nor digital).

P4 suggests to P3 to start the next video with a small chunk of the video remaining.

P4: Next video?

P3: Yeah.

P4: He's talking rubbish.

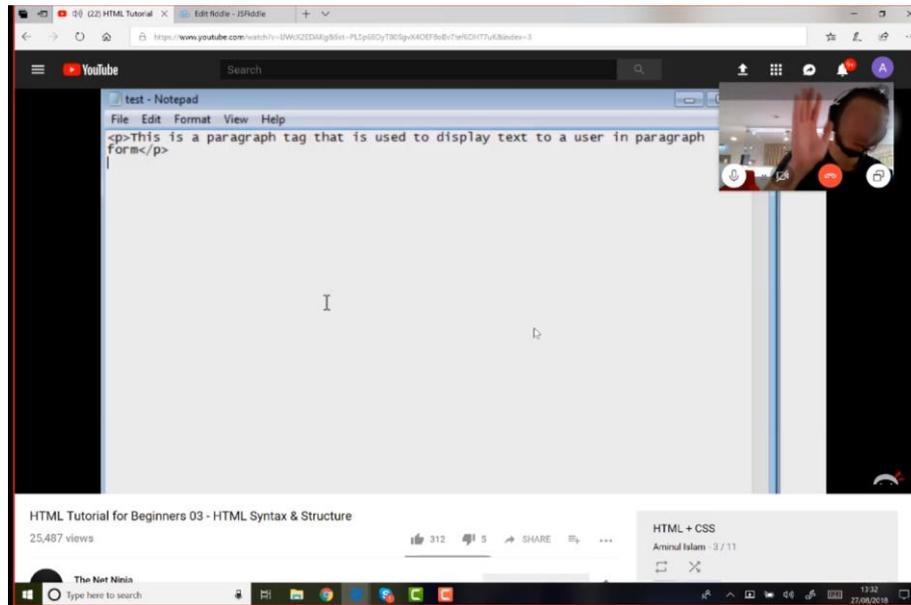
P3: Yeah, let's keep it moving.

P4 then plays the third video in the playlist titled 'HTML syntax and Structure'. The video goes over simple tags in HTML and P3 seems to not want to listen to this as he already knows it. He asks P4 to keep it moving.

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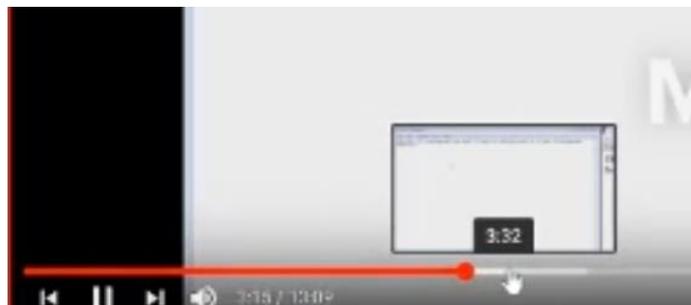
P3 puts their hand up before asking to move on (see screenshot). P4 manages to hear him and listens to his request.



P3 asking P4 to pause the video currently playing (see top right corner).

P4 fast-forward this.

P4 moves the video forward. They then use the timeline's preview feature to see what is upcoming. In the moment the video tutor is talking about attributes and P4 fast forwards to the section where a 'fuller' implementation of an attribute is shown. (See screenshot below). The Participants here continuously uses this feature for this video.

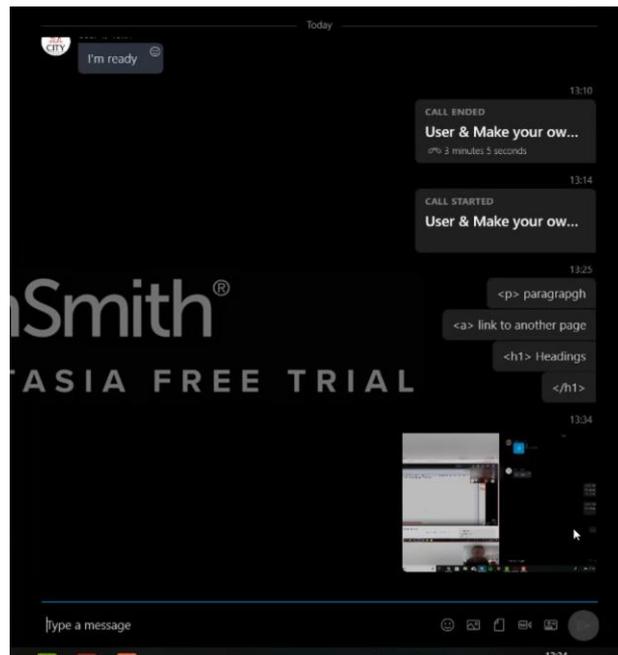


P4 seeing what is coming up on the video using the feature provided by YouTube.

As the video finished speaking about tags and attributes. P3 sent a screenshot of the 'full' code to the chat and found it hard to close once clarifying what they screenshotted is useful. They inspected the screenshot and didn't refer to it again later during the rest of the session.

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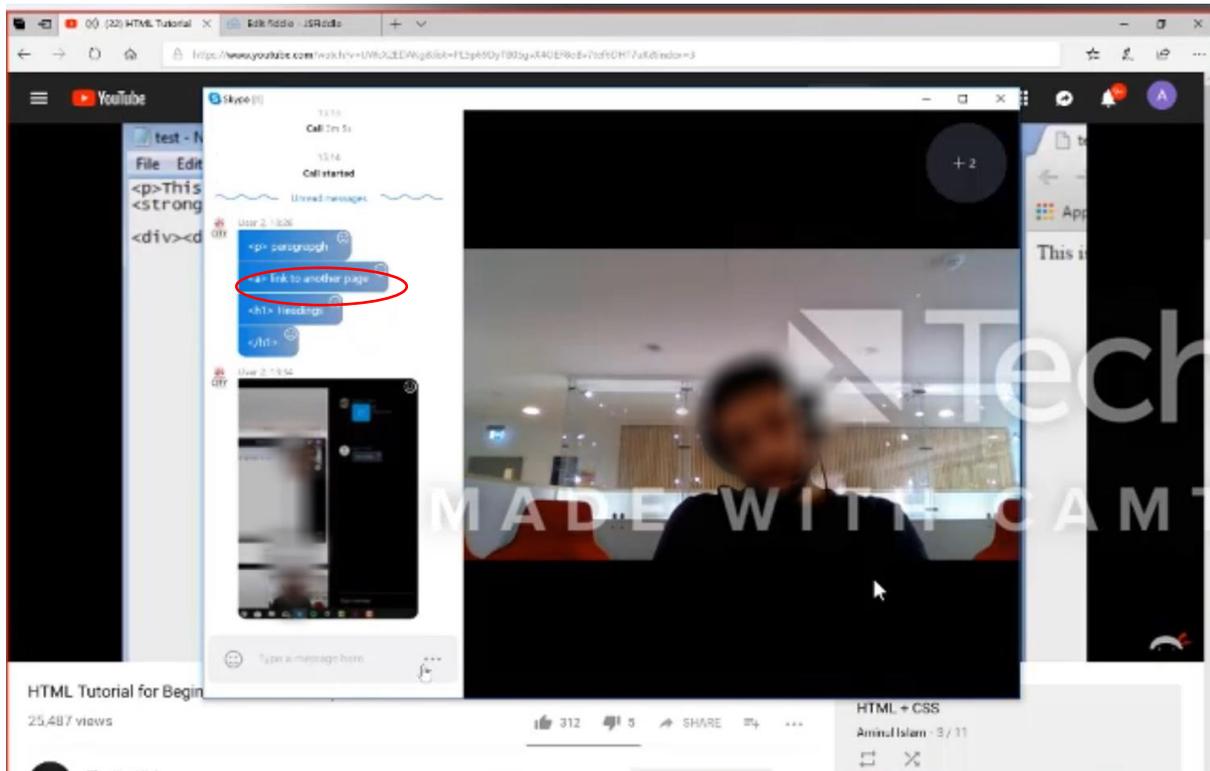
P3 sending his screenshot to the chat (see lower third).

The video starts to talk about indentation and shows an `<a>` tag being used. P4 then has a question about it whilst the video is playing.

P4: What's the a tag again.

P3: Oh, it's a link to another page. It's on the chat. (*P3 is referring to the notes that he made on the chat and sent*).

P4 then goes to the Skype chat to see the notes that P3 was referring to. He glances at them briefly.



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P4 looking at the notes P3 sent to clarify what the <a> tag does in HTML.

P3 then starts to doubt whether the content being discussed in the current video is relevant to the task that is being completed. He asks P3 to go to the next video. The video is talking about indentations and mentions how bigger websites should worry about it.

P4 pauses the video.

P3: This is too complex for us man. Next one (video).

P4: What?

P3: Next one. This is too complex for us.

We are just trying to make three paragraphs and headings and that. Why am I listening to all of this nonsense?

P4 then moves the video forward and sees the <div> tag in use and questions what it is about.

P4: Yeah but I want to know what does div do.

P3: Alright, we can watch it to the end.

The participants proceed to watch the remainder of the video.

P4: Oh, it's just nesting.

In this case the video is using the <div> tag to show how nesting works in HTML coding.

P4 then skips towards the end of the video. And P3 slightly pushes P4 to go even quicker.

P3: Go on the next one (video). Let's just start skipping the stuff. Let's just go to the basics, what we need to do.

Then P4 skips all the way to start of the 4th video in the playlist titled 'Headings and Text'.

P4: What did you say?

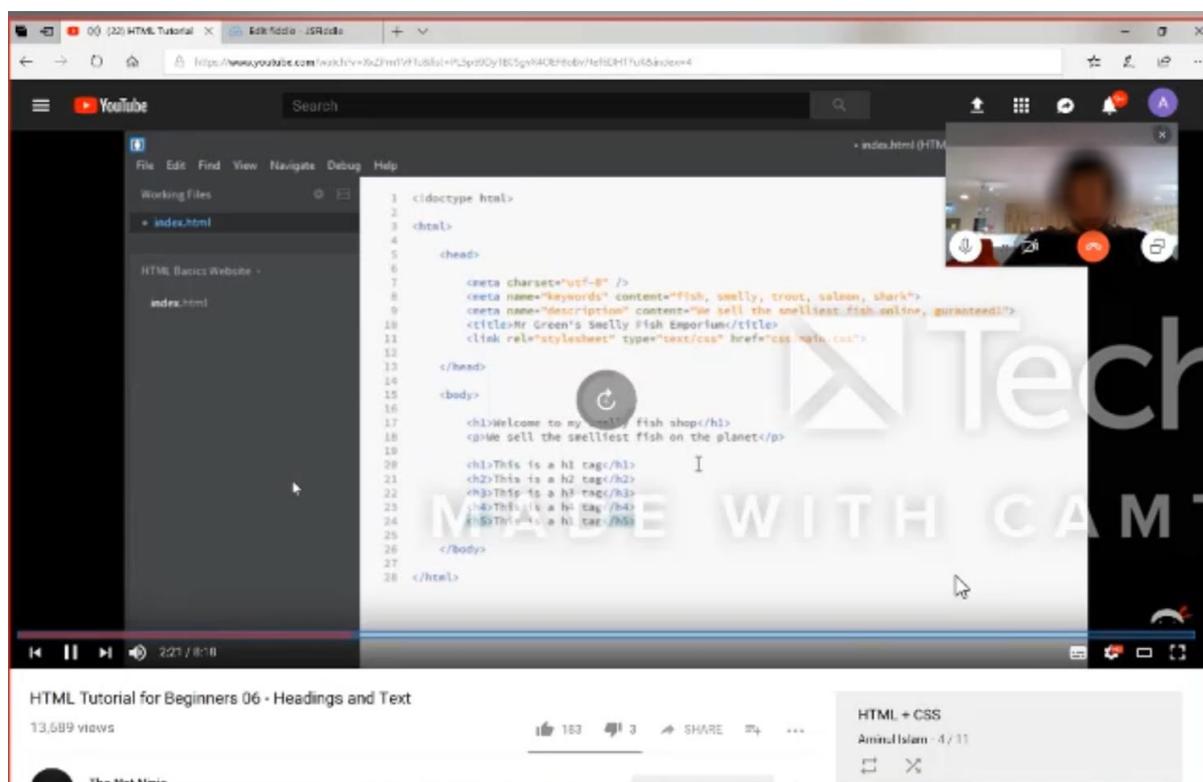
P3: Let's just go to the bits that tell you what you need to do. How to make a paragraph. How to make all of that then we will start jumping into things that we need. So, headings and text lets jump to what the rules are. All we need are the rules.

P4: Yeah.

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P4 then plays the 4th video and skips the introduction section to save time. **Then they used the timeline preview tool mentioned beforehand to see the implementation of headings and text.** They skipped a large amount of the video to get 'to the point' (See screenshot below).



The participants often went to the implementation section straight away when viewing video.

After seeing this chunk of the video, the participants are confident that they could create the web page.

P4: We can do this then.

P3: Yeah. All we need is the CSS stuff, go on the CSS stuff. We know all the HTML stuff. I'm listening to so much stuff, all you need is the basics.

P4: Yeah exactly.

Whilst the participants are talking about the simplicity of the task, P4 opens the online code editor that was opened in another tab. P4 checks what happens when the code runs.

Obviously, as there is no code...nothing is shown in the output.

The researcher needed to inform P4 there is no code written hence the blank output to avoid time wasting during the session.

Both participants then turn to the comments to see what they need to do.

P3: Referring to HTML comments.

So that's basically what they suggest we write...

Just before P4 writes code in the incorrect tag, the researcher had to say code needs to be written within the body tag. The participants have ignored the provided comment in this case.

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P4 coding away.

P3 remembers that they can collaborate too and attempts to open the link to the online editor on their laptop.

Alright, let me get this up. Let me click on the link.

The collaborative aspect works for a second then seems to stop working, both participants do not notice this. Both participants seemed to be seeing two different version of the code for some reason. However, P3 manages to help P4 go through coding issues being raised using notes they had previously written.

P4: That's a syntax error isn't it? That's how you close it right?

P3: Yeah that is how you...

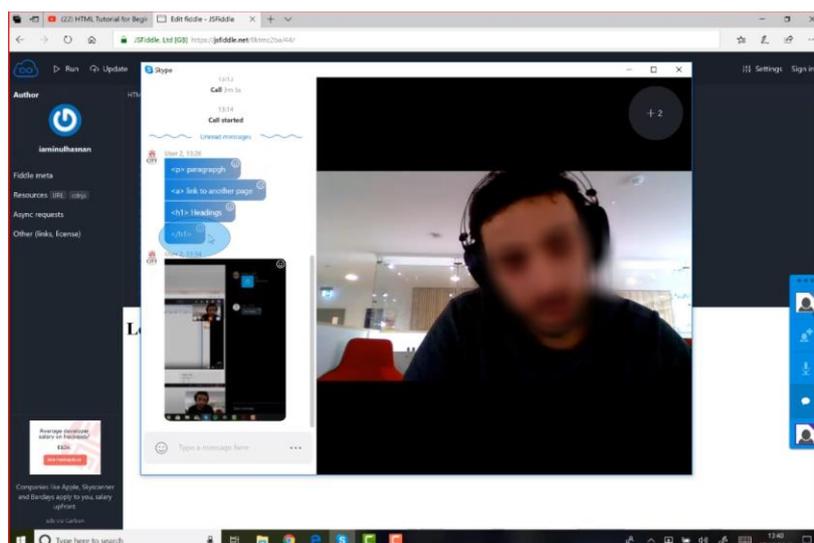
Notices the incorrect code.

No...you used the wrong one. It's on the Skype Chat.

P4: What?

P3: It's the other side.

P4 then opens the Skype chat and realises what P3 is talking about. (See screenshot below).



P4: Oh, it's the other side (*talking about a backlash*).

Then P4 implements the correct code for a heading with the contents 'London'. P3 notices that he cannot see this and tries to reopen the online code editor from the task sheet. The researcher comes in to try help opening it in order to stop time wasting.

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The system partially worked then P3 resorted to just using the share screen to see what P4 was typing in the code editor.

Then the pair started to program the page and assigning each other tasks.

P3: I will find the pictures on Google.

P4: Alright. I'll start the Google Doc.

P3: I will use Paint to make them JPEG.

P4: I mean you can probably download them as JPEGs.

P3: Can I?

P4: Yeah.

P3 then turns to Google searches to find 'london.jpg image'. They spend some time doing this.

In the meantime, P4 starts a Google Doc and P3 notices this with the screen share feature open in a smaller window.

P3: Did you make a Google Docs for page for us.

P4: Yeah, I am making it now.

P3 spends some time looking for images. They spend time saving them etc. Bearing in mind they have skipped the image video in the playlist.

P4 also sends a link to their Google Doc on the Skype Chat.

P4 realises they don't know how to place images into their code.

I'm not sure how to put images in by the way. Once we get there...

P4 is referring to the physical task sheet whilst he says the previous sentence. See the image below. The task sheet is on his left hand side.



P3: we will go a step at a time. Let's get all the basics in, the coding bit looks easy. We will just pick a video that says (talking about how to add images).

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Whilst doing this P3 is still spending time finding decorative images for the implementation required to complete the task.

P4 aims to implement images by looking at the current video.

P4: Headings and text. This guy is talking about headings and text. Headings and text.

P3: Yeah, we'll just find a link. We don't even need to use that (referring to screen share being seen on top right corner of their screen). We'll just go YouTube ourselves man.

P4: I actually don't really like looking at YouTube tutorials for this sort of stuff. It's good to know how to install the stuff and that's pretty much it.

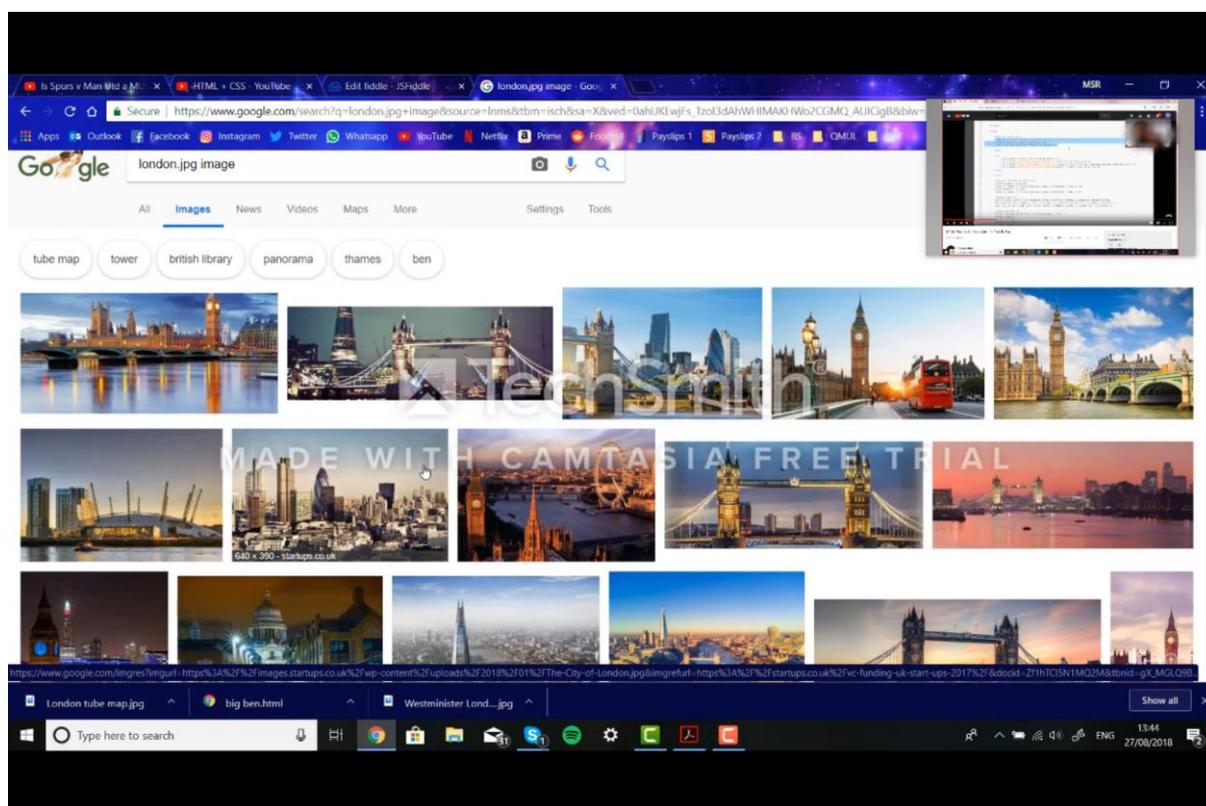
P3 is still spending time looking for images.

P4 is doing something to learn about images but starts to view a video about the <div> tag instead. They actually mute the video in order to not disturb P3.

A lot of time is spent on looking for images by P3. The participants also discussed how their implementation could look.

P4 gets very confused about how to add images and asks P3 to look into how to add images in HTML.

See screenshot below to see that the participants were doing different tasks at this moment.



Here you can see both participants are doing different tasks. P3 is looking at images to save on to his computer (although the task doesn't require it). P4 is looking into how to implement images using the video titled 'The img tag' in the video playlist. This is P3's screen and the smaller window is the screen sharing done by P4 via Skype.

P4: Look up online on how to add these images in.

P3: Okay, I'll do that now.

P4: Because I don't know how you do it with the collaboration tool.

P3: I'm looking at the HTML playlist now.

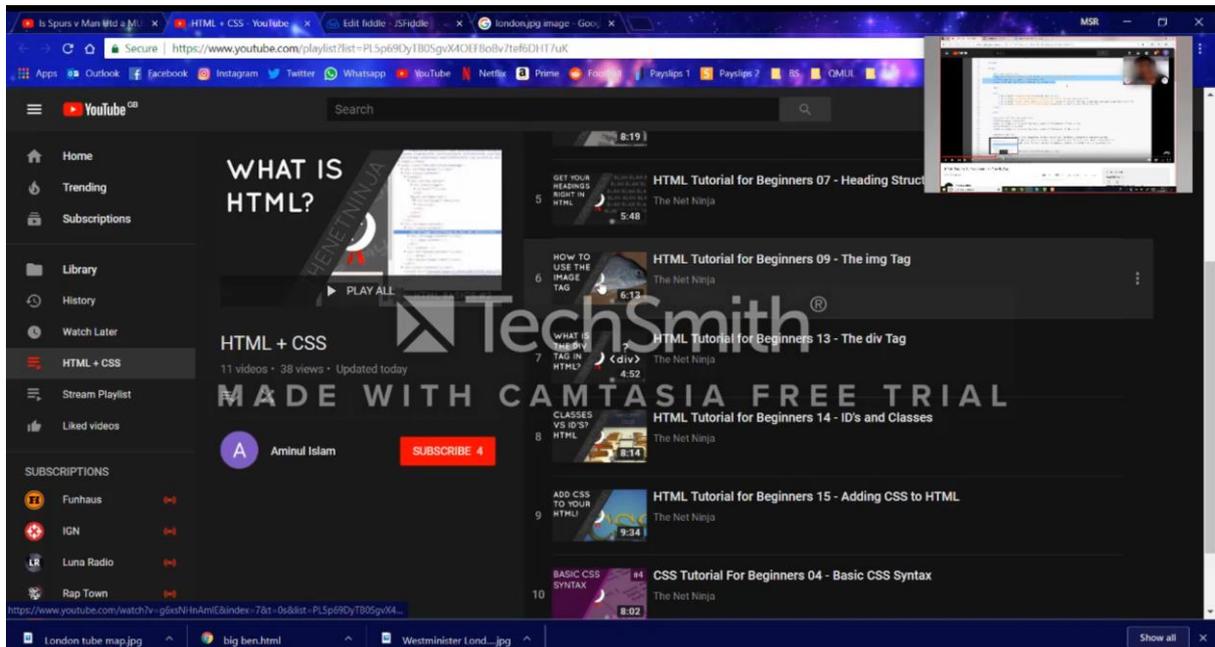
P3 looks through the playlist but doesn't go to show P4 what he is currently doing.

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The img tag, I think that's the image tag (see screenshot below).

P4: Yeah img.

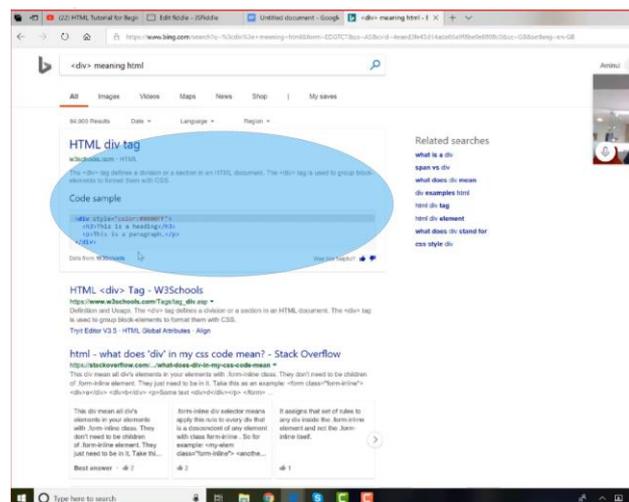


P3 looking through the playlist but doesn't show it to P4 using Skype. They talk about it via their mics.

P3: You find out the facts. I will find out about how to put images in.

P4: I think I'm just going to find out what the div does.

The participants start to do separate tasks again. Clearly, P3 is keen to find out how to implement images. And P4 is still finding out what the <div> tag does. However, P4 is no longer using the videos. They are running searches on Bing to find out about <div> tags. (see screenshot below). They find out what divs are but do not articulate their own knowledge so well into the conversation.



P4 figuring out what <div> tags mean.

P3 uses the timeline preview feature to skip forward to parts of the video that seems relevant. He pauses the video at points that seem useful to him. He tries to echo his thoughts whilst watching the video.

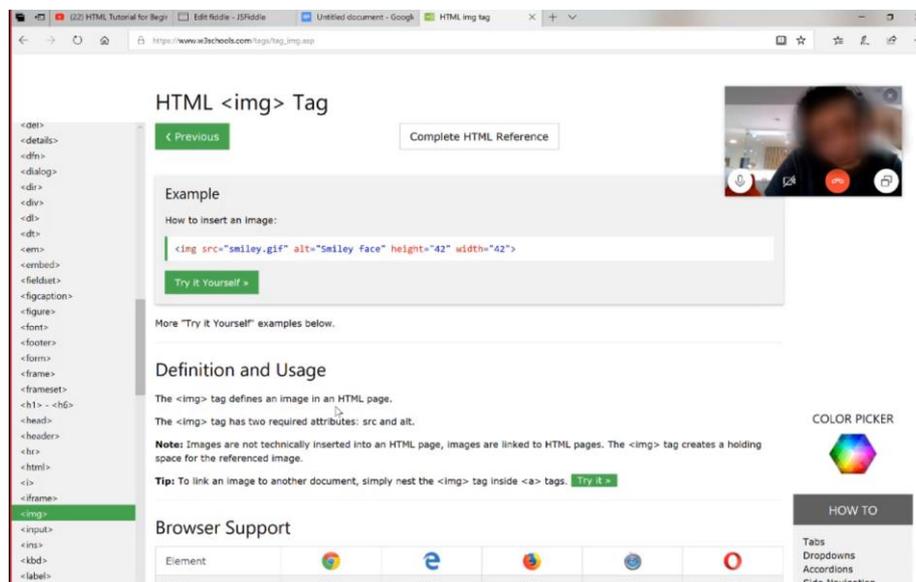
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P3: img. We specify where the image is stored using the src attribute.

P4: You use a div tag to specify what these areas do or how they look in the styling of the CSS. Images...

P3 spends some time trying to understand the implementation of the tag. They get easily carried away with the tutorial and ignore the task sheet about using links. Funnily, in this exact moment P4 asks his main concern about the tag using his Bing searches. They find out information on w3schools.



This is similar to what you do in LaTeX...but how do you know, this stuff, the fiddle stuff. How do you specify the location of the...

P3: You start a new tab, it's on this.

P3 starts to follow the video tutorial he is watching. However, this is clearly wrong as participants are told to ignore this type of implementation on the task sheet. P4 has more questions popping up while he does his independent research.

P4: What does s.r.c and alt mean.

During this whole time P4 is trying to make sense of the webpage written by w3 schools. They also run further searches regarding the <src> and <alt> tags. However, its unclear whether they understand they can use links to place images (their current problem).

src means source of the location...alright.

So, have you added it the code? (to P3)

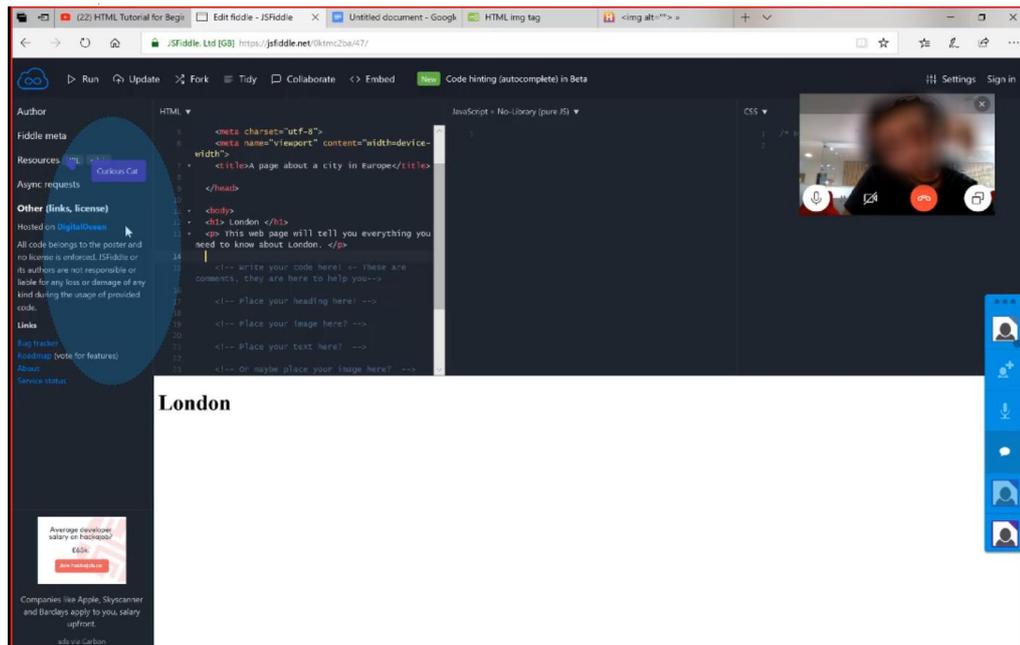
P3 realises the implementation explained in the video is not available on the online code editor.

P3: Trying to add it to the code on the side but it's not working. (P3 is trying to create a file path for the images they saved but the online code editor does not have this feature!)

During this time P4 is looking at P3's cursor through the collaboration mode provided by JS Fiddle. P3 is trying to create a folder. (See screenshot below of P4's screen at this moment).

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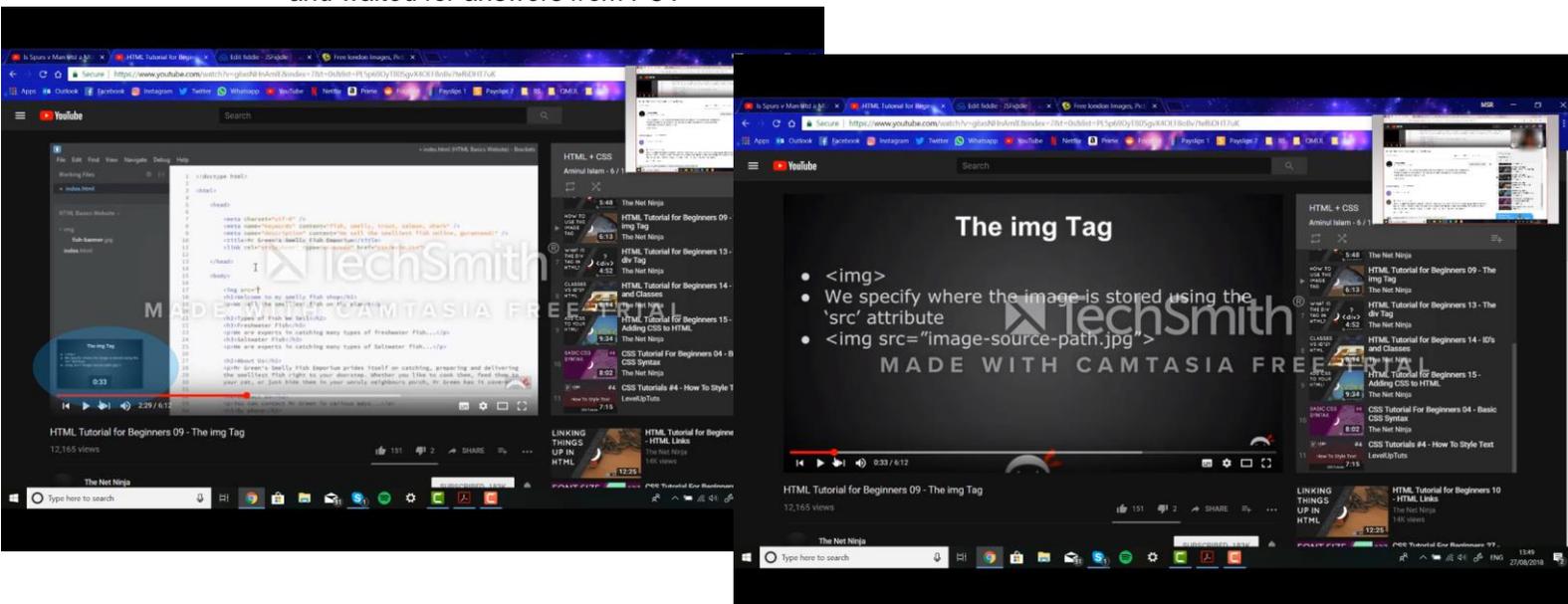


The researcher then gives a hint that the image files do not have to necessarily be stored in a file.

Then P3 takes a few seconds to take in the hint and starts to code using the tag.

img, what's he doing?

P3 then goes back to the video titled 'The img Tag' to see how the implementation was done. He goes backwards to the section explaining how to use the tag using the timeline preview feature to find it more quickly. He is not using the 'coding' section to help him. (See screenshots below to see how P3 looked for the 'correct implementation'). In this time no collaboration was carried out. However, it is clear P4 doesn't really know what to do as well and waited for answers from P3.



P3's screen when looking for the correct implementation to add an image.

Where is it, it's here...let me get it. S.r.c, i.m.g...

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P4: which one did you use for the img? (*referring to the videos in the playlist on their screen*).

P3: *Ignores P4's request*

s.r.c so I need to get the path. I'll just copy and paste the path from the documents on to the. (Doesn't finish sentence).

Not knowing what to do P3 then goes to look at what the video has to offer by skimming through its content using the aforementioned preview tool. The task sheet even tells participants to use a link.

So what does he do? [confused]

P3 goes to an implementation section on the video to help him out.

P4: I'll just look at some facts about London.

P4 goes on another venture to complete the task by looking for facts about London.

P3 is still looking at different sections of the video rather than viewing the whole thing and listening to it. Then P3 randomly opens the documents area on their laptop.

The researcher had to step in and says the video states a link can be used but P3 doesn't understand this means a typical 'web link'. The researcher had to explicitly explain how to code in an image as there was now a lot of time being wasted.

Then it seems P3 understands what they need to do now and calls for P4.

P3: P4 what are you up to?

P4: Looking at facts about London underground.

Participants are reminded not to get too wound up on the content of their web page.

P3 has understood the help from the researcher and starts to copy an image address and places pastes it into the code editor. Then they refer back to the YouTube video to help them code when using the tag.

They successfully manage to get an image up on to the page.

P4 is writing facts about London in his Google Doc.

P3: Look I got a photo. Where's your header? I can't see it.

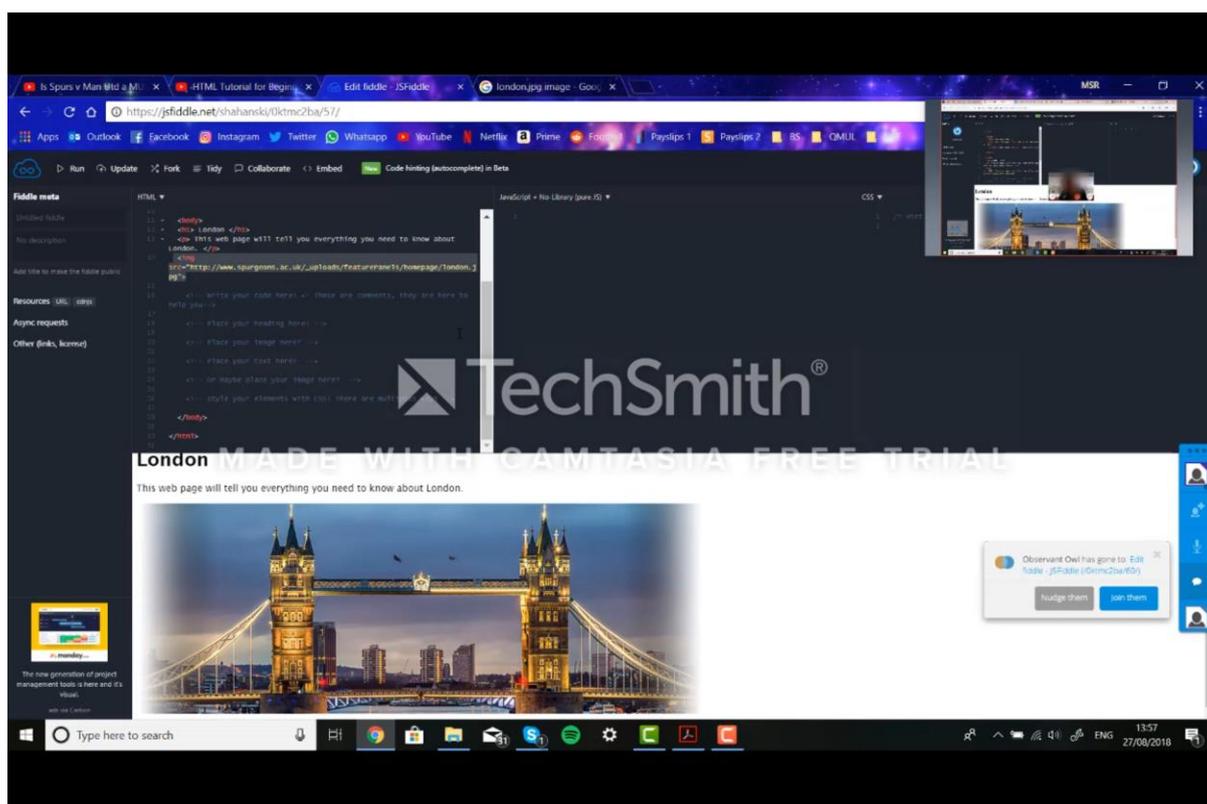
P4: What do you mean?

The collaborative aspect isn't working, and the researcher needed to see if there could be a solution.

P3 manages to find a solution and gets to see what P4 has coded. Doing this action made them lose their image they coded but it seems like they know how to code images now. P4 manages to see how the image looks using the collaboration tool (see screenshot below).

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P4 can see what P3 has coded (evident through the screen share on the top right corner). This is because of the collaboration aspects provided by JS fiddle.

P3: So we need to find out how to style our headers and that.

What do you want to do? The chunks of text or formatted titles?

Do you know how to makes the titles nice?

P4: I have to use the CSS stuff for that.

P3: Yeah so do you want to start doing 'How to style text'.

P3 is referring to content that is in the playlist but P4 cannot see this as P3 is not the person sharing screens. P4 realises this and explains what he means.

Play that for us.

P4: Is there a tutorial for it?

P3: Yeah, how to style text. So, we can go from there. It's the last one on the list.

P4 is preparing to view the video.

P3 goes into Skype to see the screen share of P4's screen.

Then the participants start to view the video titled 'How to style text' on the playlist.

Both participants watch the video in a conventional manner.

P4 skips a chunk of the video as it is seen as introductory content. He skips to the implementation aspect straight away.

P4 continues to skip video that seems irrelevant.

P3 seems fine with P4 carrying on with the skipping of video content.

The video goes over the use of the class attribute and pauses the video to show he understands it.

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P4: Oh okay.

However, there is no conversation or anything. P4 then resumes to watch the video. The participants watch the video all the way up to the end. They are determined to do the task required and do some implementation. They seem confident with the use of CSS.

That's calm... alright.

P3: Let's try some of this.

Are you going to do the title now?

P4: Yeah, alright. What colour do you want it to be then?

P4 starts coding CSS in the online code editor.

P3: Green.

P4 proceeds to write some code.

P4: Are you sure the syntax is correct?

They refer to the video quickly and back out of it.

P3: Just put it up, I'll talk you through it. I'll look at your screen. I'll see if you're doing it correctly.

The participants then go over CSS coding for the <h1> tag. P3 is guiding P4 whilst they type the code.

There are moments where the participants are unsure with their coding.

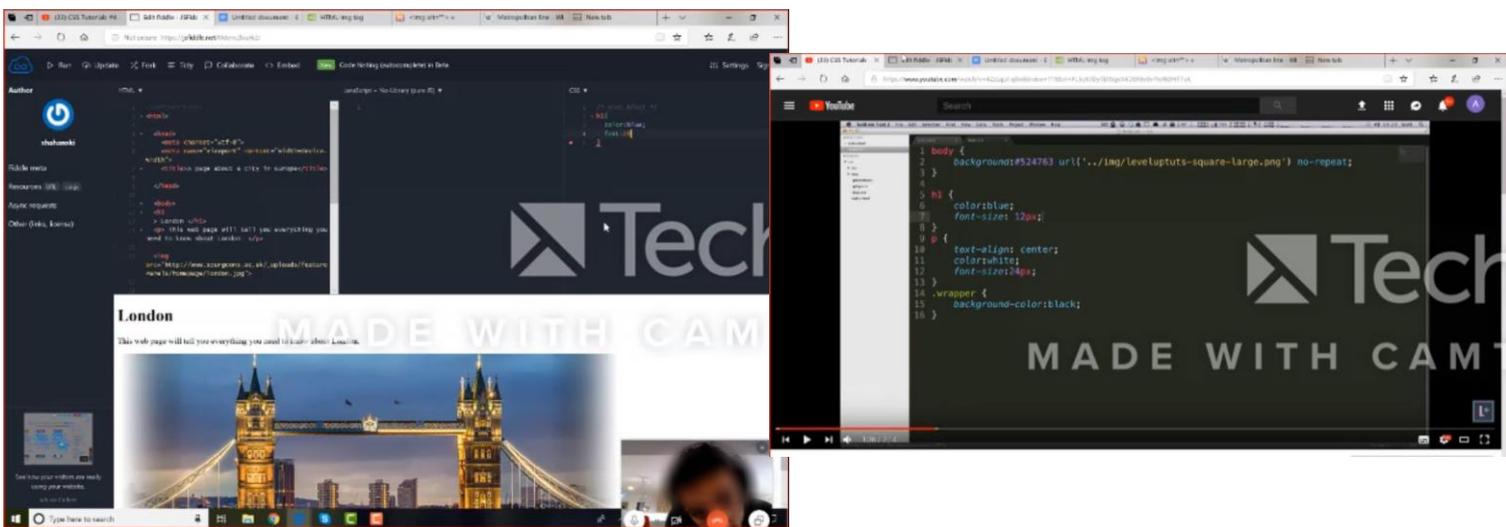
P3 asks P4 to refer back to the video when they are in doubt (see screenshots below).

P4: Is that correct?

P3: Run it and we will see.

P4: px right? (Referring to what needs to be coded after writing an integer).

P3: Go back (to the video) and check it, I'm not 100 percent sure.



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P4 asks what to write after typing 20 and then uses the video to clarify what is the 'correct' implementation

The participants continue this strategy until they manage to make some changes to their page. In this case they manage to change a header's colour and move text to the centre of the page. During this time P3 points once to the screen as if P4 can see him pointing. Then the participants discuss how to further complete their web page and start to code the relevant CSS.

There are some cases where the participants are writing incorrect code and the researcher needs to tell them what is going on in order to stop time wasting.

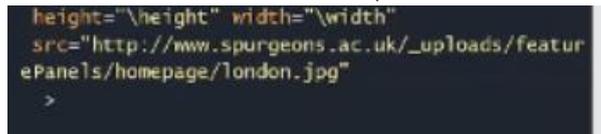
P4: Can't be bothered to go through videos.

P4 starts to do more Bing searches using their browser to figure how to 'align paragraphs css'.

They manage to figure out it is possible to use the align attribute to move elements in HTML. However, the attribute did not work on the tag. So P4 ran a search on how to centre images on Bing. They take some time to get an answer and attempt the code. They attempt to use knowledge from using 'LaTeX' and search results. P3 tries to give some of his suggestions.

P3 also consults his physical task sheet when reading about the task during this search.

Maybe this will work, this is how I do it in Latex. (see screenshot of solution below).



```
height="\height" width="\width"
src="http://www.spurgeons.ac.uk/_uploads/featurePanels/homepage/london.jpg"
>
```

P3: What's a div tag? A division tag isn't it?

P4: You specify how you want to do division of the CSS.

P3 then starts to look into the video called 'Adding CSS to HTML' by their self. They start to look for the 'correct' way to implement styling for images. Inevitably, they find nothing and go to the video titled 'The div Tag' to learn quickly what a <div> tag does.

In the meantime, P4 finds a solution for their image problem through the web search.

P3 tries to code some <div>, <h2> and <p> tags to complete the task and achieve 'hierarchy' of titles.

The collaboration tool is not working therefore the participant copies and sends it to the Skype chat.

P4 finds a way to centre images through their searching and implements it into the code editor.

There you go, it worked! Its centred and everything like that. I can make the width however I want it. I made the image the size of the browser.

P3: You do the CSS stuff, I'll do the next bit.

P3 is trying to get the contents together to complete the task at hand. Since P4 knows how to do the implementation for centering image he is given the task to do the final touches with CSS on the code editor.

P3 proceeds with gathering the contents into the correct tags and sends them to the Skype Chat. P4 does the final touches and runs the code.

P3 then sends the code for images to P4. P3 refers back to the video titled 'The img Tag' to help him write the relevant code. These codes were also sent to the chat.

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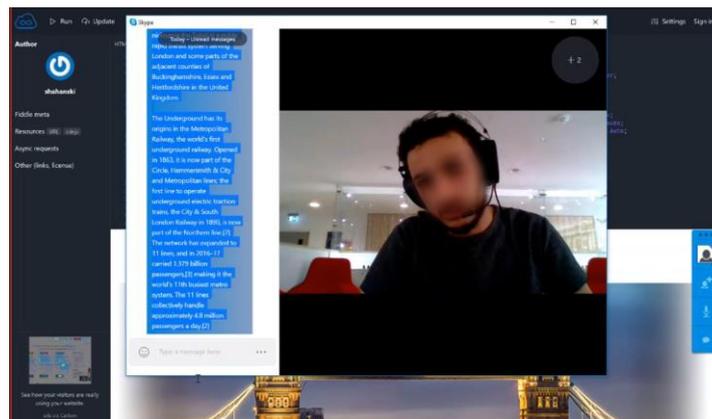
Observation session and informal debriefing transcripts/summaries

```
<div>
<h2>
The London Tube
</h2>

<p align = "center">
The London Underground (also known simply as the Underground, or by its nickname the Tube) is a public rapid transit system serving London and some parts of the adjacent counties of Buckinghamshire, Essex and Hertfordshire in the United Kingdom.

The Underground has its origins in the Metropolitan Railway, the world's first underground railway. Opened in 1863, it is now part of the Circle, Hammersmith & City and Metropolitan lines; the first line to operate underground electric traction trains, the City & South London Railway in 1890, is now part of the Northern line.[7] The network has expanded to 11 lines, and in 2016–17 carried 1.379 billion passengers,[3] making it the world's 11th busiest metro system. The 11 lines collectively handle approximately 4.8 million passengers a day.[2]
```

P3's codes sent to the Skype Chat.



P4 copy and pasting the code created by P3 and put on to their Skype chat.

To complete the task fully P3 is adamant to know how to code bullet points. Yet again, there is use of the internet search by P4. Example code from w3 schools is taken and manipulated to meet their idea of what the implementation should be (see below) .

P3: Yes we did it!

Session completes...below shows snippets of completed code.

London

This web page will tell you everything you need to know about London.



London Parliament

The Parliament of the United Kingdom of Great Britain and Northern Ireland, commonly known internationally as the UK Parliament or British Parliament but is more generally known domestically simply as Parliament, is the supreme legislative body of the United Kingdom, the Crown dependencies and overseas territories. [3] It alone possesses legislative supremacy and thereby ultimate power over all other political bodies in the UK and its territories. Its head is the Sovereign of the United Kingdom (currently Queen Elizabeth II) and its seat is the Palace of Westminster in the City of Westminster, one of the inner boroughs of the capital city, London. The parliament is bicameral, consisting of an upper house (the House of Lords) and a lower house (the House of Commons) [4] The Sovereign forms the third component of the legislature (the Queen-in-Parliament) [5][6] The House of Lords includes two different types of members: the Lords Spiritual, consisting of the most senior bishops of the Church of England, and the Lords Temporal, consisting mainly of life peers, appointed by the Sovereign on the advice of the Prime Minister, [7] and of 92 hereditary peers, sitting either by virtue of holding a royal office, or by being elected by their fellow hereditary peers. Prior to the opening of the Supreme Court in October 2009, the House of Lords also performed a judicial role through the Law Lords. The House of Commons is an elected chamber with elections to 650 single member constituencies held at least every five years under the first-past-the-post system [8] The two Houses meet in separate chambers in the Palace of Westminster (commonly known as the Houses of Parliament) in London. By constitutional convention, all government ministers, including the Prime Minister, are members of the House of Commons or, less commonly, the House of Lords and are thereby accountable to the respective branches of the legislature. Most cabinet ministers (Secretaries of State) are from the Commons, whilst junior ministers can be from either House. However, the Leader of the House of Lords must be a peer and is a cabinet position, usually combined with a paid position.

Made By:

- Ahmad
- Mehdi

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Informal debriefing for Session 2

Researcher: Thank you, that was a nice session. It was a lot better than the example I gave. So, I am going to straight to it. First question, how was your experience and how would you describe it.

Sound Encounter → P4: So, for the collaborative tools and using the videos, it wasn't that great. For example, I had to put the volume high enough just so I can hear it. At the same time, I couldn't hear him say anything. So, for him to start talking I'd have to mute it then ask him to repeat his question. It was a bit annoying.

P3: In terms of collaboration, I think once we got down to the nitty gritty and we understood what we needed to do we stopped collaborating. We gave each other tasks to do. That's how we collaborated. We stopped talking as much as the beginning. Once we got into a rhythm, we gave each other tasks. P4 was in charge of doing the styling more and I was doing the paragraphs and making sure that. At the end we came together. There was a period where it might have not seemed like we were collaborating, we had given each other set tasks to do. I was sending over code but during the videos I felt we were the most inefficient. I didn't know what P4 was understanding and there wasn't a way for if I got something. We'd both had to sit through a certain amount of the video.

Researcher: On that note, what was the worst thing about the situation?

P4: Sometimes I would want to skip something forward. I feel like I can skip because I don't need it. I'm not sure if P3 wants me to skip that.

↕ *CAUTIOUS COMMUNICATION.*

P3: I think it is watching the videos where you struggle. Because were working over Skype, it's harder to do the videos and watch your partner, speak to your partner, collaborate and how to skip it.

Researcher: Was it implicit that he (P4) was moving across the videos?

P3: No, so I had to stop him once or twice and just say please start skipping. That's when we decided that we weren't going to watch all the videos, we'll just get our heads down and try code. We would go to the videos when we needed them.

Researcher: I know you guys gave each other tasks. Would you say each of you had your own distinct role in the situation?

P3: I think P4 was more quicker on to it, I took the easier tasks sort of just using the same code on HTML. Putting the images there. P4 was in charge of styling the website. I think that's where we split it up.

Researcher: What was the best thing of the situation?

P3: The website coming to fruition.

→ *gratification upon completion.*

P4: Yeah (in agreement with P3).

P3: Doing everything...

Researcher: In terms of using the tools what was the best thing?

P4: The collaborative tool wasn't that useful.... *Talks more about online editor (not in scope of project).*

Researcher: What excelled the collaboration.

P3: I think it was Skype because I could see your screen. Whenever you were running it, I didn't really need to. I could see a live thing on Skype so I would see everything that you were doing. So I could see what stage you're at. I didn't screen share but I was telling you what stage I'm at.

P4: Yeah.

Researcher: How come you didn't share your screen during the call? *Speaking to P3.*

↙ *Synchronised view.*

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P3: I didn't screen share with P4 because at the bulk of it he was doing the YouTube videos. After that I was looking at P4's stuff. I think everything I was doing I was putting on the Skype chat. Instead of screen sharing to over complicate it. Anything I thought was important I put on the Skype chat. After the YouTube videos we started going a few separate ways, so we can do a things to get the websites sorted. I didn't want P4 to watch the videos I was watching.

Researcher: Other than video, how did you guys see the other person represented digitally?

P4: I tried to work with Google Docs but it ended being a hassle. The Skype chat was useful in terms of...

Researcher: So how did you know that P4 was there.

P3: Our voice chat was very helpful. Speaking to each other **we made sure that...we spoke about everything that we were going to do**. We made sure that it was clear: our actions, what we're doing, when we're going to do it, when we maintain communication. The only time we didn't maintain communication is when we were on our projects our self. We were waiting to finish that to speak to each other.

→ **Verbal presence**

Researcher: Do you feel the same? *To P4.*

P4: Yeah.

Researcher: Maybe when he was typing or anything like that? Did the Skype chat show anything? *To P4. P3 answers instead.*

P3: I told P4 this is what I am about to do. Then I'd copy and paste the code into the Skype chat so he'd know because I'd tell him before.

Researcher: So how did you coordinate?

P4: Voice and the chat.

P4: Coordinated through voice and Skype chat....

P3: At the beginning we didn't know where we were going. I just watched P4 do a few things. While we learnt the code, we started to mess around with it. After that, we looked at the time. We understood we have to have each task. I took a task and P4 had a task and we went from there.

Researcher: How did you deliver information that was helpful for the conversation?

P3: Put it on the Skype chat so I was putting my code on the Skype chat. Anything that I found useful from the YouTube videos.

Researcher: P4 you did go onto websites and that. How did you add that information into the conversation? *P3 responds instead.*

P3: Anything he was learning he would put it on the screen share. As I could see his screen, it was on top-right. Anything I thought was interesting I'd go on the screen share.

→ **SYNCHRONIA** *grau.*

Researcher: So, then your focus, was that a direct observation? In that sense, it was always there?

P3: It was two screens I was always aware of. What P4 was doing it all times.

Researcher: So in terms of awareness, situational awareness. How did you feel...

P3: I think we were having a conversation throughout. Every time something works for him he would tell me. I'll ask for updates and he'll ask for updates off me.

↓ **voice presence.**

Researcher: P4?

P4: Yeah.

Researcher: What cues did you use?

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↑ void.

P3: We gave each other tasks. At the end of task I said 'oh P4 its on the chat...run the report again'. We were making sure we can see what we were doing or knew what each other was doing.

Researcher: There was at points silence...nothing was going on.

P3: We know our tasks well and we trust each other.

P4: Yeah!

Researcher: In terms of rules, the task said establish some. At the beginning of the call there was this hands up thing initiated. Why did that go away...?

P3: Trial and error...it just didn't work.

P4: That was only because I couldn't hear him properly.

Researcher: The Skype audio sharing how did that help?

P3: It just meant that we could watch videos together.

P4: I think a better system would be a way to watch his video individually. I can see where he at and he could see where I'm at.

Researcher: You're not in favour for synchronised views?

P4: No. it doesn't work.

P3: I like synchronised view.

P4: If I wanted to skip something but he wanted to watch to something. If he wanted to watch something but I want to skip something. *P4 doesn't finish sentence but implies it is hard to follow when watching together.*

↑ (only) lower.

P3: I liked synchronised view in terms of if you both know zero and you both start at the same point. Synchronised view is the best thing.

P4: Yeah.

P3: Especially if you are in different rooms/different countries...everything. Because then you at least know where someone else is. I understand it could be easier if watching the videos independently then come back together right at the end. However, that would have been a waste of time anyway.

Researcher: Do you feel like you could have watched the videos independently? Or you should of?

P3: It would have been harder to concentrate. We would have collaborated less in the beginning. At the moment we came together we might have had different ideas. It would have added a lot more time to the task.

Researcher: Is spending a lot of time a problem?

P3: Yes, you try to be efficient as you can.

Researcher: When you're not on an online course. Let's say you want to learn anything to do with your career and this would get you a certificate. The videos are 20 minutes long and you have to watch it and you would say no? You rather do a class room experience?

P3: Yes, from experience. I would not do a 20 minute online course. I prefer people lead courses.

P4: I rather spend 20 minutes looking it up myself.

Researcher: You rather do traditional courses?

P3: Yes from work experience, I do not like courses which are 20 minutes videos. I prefer more interactive courses. They stimulate my mind more.

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P4: I agree with that.

Researcher: In terms of the communication hubs. There were some failures and successes. The Skype chat was...?

P3: A success!

Researcher: The Google Doc it was like something was happening?

P4: I tried to push it but it seemed like it was too much of a hassle.

P3: I think the Skype chat was too easy to use. I could not be bothered to go another document and overload the documents. I could see the screen share. I had the Skype chat there as well. It was all easy for me to have it on one platform.

P4: I feel like if it was a more in-depth project, Google Docs would have been useful. Something like this Google Docs wasn't useful.

Researcher: The video itself, was it a communication hub?

P3: I think at the beginning it was but after me and P4 watched two or three videos we understood that we need to go back to it when we want to do something. Rather than watch all of them...so we started working on it.

P4: The videos were useful to learn the basics syntax. After that it was just move on...*(doesn't finish sentence)*.

Researcher: You did this strategy thing, it was 2x or 3x play speed. Why did you do that?

P3: Just because the video started dragging. The basics were quite easy to understand. It was at a stage I wasn't confident enough if P4 was willing to cut out all the videos. Double the speed or triple speed we would get through it much quicker. We may slow it down at points we may think are important.

Researcher: In terms of information flow...you used only virtual stuff...why did not use pen and paper at all?

P3: I think if we are going to code online, it much easier for collaboration for me and P4 to have everything online. With a piece of paper it's harder for him to see and visualise. Also, it takes me away from collaboration because that means that's my independent work. It's harder for me to share with P4. I prefer everything on a communal basis where P4 can see what I am doing or what I'm thinking and ask me questions upon it.

P4: Yeah... *in agreement*.

Researcher: P3 looked distressed at one point. Your hands were all over the place.

P3: Long winded video aren't for me. **My learning style is - get in there and try learn or decipher from there and get the information.** The possibility of watching 8 videos back to back to back to back was distressing.

*Long winded
video
viewing.*

Researcher: There's this thing called student agency and connectivism. You guys did examples of that...

In your opinion would videos and other tools make a good interface?

Both participants: *(In agreement)* Yes.

Researcher: What else should it include?

P3: text on the side...like YouTube Live comments with text of the side. Lets say they heard something interesting, they can write something on the side. You can see this is important and they can bullet point what is important.

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P4: Maybe being able to pin videos and cut them out. To cut off important sections. Maybe not through live collaboration.

P3: Maybe one person goes through all the videos and pins the important bits and then everyone just watch those important bits (together). Then within a group you can see who's watched a video and who hasn't.

Researcher: There were some points you didn't tell each other stuff. Why?

P3: We didn't want to tell each other every single piece of detail. We thought it easier to not speak in my opinion.

P4: Yeah (*in agreement with P3*).

Researcher: Thank you very much for taking part. I will let you know later about the results if you want.

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Session 3 (held on 28/8/18) – Synchronous

Participants: 'P5' and 'P6'

Calls starts

P5: So, you ready?

P6: Yeah.

P5 opens the task sheet window that was opened before the call started.

P5: So, we will go back on the sheet. It says here, for the task creating a web page, there's a video playlist. So, let's click that. That's going to give us the step by step help.

Then P5 proceeds to the YouTube playlist provided. However, P6 is not sure about what P5 is looking at.

P6: Which sheet are we looking at?

P5: You know the PDF file. The task sheet. Do you have it open?

P6 seemed to not be able to find the task sheet through the relevant software or Skype Chat that it's in. In this case Internet Explorer Edge opened PDFs. It needs to be stated that P6 used the physical task sheet to understand the task before the call.

The researcher had to step in and tell P6 where to find the task sheet and the call resumed. P6 then has the task sheet open and goes to the video playlist.

P5: You got that open yeah?

P6: Yeah.

P5: Click the video playlist.

So, let's start watching that.

P6: Yeah.

The participants are setting up to watching the videos independently but at the same time. P5 starts the video titled 'What is HTML' and starts viewing. Whereas, P6 takes longer to view video causing P5 to pause his video. P6 speaks to P5 to understand what they will do.

So, we will start with the first one.

P5: Yeah what is HTML.

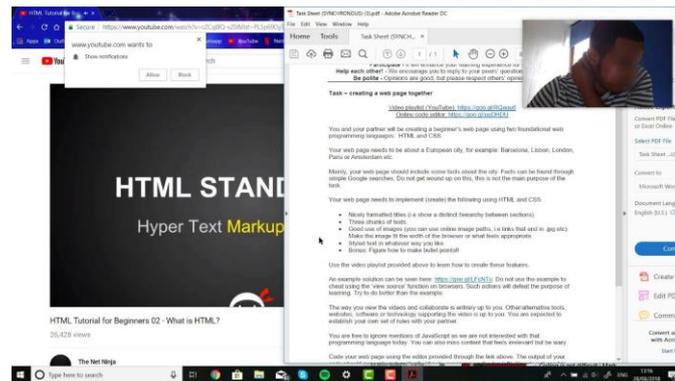
P6: Then we will go through it and see what we need.

P5: What we will do, we will follow the list that they want....

P5 has the digital task sheet open when talking about what needs to be done. P6 looks down to their physical task sheet provided to see what needs to be done. (See screenshot below).

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P5 looking at the digital task sheet whilst P6 is looking at their physical task sheet (see small window in the top right)

Both participants then proceed to view the same video independently ('What is HTML?'). P5 starts to make notes however it isn't too clear what they are writing (recording issues). See screenshot below for evidence. It looks like they only made notes about the HTML tags.



P5 writing notes whilst the video 'What is HTML' is playing from the YouTube playlist.

P5 calls for P6 mid-way through the video.

P5: P6!

P6: Yeah.

P5: So where are you now with regards to the video?

P6: I'm on the HTML tags.

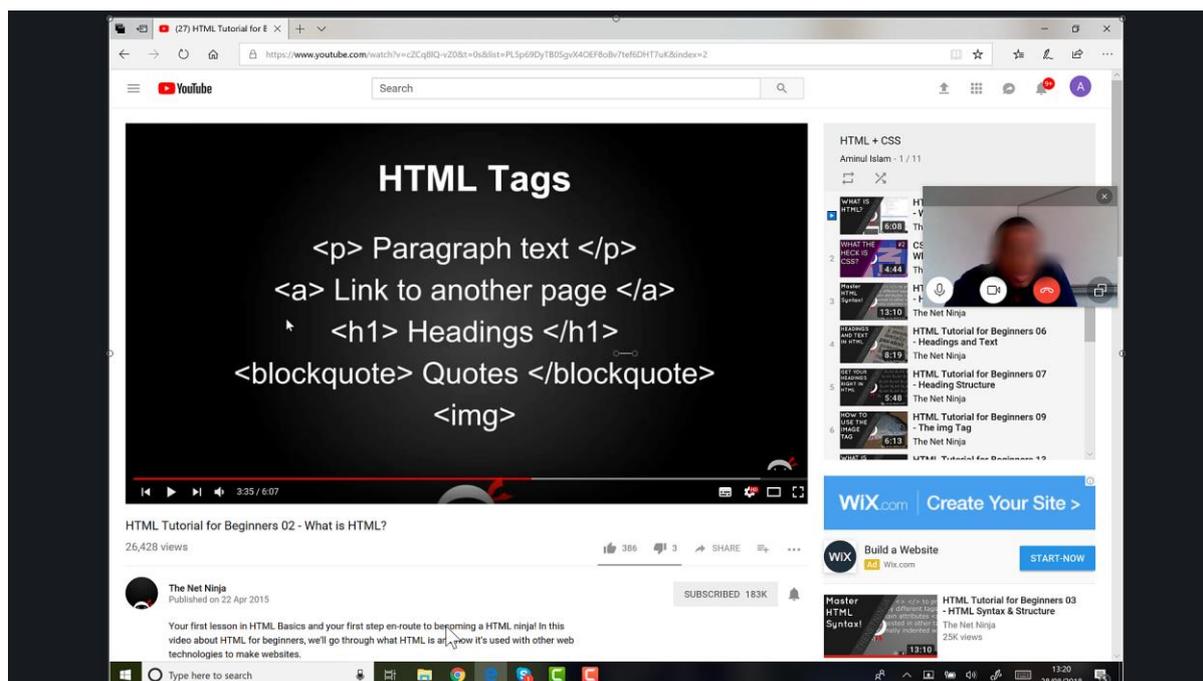
P5: What minute?

P6: 3:35.

P5: 3:35, okay.

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P6 pausing the video and letting P5 know where he is.

P6: Why?

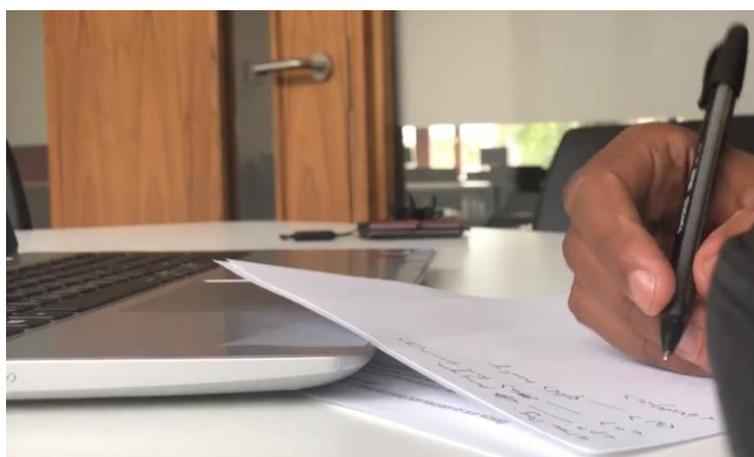
P5: No, I'm just slightly ahead of you.

In this time P5's video is still playing his video and doesn't pause it. P6's video is paused.

P6: Alright, I'm going to continue yeah?

P5: Yeah continue.

P5 watches the video and is able to go back and forth between the content to clarify things. This is done using the keyboard. He also mutes his microphone and P6 is not able to hear him and unmutes it a few moments later. Then he tries to share his screen and audio with P6. P5 also moves their notes pages in front of them to help them write further notes about HTML tags. See image below to see this moment.

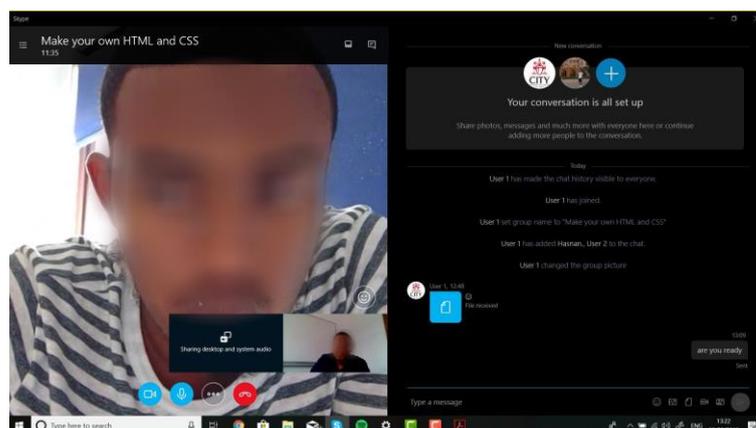


*P6 is
freedom to go back and forth on the video.*

also given

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P5 attempting to start screen and audio sharing with P6.

I'm sharing my desktop and my audio. Check it, can you see it?

Go on Skype, check if you can see me share the desktop and audio. You can see my screen and what I'm watching. So, we can watch it simultaneously.

P5: Do you want me to share as well?

P6: No. View my share screen.

P6 is having difficulty viewing P5's share screen. So, the researcher had to help them start their share screen instead as a quick remedy. Then the call continues.

P5: Go to the 4th minute P6.

P6 doesn't hear this and they continue watching the first video but now from a random point (i.e. the point P6 was in before the involvement of screen sharing). They watch the whole video.

Then the call faces a technical issue that needed to be tended to by the researcher.

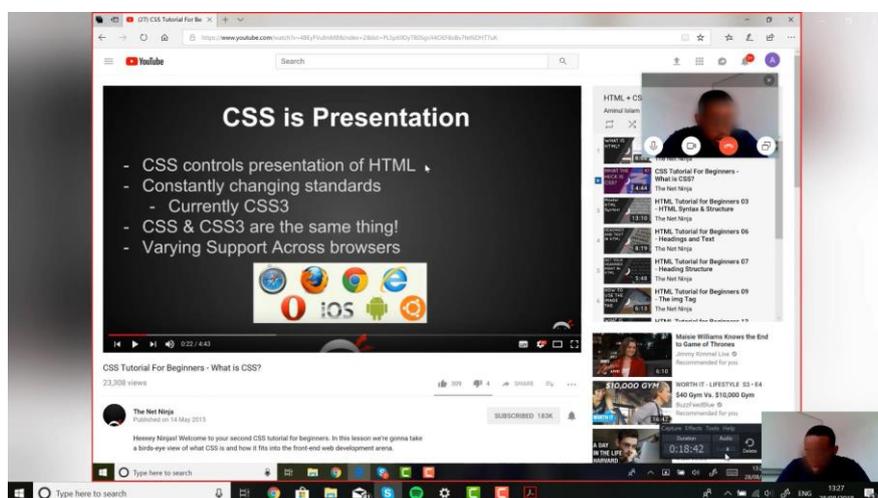
The call gets fixed and the participants start watching the video 'What is CSS?' from the playlist intuitively with no real agreement.

A few seconds into the call the video P6 asked P5 a question about the previous video. P6 pauses the video.

P6: So, did you understand the HTML stuff?

P5: I understand the headings for example p, a, h1. Understood that and I wrote it down.

Whilst P5 says this he is looking at the notes he had written down. (See screenshot below).



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P6 pausing his video and discussing with P5 about the previous video they watched independently.

P5 is clearly looking at his notes for reference during the conversation.

P6: Yeah and for the image one you just have everything inside its bracket.

P5: Yeah.

The participants then watch the 2nd video together using the share screen and audio features. P5 calls for P6 but is ignored until 4 calls.

P6 starts to make notes for the first time but its not clear what they are writing due to recording issues. It seems like they have written about the <p> <a> and other HTML tags. Other notes taken by P6 were unrelated to the task.



P6! Can you hear me?

P6: Yeah.

P6 pauses the video to be able to hear about what P5 has to say.

P5: Always try fast-forward the history part so we can go to the actual part that we are looking for. Like this part for example you can fast-forward and check.

In the last sentence P5 is referring to content that is explaining what CSS is and how it always evolves, the content is just description about the language and not relevant for the task.

P6 skips the content using the timeline preview feature.

They skip to the section of the video about websites with and without CSS.

Both participants watch the video in a conventional manner.

P6 skips the relevant sections of the video until they suggest to just increase the video speed.

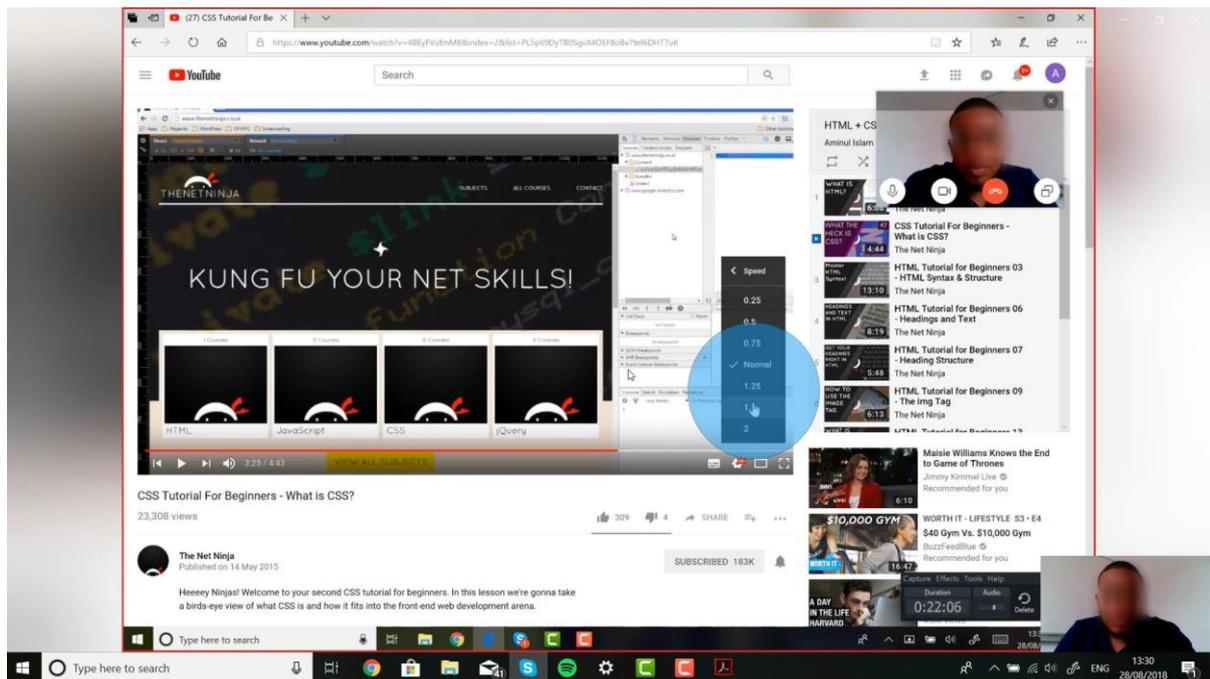
P6: Should I just put it on 1.5x speed?

P5: Yeah.

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P6 then proceeds to change the video speed.



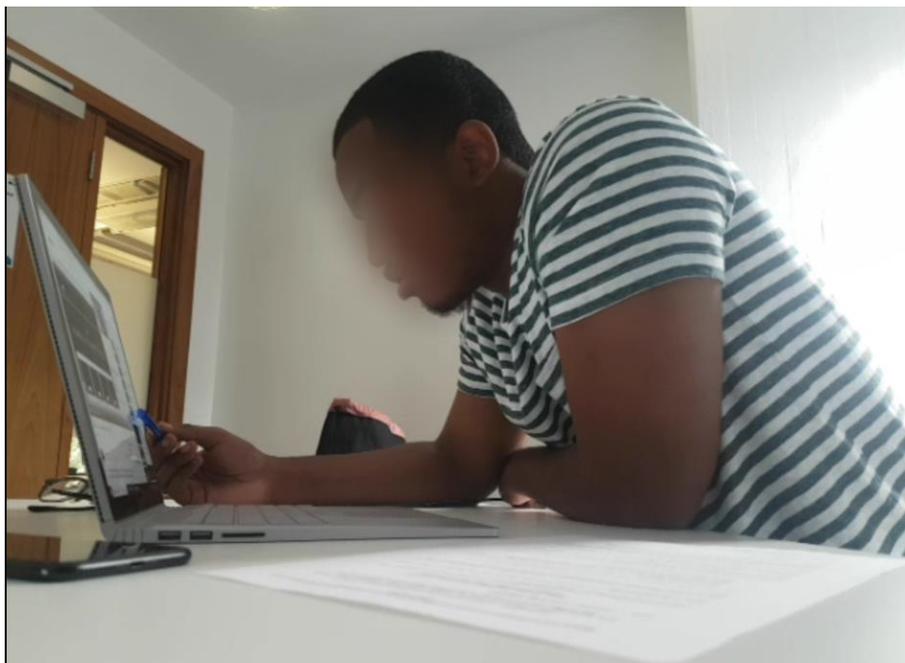
P6 changing the video speed of the video after gaining permission from P5.

Both participants then watch the video in 1.5 speed.

The participants watch the video almost to the end and P5 asks P6 to go to the next video and P6 discusses the videos that are in the playlist.

P5: Next video P6.

P6: There's other videos on the HTML, we know we want to do headings and text, heading structure and the image tag. We still have to do the syntax and structure right? (*referring to video in the playlist, in this time P6 is pointing to videos with his pen*).



P5: Correct.

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Participants are able to have this conversation so freely because they are looking at the same screen and discussing the content within the playlist although not pointing at it (see above).

What we do is you see how its 13 minutes. We go straight to the bit it talks about the actual structure (code).

Let me open up the word document (task sheet). It still says nicely formatted titles, three chunks of text, image...I think in regards to that...

P6: Syntax is how words go together isn't it?

P5: Yeah so I think with regards to the structure I still think we will check it (the video). What we need to know is how to put in the paragraphs of text we need to get from online websites and Google.

P6: Alright I hear what you're saying.

P6 then goes on to play the video titled 'HTML Syntax and Structure'. As the adverts for the videos are playing. P5 has more instructions for P6.

P5: When you see that the guy starts to waffle just start speeding up even though it's on 1.5. Still speed it up but even more. With the right arrow (referring to keyboard).

They both then watch the video. There is no collaboration at this moment and not many notes are made. P5 makes minimal notes of code that is explained in the video.

P5 refers to their digital task sheet while the video is playing.

P5 also calls for P6 to fast forward the video. P6 pauses the video to be able to hear P5.

Fast-forward this, all we need to know is how to do a heading. We know how to do (about) heading(s) lets fast forward it. Let's go to the next bit.

P6 then fast-forwards the video by tabbing through it. Eventually P5 wants to progress further.

To the next video P6.

P6: Alright.

P6 then opens up the video titled 'Headings and Text'. P6 starts to skip video without being called to. P5 asks P6 to pause the video when it came to the video discussing the various heading tags in HTML. (See screenshot below).

P5: Pause it P6.

Can you see on the first line is says h1...That's a heading? With p it was a paragraph. That's where we include for example, the heading like Lisbon and write below in our paragraph we have our p.

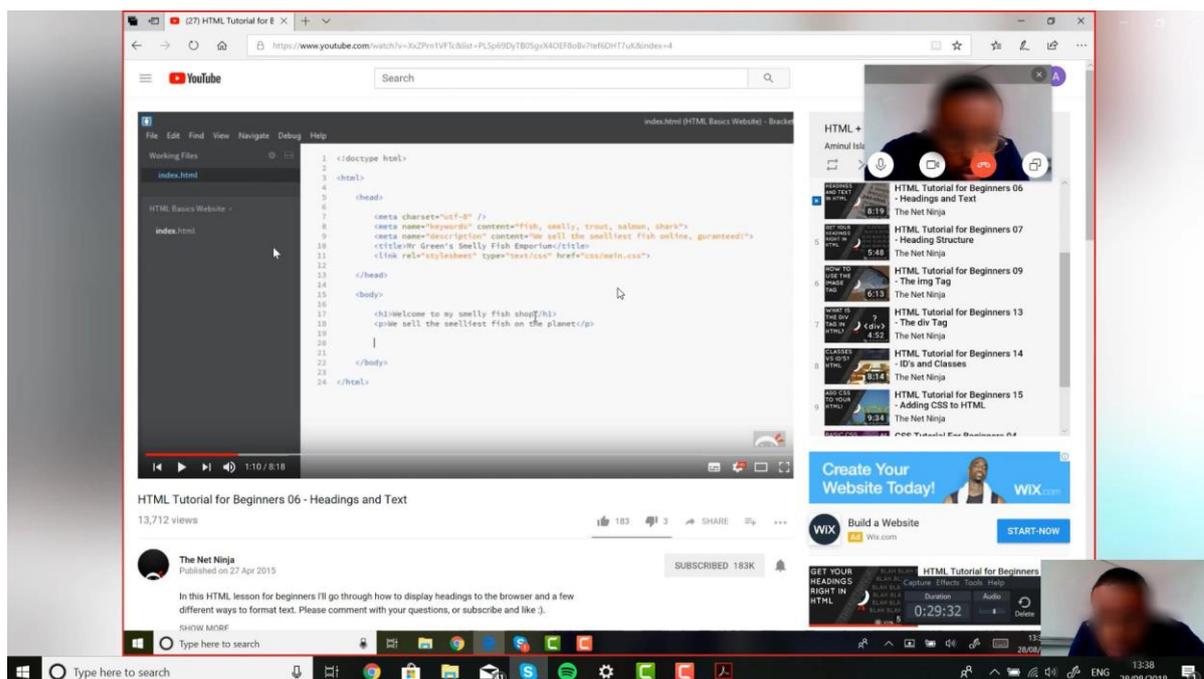
P6: Yeah.

P5: Alright press play.

The participants then continue watching the video until the video clarifies how headings look in a browser. P5 doesn't make many notes during the rest of the video and often discusses instead.

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P5 asking P6 to pause their video to discuss heading tags.

So that means the title of the website we would have as h1. If you want to talk about something specific you do a H2. Then it's like a subheading.

Then the participants spend some time talking about the web page implementation. Then they start playing the video again where P5 reminds them to fast-forward sections that do not seem relevant. Before the participants move to the next video P6 wants to discuss it.

P6: Do we really need heading structure? (*Referring to the next video in the playlist*)

P5: I don't think we need heading structure. One second like me check the adobe...

P6 starts playing the video 'Heading structure'.

I don't think so P6. Let's just go on images next. I think we know how to do headings now.

The task did require heading structure, but the group already knew it as 'subheadings'.

P6 is loads the video 'The img Tag' then they watch it with P5.

P5 instantly makes notes about the tag.

P6 pauses the video to speak to P5 about what they think the src attribute does and the tag properly.

P6: The src is just us putting in the file name for the image. Do we have to have the img in it all the time or?

P5: I think so because...we will see the example that he shows.

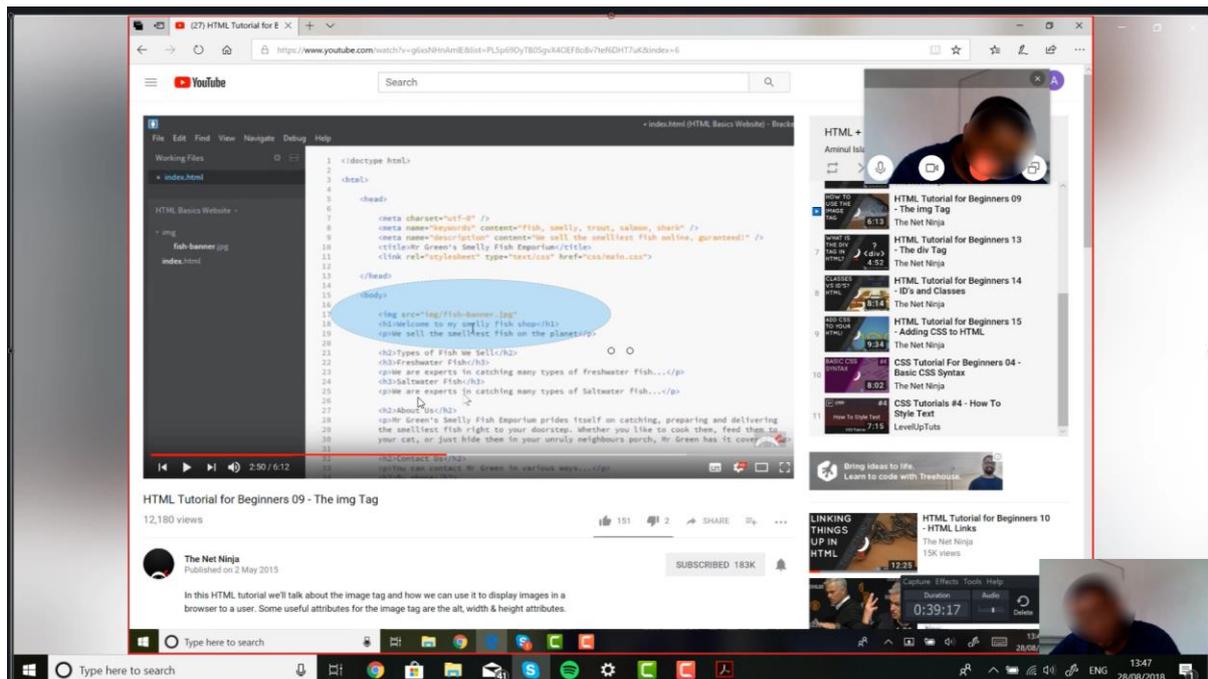
The participants go back to watching the video.

Based on previous sessions the researcher just stepped in and said to ignore the way the is implemented in the video and to use a link for the image path.

While the video is playing, P5 is getting to grips with the online editor to be able to use it later. P5 asks P6 to go back and pause the video and then write down some notes. (See screenshot below).

Appendix I

Observation session and informal debriefing transcripts/summaries



P5 asking P6 to pause the video so he can make **notes** about the `` tag.

P5: Pause it one second. Go back a bit like 10 seconds.

Taking **notes** You write down image, s.r.c equals...

P6: So, source equals and then the quotation marks

P5: And then he found the image.

P5 then writes the literal code down despite being told he is allowed to use a link in place of an image path. After this P5 made no more **notes**.

P6 then starts to go to the online code editor.

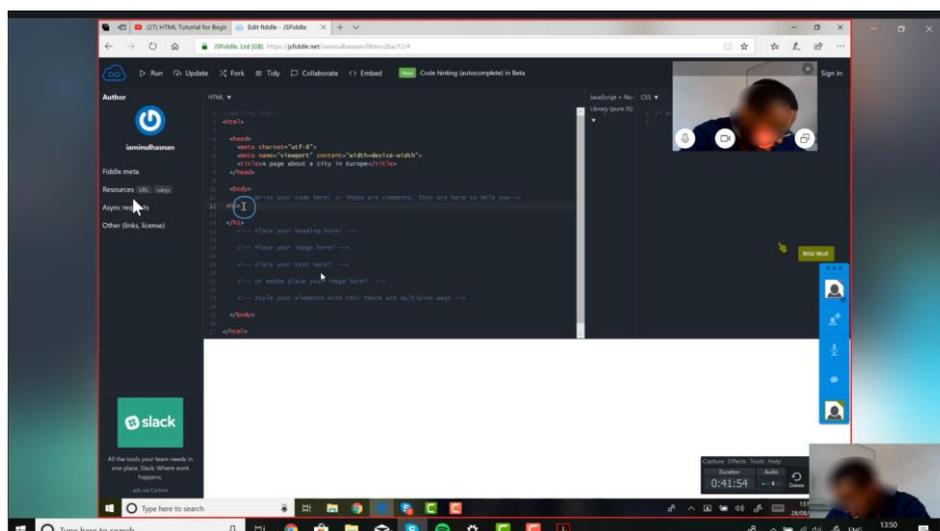
The researcher tells participants the `<body>` is where code goes into as the video doesn't state it.

P6 then joins the collaboration mode on the online code editor.

It doesn't work and the researcher just tells the participants to use the share screen feature. Participants start to code their web page and P5 uses their **notes** to guide P6 to code some simple HTML and made their page about Barcelona. The participants spend some time on figuring content.

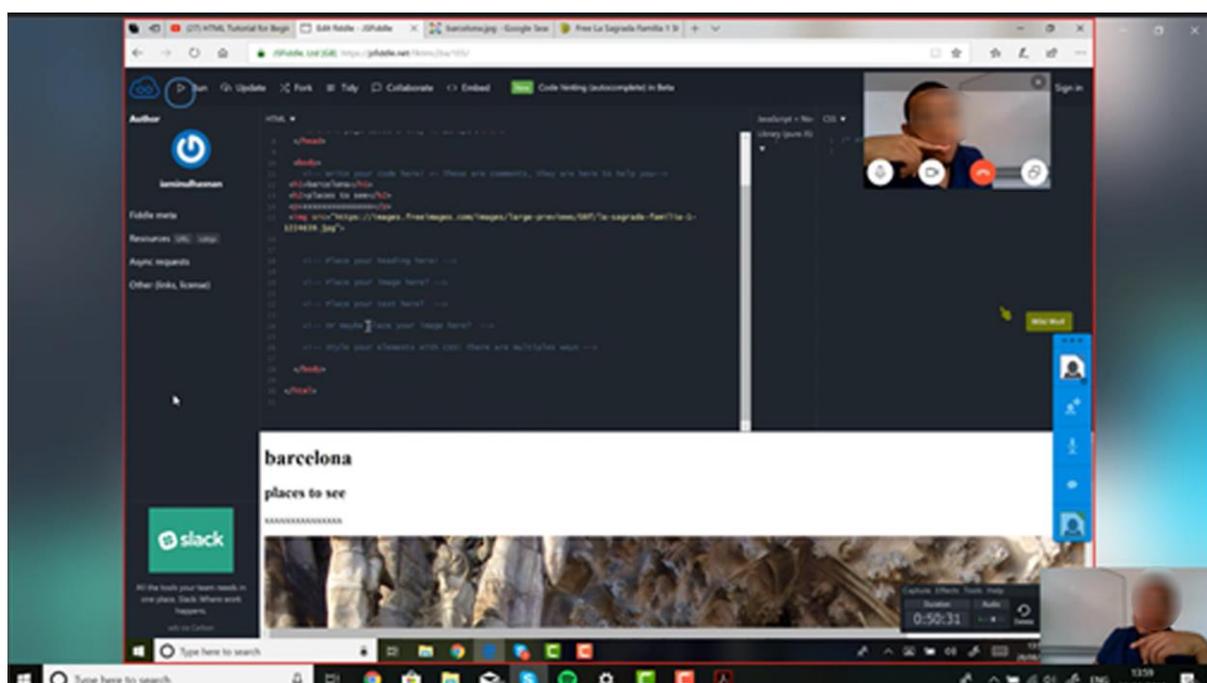
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Observation session and informal debriefing transcripts/summaries



P5 looking at his notes and telling P6 how to code.

The participants go back to completing the 'The img Tag' video. P5 ignores the researcher's instructions and wastes some time watching until they realise they can use a link. P6 then runs a web search and they look for images and copies their links. Then they use notes and knowledge gathered to code using the tag.



The participants successfully implemented images during the session.

The participants then implemented their web page and took longer than usual to do this. P5 referred to the digital task sheet often to complete the implementation required for the task.

The participants then referred to video content and made use of the width attribute.

P5: P6 can you see that? Width. Do that Width.

P6 then proceeded to write code using the width attribute. However, they do not use quotation marks when writing their value.

Thus, the participants referred to the video content again and rectified the issues by spotting the quotation marks. To be clear P5 saw the quotation marks.

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Observation session and informal debriefing transcripts/summaries

Is your one (in) quotation(s) P6? (See screenshot below).

P6 then simply codes the width attribute with the quotation marks after pausing the video.



P5 referring to video content for P6 to code using the width attribute.

The video then talks about the alt attribute and is skipped by P5's request.

The participants then start the video titled 'The div Tag'. However, this video gets ignored.

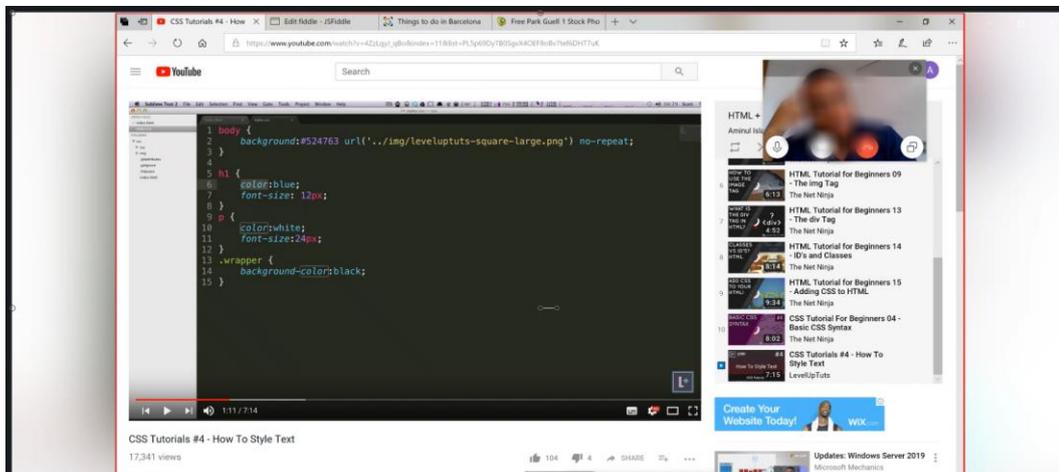
P5 then refers to the task sheet and makes P6 search images and text (headings & paragraphs) that is needed. Then they are added to the implementation. The participants spent a lot of time doing this.

They skipped the <div> tag video as mentioned beforehand.

P5: Go to how to style text.

The participants then view the video mentioned above.

P6 pauses the video and listens to P5 when he speaks. P5 refers to the content screenshotted below. P5 also **points** at the screen whilst looking at code and talking to P6, see image under screenshot.



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Observation session and informal debriefing transcripts/summaries

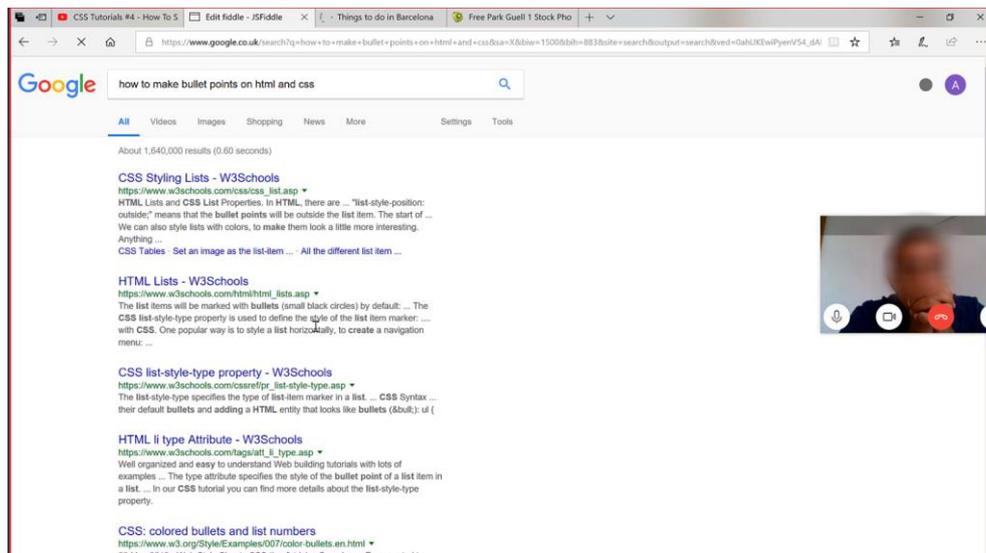


After p, we can do this. Colour: blue, font-size: 12 and the close bracket. Do you understand?

Then P6 tries to code the styling by referring to the video explicitly. They move back and forth between the tabs. This works first time.

Then P5 intuitively asks P6 to go on Google to search how to implement bullet points in HTML.

P5: Write down how to make bullet points on html/css. (See screenshot of P6 doing this below).



P6: I think you just do it in the p.

P5: Let's not guess P6 and go on Google.

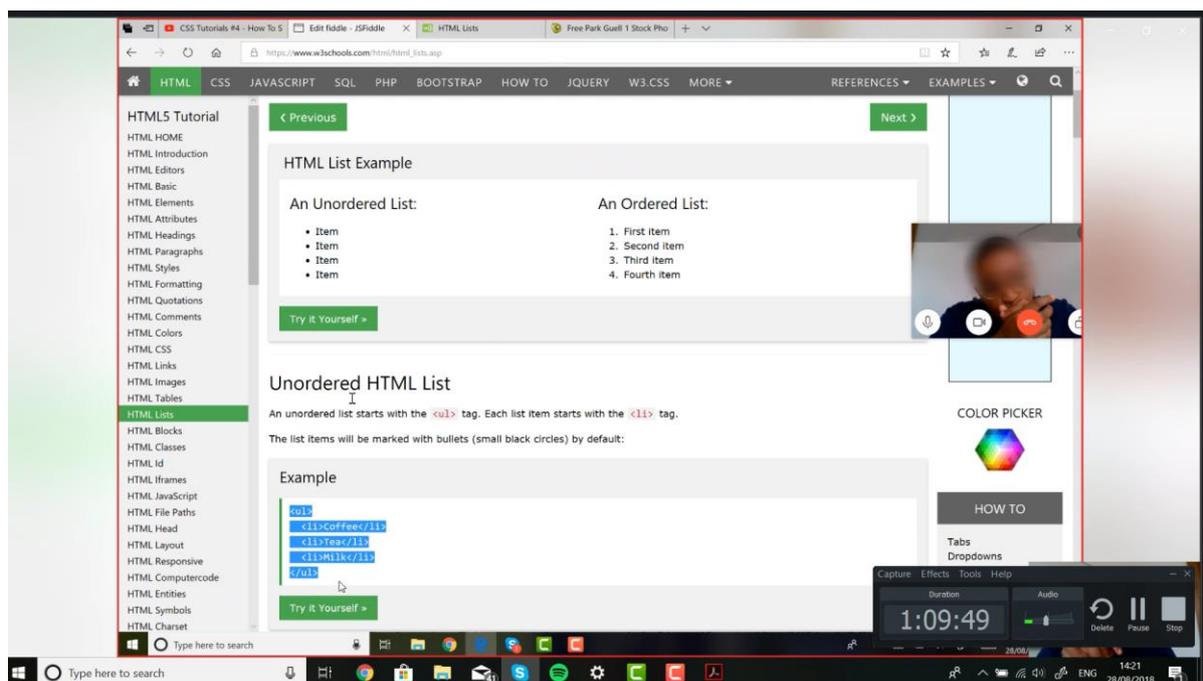
P6: The guy told us, didn't he?

P5: I don't think so. I didn't hear anything about bullet points that's why.

The participants then find codes on w3 schools and copy it to then manipulate it into their code.

Appendix I

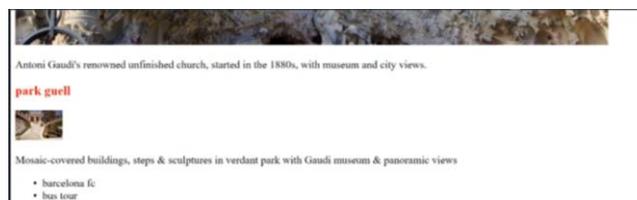
Observation session and informal debriefing transcripts/summaries



Participants copying code from w3schools.

The participants then complete the session and message the Skype chat to let the researcher know the task was completed.

Session completes (snippets of implementation provided below).



Informal debriefing for Session 3

Researcher: Thank you for taking part in the session.

Researcher: Anyone can answer first. Overall how was your experience and how would you personally describe it?

P5: Overall, I would say the **steps were longer than expected**. In the sense that they weren't that direct. They weren't that straight to the point. It wasn't showing the example straight away. It was more of a information based video. Where they give you overview and background then showing you an example. If someone wants to learn quickly, the only way in my opinion was to show quick examples of how to code basically.

Long winded video viewing.

Researcher: For this experience, what would you rather have?

P5: A video with an example a person can use straight away to help them.

Researcher: P6 how was your experience.

P6: It was alright, doing something for the first time using video. Its understandable how to do it and working with someone else who's not in the same room as you. **The videos were long, for myself it would be easier if it was in a written format. I could read each example and just do it.**

Long winded video viewing.

Researcher: What would you think is the worst thing for learning, in this situation?

Appendix I

Observation session and informal debriefing transcripts/summaries

P6: Coordinating videos with the other person. What you might see as important or you want to skip, the other person may think we don't need that...

Researcher: In that case, how did you coordinate?

P6: We had to communicate a lot of the time.

Researcher: What are tools you used in the scenario to help you coordinate?

P6: You write down the notes and just explain what you wanted to do. Then you talk with each other to come up with the similar idea.

Researcher: Using the voice feature?

P6: Yeah.

Researcher: To P5

What was the worst thing for you in this situation?

P5: Maybe the worst thing is exactly what he said. Me thinking something that is exactly not important and him thinking it is. The issue with that was because of the way it was portrayed in the video. The video can say oh this is very important. You would spend a bit more time trying to listen to it.

Researcher: So then, P6 said he used voice and some notes to coordinate. What do you think you used to coordinate?

P5: With regards with the ability to see the screen while he was working. I was able to see small little mistakes. Small little things missing with regards to the work. It is always good to have a second eye on the screen. With Skype we were able to work together at the same time. I was looking for what's missing and what needed to be added on.

Researcher: In terms of coordination, in the beginning you guys play the playlist and it wasn't synchronise view until later on you discovered you can use the share screen feature.

P5: The issue I had was the audio with regards to the video was very low. I think it was because P6's audio was taking over. When we shared the screen, I was able to then hear the video. It was not ideal because it was slightly smaller. → sound encounter.

Researcher: Would you have used the first method you guys used in the beginning?

P5: In my opinion without Skype that would be a better idea. Your able to hear audio properly and then discuss. But you spend a bit more time discussing things.

P6: I think you'd have to use the share screen if your both working on it simultaneously.

Researcher: Alright, what was the best thing about the situation?

P6: Working in real time. Both of us to be able to look at the video at the same time.

Researcher: Do you think this could work to scale?

P6: If you plan out what everyone wanted to do and you plan before hand instead of going into a video session from scratch. Then I think it could be helpful.

P5: For example, if you were to make it large scale if everyone has their set roles. That's what I think will be an important thing. Then it goes out smoothly.

Researcher: So what do you feel like excelled in this situation?

P5: Having more than one person was a good thing. It helps when it is a team.

Researcher: Do you guys feel like you learned anything today?

Both participants: Yes. [amused]

← cautious communication

→ Verbal communication.

sync view?

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Observation session and informal debriefing transcripts/summaries

Researcher: Would video be a good channel for learning?

P5: Video was definitely something that helped. In the terms that it made it easier. Written maybe it would be scary. The videos made is so simple. Anyone can do it.

Researcher: How did you guys communicate well?

P6: Focussing on completing the task at hand was a motivation for communication. Just wanting to excel at what we were doing.

Communication upon completion.

P5: I would say the same. Also, when we were discussing: one would talk and the other would listen. We gave each other time to speak to each other.

Researcher: How did you deliver information to the conversation?

P6: Just looking through the points we had to go through to complete the task. We say okay we complete this then the next one. How do we do that.

Researcher: Other than video, how did someone's digital self get reflected into the session.

P5: The shared screen, I can see his writing and what he's working on.

P6: I'd have the video.

Researcher: You can hear each other talking?

P5: We can both hear each other talking.

Researcher: In terms of awareness, your workspace awareness. How did you know what's going on?

P6: Verbally we tell each other what we write down.

P5: I would write down and tell him the code. Stuff like that.

Researcher: Did anything impede your communication.

Both participants: No.

Researcher: Do you wish that you could use something that was not available to you today?

No answer

Researcher: You guys referred to minutes at one point?

P5: While watching the video there were certain minutes that were key in terms of taking notes down. So I'd say pause at that certain minute. Lets drop down that note.

Researcher: You guys avoided what you called 'waffle'. Should the videos be clear/concise. Would you say a certain time? If you were to give a time.

P5: Anything more than 5 minutes, it starts to get tiring.

P6: When it gets to 8, you just fast-forward.

Researcher: Lets say your watching it by yourself. Would you mind?

P6: I was able to focus on the video as well in this situation.

Researcher: Did you use pen and paper for the whole session?

P6: We'd translate our notes to each other.

Researcher: Did you guys prefer the digital task sheet or the physical?

P6: I was using the physical.

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Observation session and informal debriefing transcripts/summaries

P5: I used the digital.

Researcher: That's it, thanks for taking part today. If you want to know the results of the session I'll let you know.

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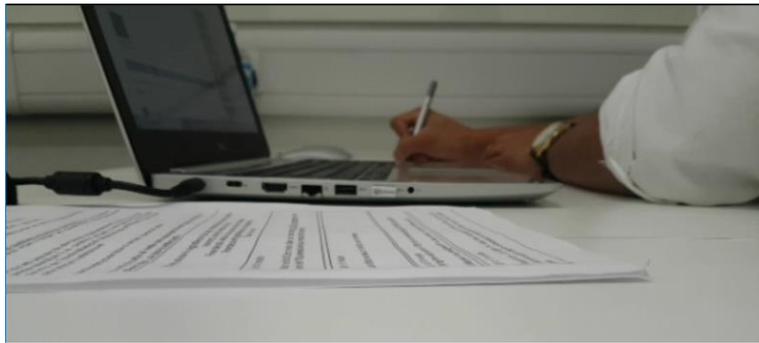
Observation session and informal debriefing transcripts/summaries

Session 4 (held on 03/09/18) – Asynchronous Participants: 'P7' and 'P8'

Sessions starts.

P7 starts watching the first 4:30s of the video in a 10-minute slot.

They reach for their physical paper straight away and make notes regarding the relevant CSS properties discussed in the video. They go back and pause the video in order to attempt to do this comprehensively. They continue to watch the video and make physical notes about the CSS Grid as requested by the task sheet. These notes are minimal.

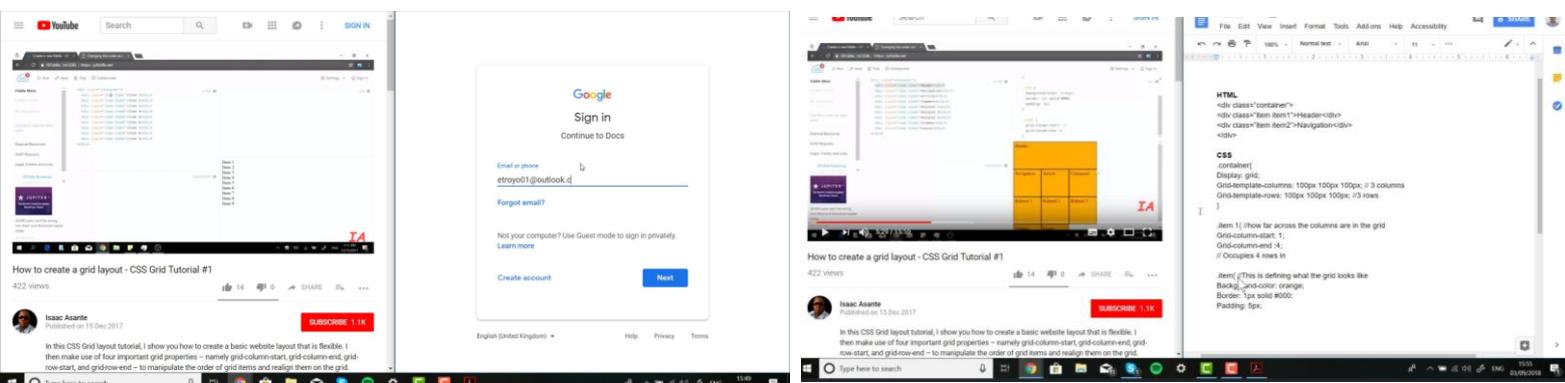


P7 making notes on their physical paper provided.

After some time P7 then starts to write notes **digitally** opposed to using the physical resources. They mostly wrote notes as the video played. They made small notes after the video section finishes by adding CSS comments.



P7 typing away digitally.

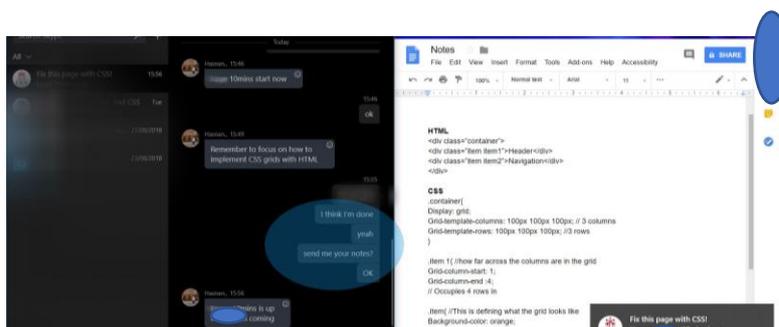


P7 set up a workspace where half the screen is taken up by the YouTube window. The other half of the screen is taken up by the Google Doc they decided to make notes on. They do this for all their note taking.

Appendix I

Observation session and informal debriefing transcripts/summaries

Once P7 was finished they let P8 know and the researcher went to observe them for their section of the video watching.

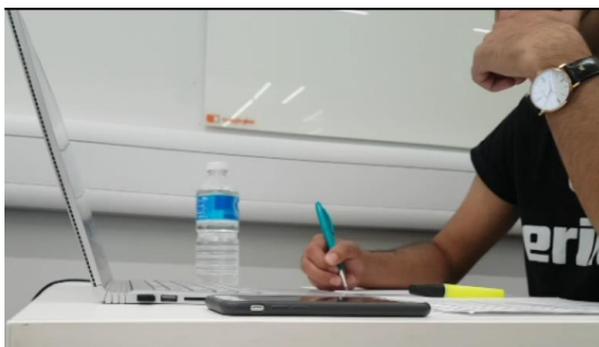


P7 messaging the Skype chat he is done making his notes. Informing P8 and the researcher to commence the next section of the task. This was done for the conclusion of all sections in this version of the data collection about asynchronous tasks.

Researcher goes to other room to make notes and observe the user.

P8 then starts their video after being prompted to do so.

They readily have their pen in their hand to make notes.



P8 was ready to make notes as soon as the video started.

P8 then makes segregated notes by writing the timing of the video. They write a large amount based on how to implement CSS grids. The notes are very comprehensive in comparison to P7's physical notes.

They finish watching the section of the video and made more additional notes in the time they had remaining. They spent a lot more time doing this in comparison to P7.

P8 then said they completed their notes.

Researcher goes to other room to make notes but further away from P7.

Promptly, this allowed the researcher to go back to their remote section and start a Skype call for the participants to collaborate using only their notes.

Call starts.

P8: Hey P7 how are you?

P7: Hey P8, I'm good.

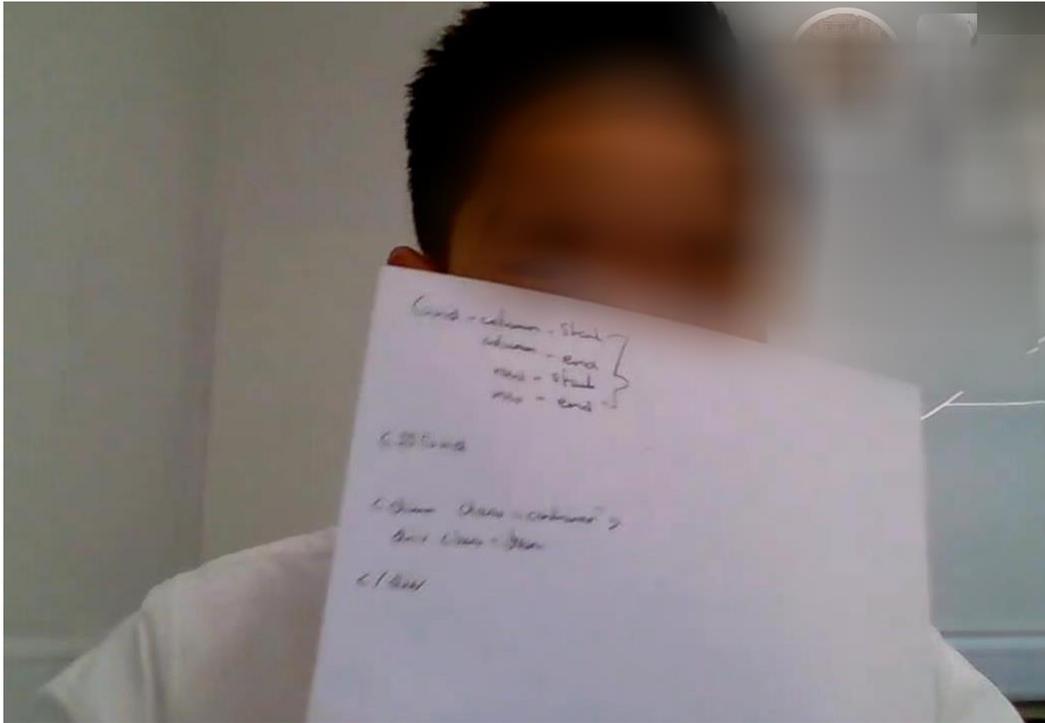
10 minutes to get this done...

I started off by writing on this piece of paper.

P7 then shows what he wrote on the piece of paper to P8.

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Observation session and informal debriefing transcripts/summaries

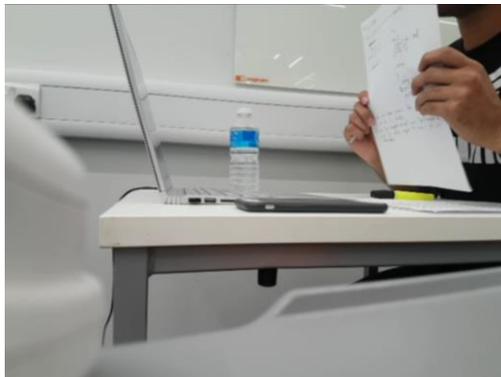


P7 showing to P8 what they had written down on their piece of paper.

...Code from the YouTube video, I copied it on to the Google Docs.

P8: I kind of did the same thing. I did make a few notes about how it's implemented structurally.

P8 then shows his notes to P7 to confirm what they did.



P8 showing to P7 what they did for their notes.

Why don't you just tell me what you understand of it, of how it's implemented.

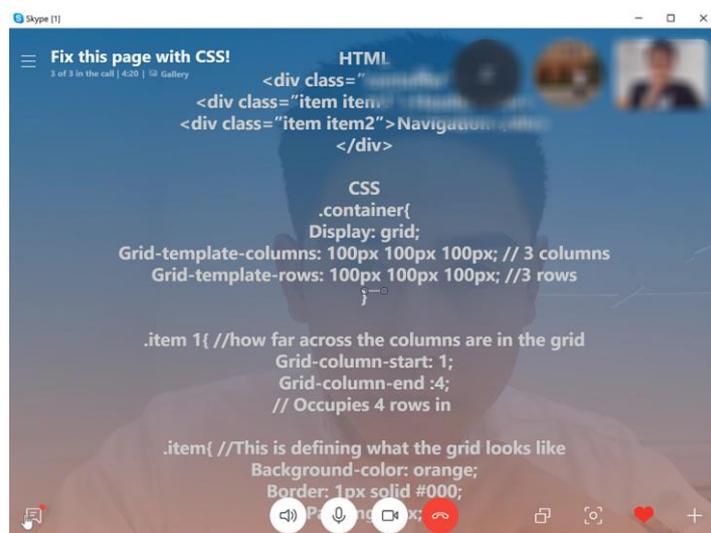
Then the participants talk about how there is different elements of HTML used. P7 then attempts to send his notes to the Skype chat.

P7: I can send it to the Skype chat, so you can see it.

P8: Ok, yes please.

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Observation session and informal debriefing transcripts/summaries



```
Fix this page with CSS!
3 of 3 in the call | 4:20 | Gallery

HTML
<div class="
<div class="item item
<div class="item item2">Navigation</div>
</div>

CSS
.container{
  Display: grid;
  Grid-template-columns: 100px 100px 100px; // 3 columns
  Grid-template-rows: 100px 100px 100px; //3 rows
}

.item 1{ //how far across the columns are in the grid
  Grid-column-start: 1;
  Grid-column-end :4;
  // Occupies 4 rows in

.item{ //This is defining what the grid looks like
  Background-color: orange;
  Border: 1px solid #000;
  padding: 5px;
}
```

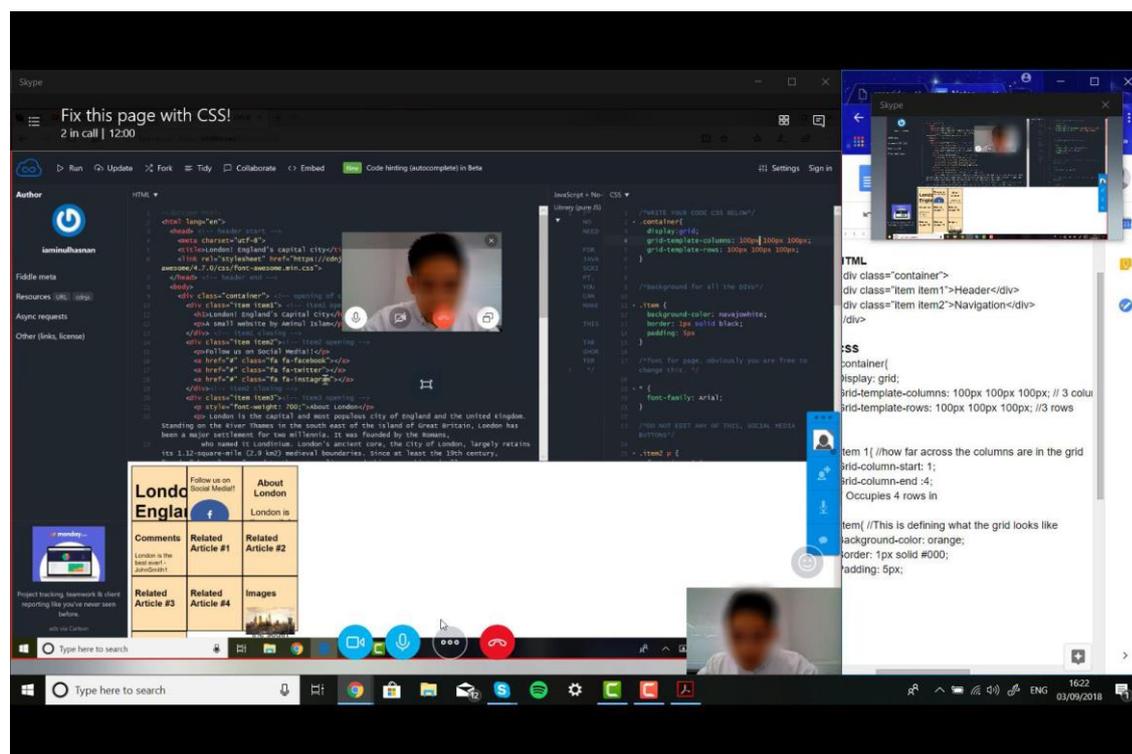
P7 sending his notes over.

P7 sends over his notes.

P8 then looks over the notes.

Then they talk further about the code.

They then used share screen to implement the code correctly. P7 used their notes to help create the code. P8 used their notes for their self. The notes were not used explicitly and was used to run conversation in aid to get the code implemented.



P8 shared their screen and made the correct implementation. P8 used their notes for themselves opposed to P7 who used their code to help complete the task by talking about his notes he used.

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This section of the task then concludes and P7 starts to watch minutes 4:30 – 8:30 in a 10-minute time slot.

They view the video and go back and forth once to clarify some sections.

They make minimal notes on their Google Doc and finish before the allocated time slot finishes and let the researcher know their done.

Researcher goes to other room to make notes and observe the user.

P8 then starts their video after being prompted to do so. They also watch 4:30 – 8:30s of the video in a 10-minute time slot.

They view the video without stopping.

They still make comprehensive notes like their previous note taking session.

They let the researcher know they were done.

Researcher goes to other room to make notes and observe the user.

P7 starts to watch minutes 8:30 – 12:32 in a 10-minute time slot. They make notes on their Google Doc and finish before their allocated time slot and let the researcher know their done.

They made notes as they watched the video, no start and stopping.

Researcher goes to other room to make notes and observe the user.

P8 starts to watch minutes 8:30 – 12:32 in a 10-minute time slot.

They watched the video in one go with no start and stopping.

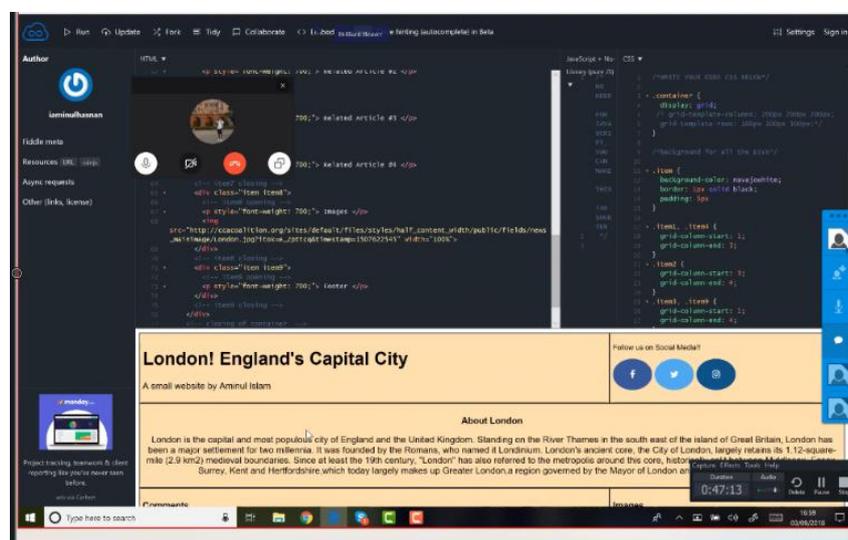
Their notes had become less lengthy in comparisons to other sections of the task.

The participants then collaborate over a Skype call. They go into screen share straight away and try to complete the task.

P8 doesn't really use their notes to complete the task.

P7 barely used the notes he had written. But he used it in the background to check if code being written by P8 is correct.

The participants complete the task required by mostly discussing what they think thought was needed.



Implementation by P7 and 8.

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Observation session and informal debriefing transcripts/summaries

Informal debriefing for Session 4

Researcher: How was your experience and how would you personally describe it? Whoever wants to answer first.

P8: The experience was alright, it was not too difficult, but I did find **viewing** my team-mates **notes quite difficult**. Especially since we wrote it down or even if it was on a Skype chat. **It was a bit hard to follow in that format**. That's the only complaint I would have. Other than that the exercise was quite good. We accomplished the task.

Note viewing issues!

P7: I think collaboration wise it's not the best way to go about it. We were able to share one screen. If we were able to share both screens we would know what each other was talking about. I think the notes, the written notes, **I couldn't understand P8's notes**. He couldn't really see mine. Collaboration using digital tools is the best way.

Note viewing issues.

Researcher: What was the worst thing, I think you guys already touched on it.

P8: The way I take notes is by writing it down in the format it is. It's more of a drawing than notes. **That is not possible to do on Skype.**

→ Not taking method.

P7: What's the worst thing about it...? Just not being able to share screens together I think.

Researcher: What was the best thing about the situation? In terms of collaboration.

P8: I think it was the communication. There was a continuous line of communication without breaking down. Even though there was things to refer to, it was still easier since we had a clear line of communication. **We can explain it in a form that is possible.**

→ clarified communication.

P7: Yeah. I think we were able to get the task done, that's the main point as well.

Researcher: Do you feel like you learned anything?

P8: I feel like I have.

P7: Well, I have never pair programmed like that. It's always been co-located.

Researcher: When it got to the call, you had two sets of notes right. How did you guys coordinate with each other?

P8: It was all verbal communication...most of the time. There was barely any reading. I actually did not read much to be honest.

→ clarified communication.

Researcher: Do you guys feel like you used your notes at all?

P8: I feel like I used my notes for myself but not for the others.

↓ lack of sharing notes.

P7: In agreement Yeah.

Researcher: How did you monitor each other? Looks like you guys had a debriefing of the video itself then you continued.

P7: Yeah. P8 would have asked me what did I think of it. Then I'd tell him and then I'd listen to what he said. We were sharing opinions.

Researcher: You guys had a lot of information you wrote down but how did you put it into the conversation?

P8: It came up in conversation due to the task. It was like this is the next thing we have to do and then this is the notes on it. So, we have to refer the notes then execute the task.

→ verification to the notes.

Researcher: In terms of having technology, did you feel there was any technology you could of had but its not here today?

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P7: The technology to share both screens on Skype. I think Skype isn't really the best tool for programming more videoconferencing and stuff. I think if they made an actual technology for pair-programming remotely...

P8: Also, better way of coordinating... it felt a bit slow and I didn't know what he was going to do, and I didn't know my next step.

lack of cohesion.

Researcher: So what did you guys feel about the video? It helped you learn or?

P8: Definitely!

P7: Of course!

Researcher: Would there be anything to improve in terms of video then?

P7: I think the video was perfectly fine. It taught how to do everything.

P8: I felt it was quite decent. As he was coding there was a visual representation of it. Which I felt is the best way to learn.

Researcher: P7, as soon as you started watching the video you started making notes on a physical area with pen and paper. Then you went to Google Docs in a digital format, why?

P7: When I first started writing notes, I thought how I am going to share this to the next person. I felt like with Google Docs they'd be able to see what I was writing. I could copy and paste, and they could see the code I was writing.

Researcher: P8, you wrote everything on physical notes. Do you have a reason for that?

P8: I just felt like my notes had to be more visually stimulating than just straight lines of text.

Researcher: Did that impede any sort of collaboration?

P8: It did because I couldn't share it. I was holding my papers to the camera.

P7: I was able to share what I wrote up.

Researcher: Do you feel like that ruined the conversation?

P8: I felt like each one of us didn't need each other's notes only our own. It didn't really impede the conversation.

P7: I think even though P8 had it written down, he was able to explain it well enough so that I'd understand.

Researcher: Did you feel like you had enough time?

P7: Generally, I pause and type up and code and pause. I'm always rewinding and fast-forwarding. So, it's not just like pressing play and just watching it. In the task we were time restricted and we had 10 minutes.

P8: I watched the video straight away without pausing actually.

Researcher: Did you need more time?

P8: I felt there was bit of pressure in completing the task. To learn, there was enough time.

Researcher: The communication hub was the Skype chat, I guess? Is that true or not? The chat...

P8: I felt that its not ideal when you have a voice call...its quite small and narrow. It doesn't really help that much.

Researcher; We did mention already, notes were not used. Just to confirm the answer, does it feel unnatural?

*↑ were taking
issues*

*TIME
ISSUES TO
MAKE
NOTES.*

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Observation session and informal debriefing transcripts/summaries

Note
taking
issues.

P8: Notes to me was valuable for me. I don't think they were valuable for P7 and his notes were valuable for him but not for me. Individuals need their own notes but it doesn't need to be seen by everyone.

P7: Yeah, I'd say the same thing.

Researcher: So this idea of social learning sort of thing, do you think its needed?

P8: It is because I wouldn't have done this fast actually.

P7: Yes.

Researcher: You were discussing but not using notes until one point. Did you remember that because of the task or did you because...?

P8: No, it was because were writing notes on anything that we found important.

P7: I think it was more a remembrance thing. Memorise stuff.

P8: Its only the thing we find note-worthy.

Researcher: Did you ever feel like this will ruin the conversation? My notes..?

P8: Any hindrances? I don't think it would.

Researcher: I'm just trying to find out why no notes were used at all.

P7: I think because your so focussed on just trying to get something out there and coded up. We had time constraints.

P8: It was based on a conversational understanding of it.

P7: I think it went from the notes into verbal communication then we understood it through that.

P8: Especially when it comes to code. Its about the understanding of how things work rather than memorising.

Researcher: Okay thank you guys...

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Session 5 (held on 04/09/18) – Asynchronous

Participants: 'P9' and 'P10'

Session starts.

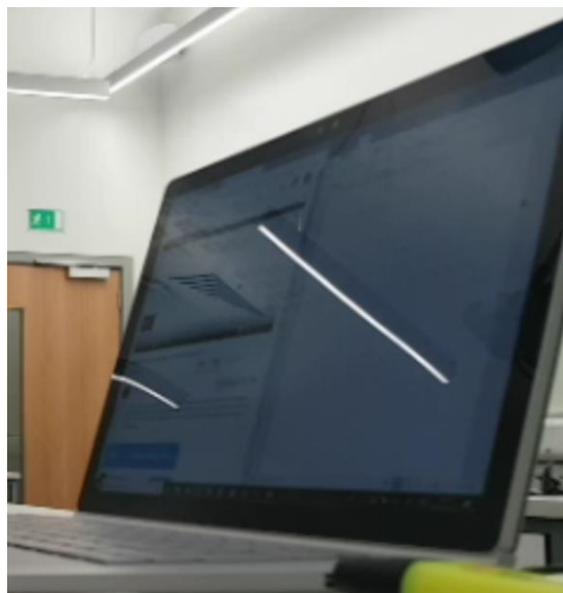
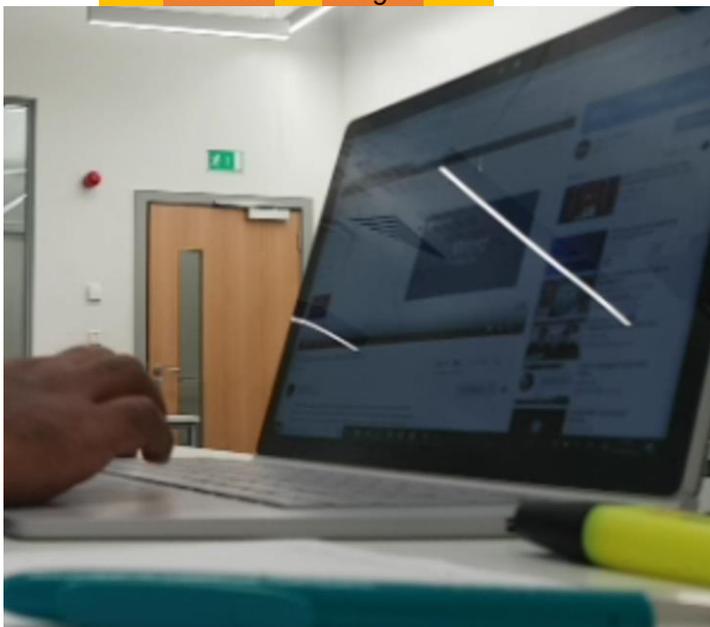
P9 opens the browser to view the task sheet, example website and start the YouTube video. They start to make notes straight away on the physical paper provided. They paused the video whilst making these notes. They watched and made notes based on the first 4:30s of the video in a 10minute slot as the task required. See image below.



P9 writing notes.

P9 resumes video readily waiting to make notes.

After a while, they pause the video and place their pen down and open Microsoft Word on their laptop. They partition the screen with half of it having a Firefox window and the other half having a Microsoft Word window. See images below.



P9 opens Microsoft Word and makes use of their screen by placing windows in certain ways.

P9 then starts to make notes using Microsoft Word opposed to physical pen and paper.

They then use the screenshot feature provided by Windows.

The image below shows P9 viewing the image that they created in a photo viewer.

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They then edit the image and paste it into their document. Below show parts of the Word Document created and saved on the computer (as a screenshot).

• Html structure to create layout

```
1. <div class="container">
2. <div class="item item1">Item 1</div>
3. <div class="item item2">Item 2</div>
4. <div class="item item3">Item 3</div>
5. <div class="item item4">Item 4</div>
6. <div class="item item5">Item 5</div>
7. <div class="item item6">Item 6</div>
8. <div class="item item7">Item 7</div>
9. <div class="item item8">Item 8</div>
10. <div class="item item9">Item 9</div>
11. </div>
```

- JsFiddle
- Container is the parent
- 9 children elements
- Each has class item has similar class because they share common things
- They also have their own class as they will have individual styling(?)
- Css of .item
 - Background-color is orange
 - Border is 1-x solid #000
 - Padding of 5px
- Css of .container
 - Use `display:grid`
 - Define structure using
 - Grid-template-columns: 100px 100px 100px
 - Grid-template-rows: 100px 100px 100px
- Order of your html structure does not matter

• 4:30-8:30

- Individual elements:
 - Header to go full length of the grid
 - `.item1 {`
 - Grid-column-start: 1;
 - Grid-column-end: 4;
- 1-4 correspond to the grid lines, so there are 4 lines in a 3 column table
- Same thing applies to rows (horizontally)
- This will push the last two grids to another row
- Adding multiples classes to a css function will apply it to more than one item
- Because we specified that the grid is spaced out with 100px and we defined grids to start at fixed lines on that grid, any items that get pushed out of the original grid, will not have the styling applied to it
- In future we need to modify the grid structure to take into consideration all of the items

From here P9 makes their notes whilst watching the video and not pausing the video whilst doing so. They do pause at one point to make sense of something but do not make notes on it. P9 then watches until the minute needed and is ready to move on. P9 then sends their notes to the Skype chat. See image below.

Fix this page with CSS!

3 participants | Gallery



Download

User 2, 18:37
im ready

User 1, 18:37
im ready as well

18:41
Call 1m 24s

User 1, 18:53

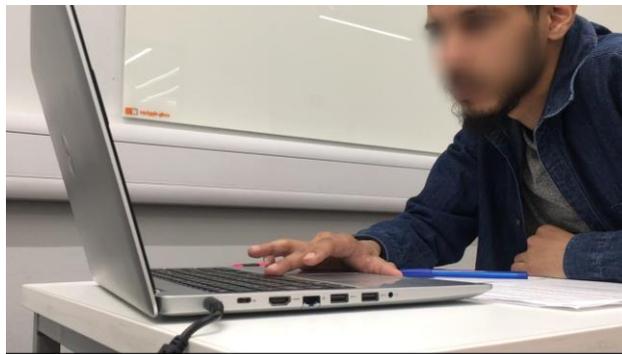
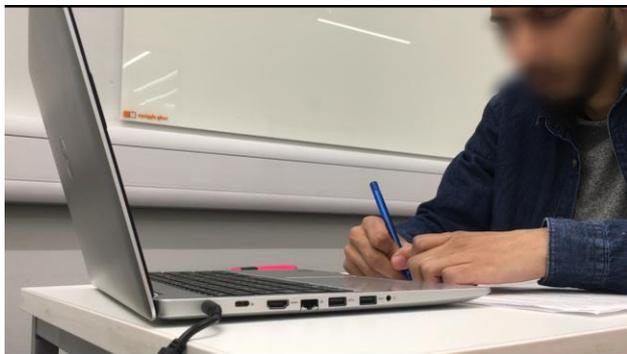
Download

Appendix I

Observation session and informal debriefing transcripts/summaries

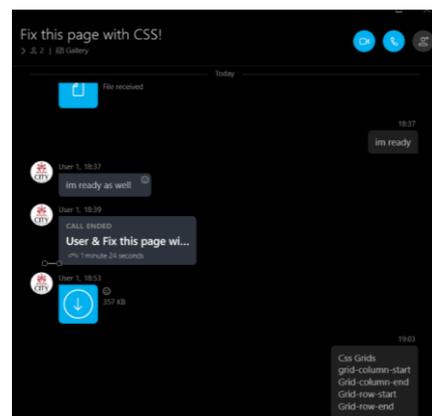
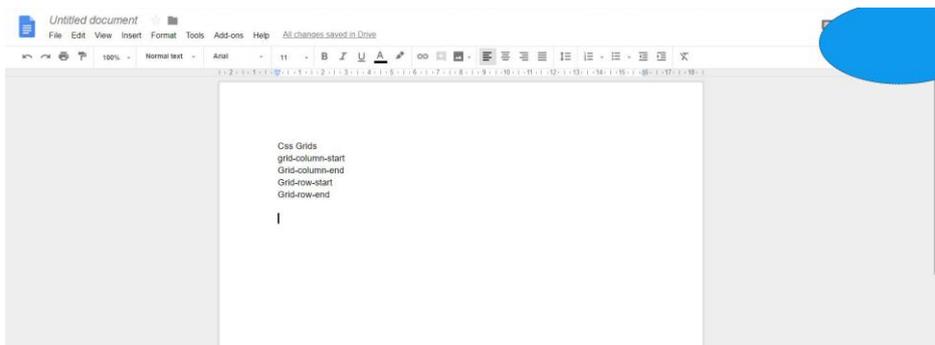
Researcher goes to other room to make notes and observe the user.

P10 starts to watch the first 4:30s of the video. In the opening seconds they make notes about the CSS properties the video will talk about. They also pause the video whilst doing this. They then watch the rest of the requested content with direct attention to the screen and not making any notes. **They were ready to pause by placing their finger on the space bar.**



P10 making their **minimal notes** then paying full attention to the video.

P10 then writes digital notes by opening a Google Doc to replicate what they wrote on the physical paper. **However, they change their mind and used the Skype chat instead to send P9 their notes.**



P10 using Google Drive to writes notes then using Skype messaging features instead.

Once they finished they let the researcher know they are done.

Researcher goes to other room to make notes but further away from P9.

Promptly, this allowed the researcher to go back to their remote section and start a Skype call for the participants to collaborate using only their notes.

The participants then start the proper call and code the website.

They use the screen share feature to collaborate and write code. P9 shares their screen.

P9 lets P10 know they have sent notes to the Skype chat.

P9: Do you have my notes open P10?

P10: I didn't get your notes.

P9: It's on Skype.

The participants then waste time looking at the HTML code although clearly being told they need to just edit the CSS.

P9 then opens his notes and explains his idea of what the correct implementation may be.

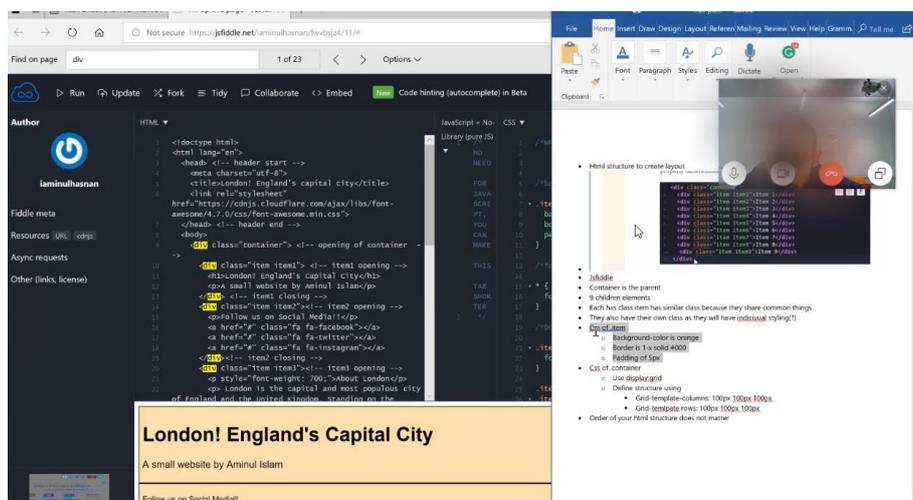
P9: So, we have to add the class item and the class container.

Appendix I

Observation session and informal debriefing transcripts/summaries

P10: Yes.

P9: So, I will do item first. I'll just do this then modify the structure.



P9 explaining to P10 what they think they need to do by showing their notes. They even highlight the 'code' noted.

Then P9 proceeds to write the code.

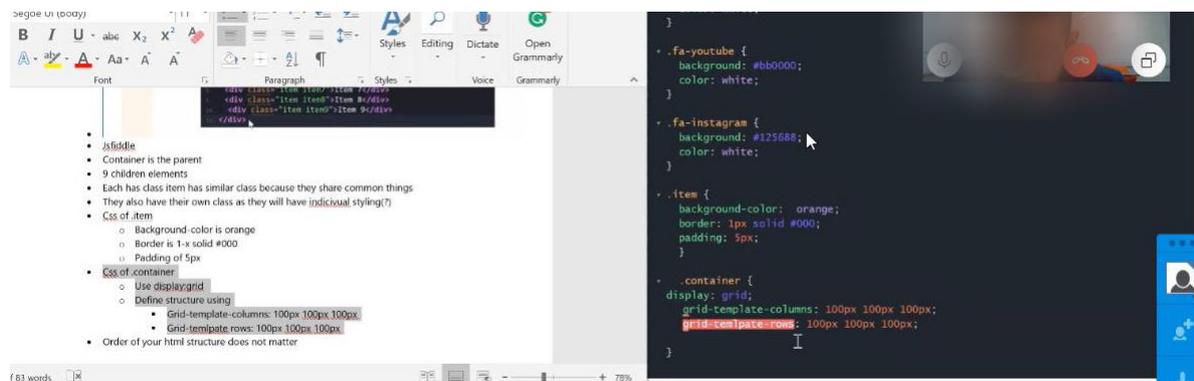
Then they attempt to write the code for CSS grid's container but fails because of positioning of the selector and spelling errors. The latter is noticed. P9 relied on their notes and that is why it happened (see image).

P9: Not sure why there is a mistake.

P10: There's a spelling...

P9: Mistake?

P10: Template.



P9 then changes the error but doesn't notice the selector needs to be higher on the sheet. Their item coding worked, it just changed the background of the grid that was not needed for the task.

The researcher then comes in to help and give the correct solution to move the task forward.

This section of the task then concludes and P9 starts to watch minutes 4:30 – 8:30 in a 10-minute time slot.

They view the video and make notes as they did before but **added a heading to make sense of the section of the video they are writing about.** (See screenshot of Word document above).

They then send the notes over to the Skype chat.

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Observation session and informal debriefing transcripts/summaries

Researcher goes to other room to make notes and observe the user.

P10 then starts their video after being prompted to do so. They also watch 4:30 – 8:30s of the video in a 10-minute time slot.

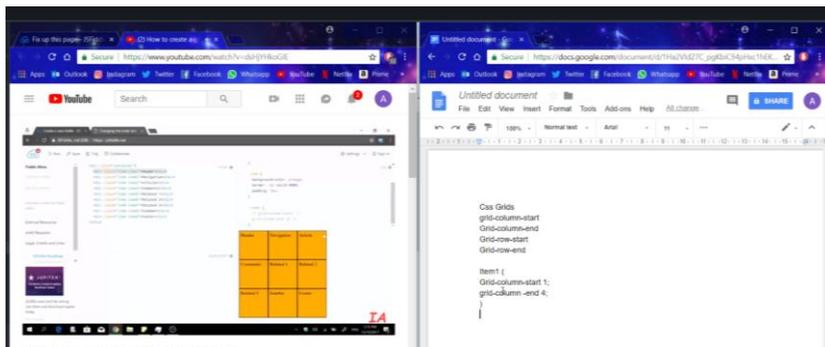
They continue their previous viewing method of paying high attention to the video and not making notes.

They try to make use of their laptop's screen by dividing the windows of the video and Google Doc.

They then pause the video and make notes of what they see on the video. They resume the video when they do not take notes.

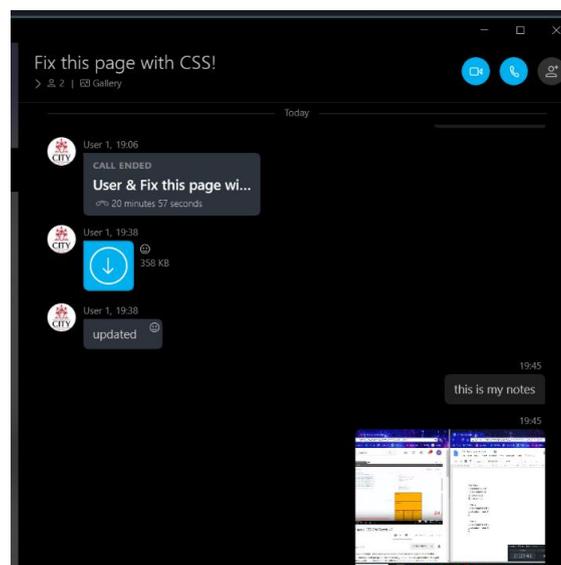


P10 trying to make windows partitioned on their screen.



The notes created by P10 when they paused their video.

Once P10 finished their note taking they sent a screenshot of their notes to the Skype Chat.



They let the researcher know they were done.

Appendix I

Observation session and informal debriefing transcripts/summaries

Researcher goes to other room to make notes and observe the user.

P9 starts to watch minutes 8:30 – 12:32 in a 10-minute time slot.

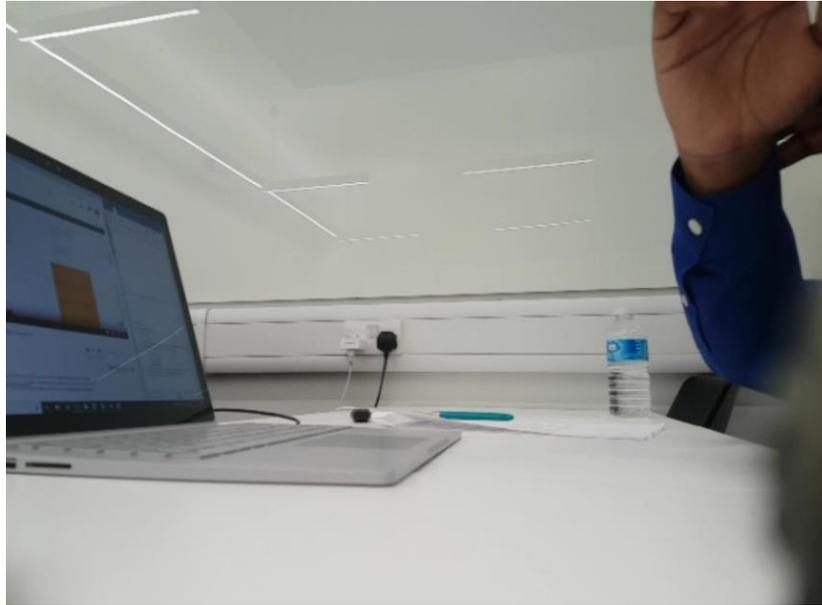
They make notes using the same methods. See image of them doing this below.

In this time P9 also moves the task sheet to the right-hand side to be able to read it.

P9 did not send their Skype notes this time round.

They let the researcher know they were done.

Note: P9's screen did not record due to an unknown error, screenshots cannot be shown for P9.



P9 writing notes about 8:30 – 12:32 about the video they are viewing.

Researcher goes to other room to make notes and observe the user.

P10 starts to watch minutes 8:30 – 12:32 in a 10-minute time slot.

They do the same actions as previously.

They make notes and send it on Skype as a text this time. **However, they do start to give their notes a header to provide structure to what they wrote.**

```
Item1 {
  Grid-column-start 1;
  grid-column-end 4;
}

Item2 {
  grid-row-start: 1;
  grid-row-end: 3;
  grid-column-start: 1;
  grid-column-end 4;
}

8:30 - 12:30
Item2 {
  Grid-column-start 1;
  grid-column-end 3;
}

Item1{
  Grid-row-start-3
  grid-row-end-5
  Grid-column-start 3;
  Grid-column-end 4;
}

1.cell takes up 2 spaces now
2.
```

Appendix I

Observation session and informal debriefing transcripts/summaries

Researcher goes to other room to make notes but further away from P9.

The participants then collaborate over a Skype call.

They compare their notes and see what they can do with it.

They use share screen to complete the task.

They agreed they had the same notes and went on to use P9's notes as the 'main notes'.

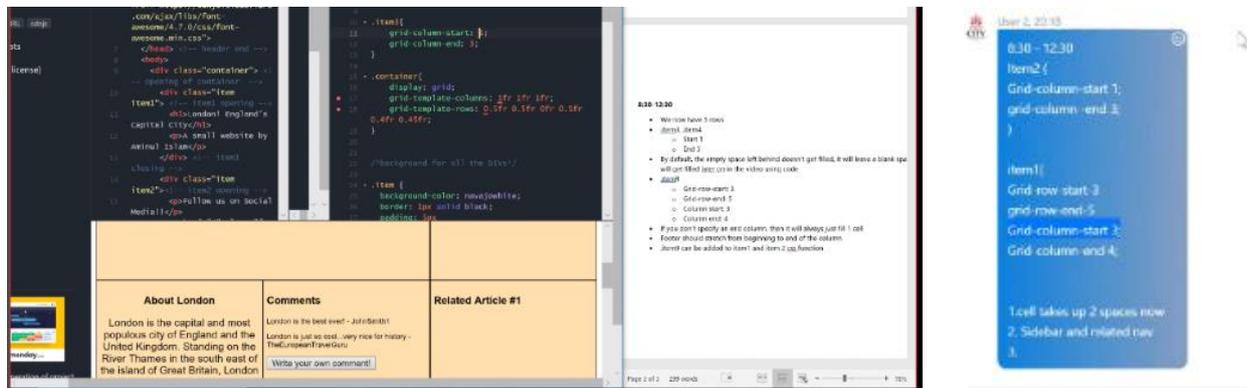
P9: You see what I wrote? On the side.

P10: Yep.

P9: Similar to what you wrote.

Then P9 tries to edit the code using mostly their notes as their screen sharing. They do use bits of code written and sent by P10. They are simply referring to notes by either opening the Skype chat or looking at a window beside the code editor. They do not really discuss the notes. See images below.

However, as the time passed the participants started to not use their notes as much and not implement correctly. To stop collection of useless data the researcher came in and gave the solution. This was also done due to time issues, the debriefing session needed to be concluded before the building closed.



P9 screen when they view notes (left).

P9 simply opened the Skype chat and copied relevant code by P10 when needed (right).

Session concludes.

Appendix I

Observation session and informal debriefing transcripts/summaries

Informal debriefing for Session 5

Researcher: Okay guys, thank you for taking part in that session. I know it was a bit weird in some cases. I'm just going to go straight to it. How was your experience and how would you personally describe it? About the collaboration, whoever wants to answer first.

P10: I think if we had more time on note-taking it would have been better. I didn't have that much notes as P9 did. When we presented our notes to each other, it was mainly going off what P9 was doing. Say for P9 got stuck he would look at his notes or my notes, it wouldn't of been much help. I think moving on for the last task we used the website as a guide not our notes.

P9: I would have preferred to watch the whole video. Rather than watching parts. For me I prefer getting the whole idea first. → preparation beforehand.

P10: Write down your own notes and go back to it after, yeah.

Researcher: Overall you guys experience, was it good or bad?

P10: For my first experience, I would say it was alright but for a second time if I were to do it again I would know what went wrong and I could improve it. (Being able to go over video twice).

P9: In terms of collaboration it was fine but the work we did was a bit.. [amused]. P9 starts to laugh.

Researcher: So, I think we've talked about the worse thing about the situation. What was the best thing about the situation or scenario.

P10: If I had any concerns or questions, I would ask P9 and he could quickly tell me or show me while he's not stopping working. He can still continue while I catch up. → Clarified communication.

P9: It was easy to send notes. See what he wrote and see what I wrote.

Researcher: Did you guys find that interesting? Being able to send notes to each other?

P10: Yeah at first but then one thing I didn't like about it I had more than 12 tabs open and I kept on getting lost. That's the issues I found.

P9: I would have preferred...there's like screensharing, taking notes and watching the video...manage the ways it laid out.

Researcher: Did you guys feel like you learned anything today?

P10: Through the video yes, a bit through practically implementing it.

P9: I think a 10 minutes rest to think about it helped.

Researcher: What made the communication bad? If anything was bad.

No answer.

Let's say you guys were using notes, right?

It feels like you guys were not using it in the collaboration.

P9 was making extensive notes.

P10 didn't have time sort of thing.

When you came into the scenario. The notes weren't used.

Were the notes useful?

P9: I used them. For me I memorise the notes if I wasn't sure about it I'd go back to it.

TIME ISSUES TO
MAKE NOTES.

NOTE
VIEWING.

CLUTTER.

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Observation session and informal debriefing transcripts/summaries

Note-viewing.

P10: You see P9, he had set out bullet points sometimes sentences. Whereas me I'd have two three words. Say for if I look at my notes I would probably understand what I'm saying but if he looked at my notes he'd be like...

Researcher: So, your notes is for you not for him?

P10: Yeah, its not for some one else!

P9: I tried to like word it so he can read it well.

P10: Yeah I could read his. He had trouble reading mine. [laughs]

Researcher: How did you guys monitor each other's notes.

P10: Say for example I write some thing wrong he would check his one. If were both wrong about it we had time to test it out. Majority of the time we were agreeing with each other.

Researcher: How did you deliver information into the conversation that was useful based on your notes?

P10: I thought it would be preferred to take screenshots. You can have a large sum of information in one screen.

P9: I was going to do that but it was time consuming like cropping it and pasting. I just left it out...

P10: I was going in and out...in between and if I stuck to one it would have been a lot better.

Researcher: Was there any technologies that you wish you could have in this situation? That wasn't with you today.

P9: If you could have like shared notes. Then we would have set up beforehand. It would take time to set-up.

P10: Yeah!

Researcher: How did you make notes, I need to clarify.

P9: I was going to do it on paper but then I was like time to write it out. I switched to the word document. It was faster for me.

P10: I made the mistake of writing it down. I realised that P9 needs to understand this as well.

Researcher: Do you guys have preferred working modes? Lets say you guys were moving one tab one side and another tab on that side. Is that your personal preference or just to make use of the screen.

P9: At work I have two screens. I can just put on different screens. Here I only have one screen, so I put it in different windows.

P10: Yeah, I agree with that as well.

Researcher: You used Microsoft Word, why Word? To P9.

P9: Because it had bullet points. If I used Notepad I'd use dashes and stuff.

Researcher: Did you have enough time?

Both participants: No.

P10: I clearly didn't have enough time.

TIME ISSUES.

Researcher: Do you guys think it will in a situation where you're in a programming pair and your online? You guys have no idea about each other.

P10: If I was using my own laptop I wouldn't have an issue.

Note
Taking
METHODS

Appendix I

Observation session and informal debriefing transcripts/summaries

P9: I don't think this works. You wouldn't share the work, exact same file. In real life you will do segments of files.

Researcher: (At the beginning) You used physical paper and pen first and then didn't take notes at all. Why?

P10: I wanted to take in all the information first. Instead of stopping starting. When I didn't have enough time, I try absorb all the information first.

Researcher: Why did you use Google Docs?

P10: I think its more of a preference. Like Microsoft word but easier to use.

Researcher: Thank you very much...

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Observation session and informal debriefing transcripts/summaries

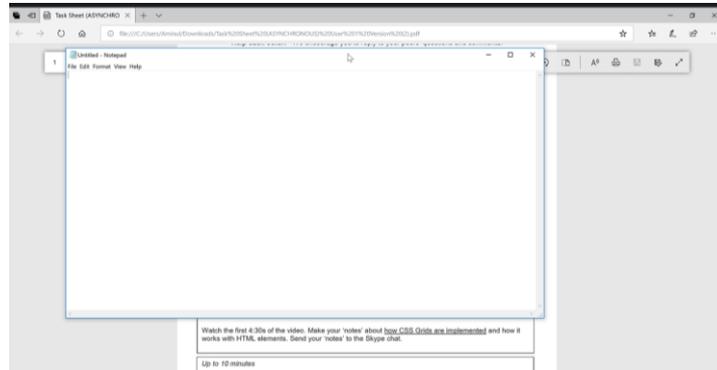
Session 6 (held on 06/09/18) – Asynchronous

Participants: 'P11' and 'P12'

Session starts.

P11 has a 10minute slot to watch the first 4:30s of the required video about CSS grids.

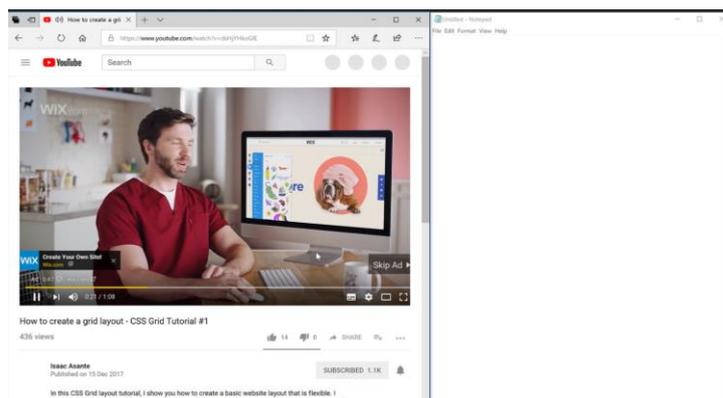
P11 Starts the slot off by skimming the task sheet once more then opens Notepad.



P11 opening Notepad with task sheet in the foreground after just reading it.

They load the video through the task sheet too.

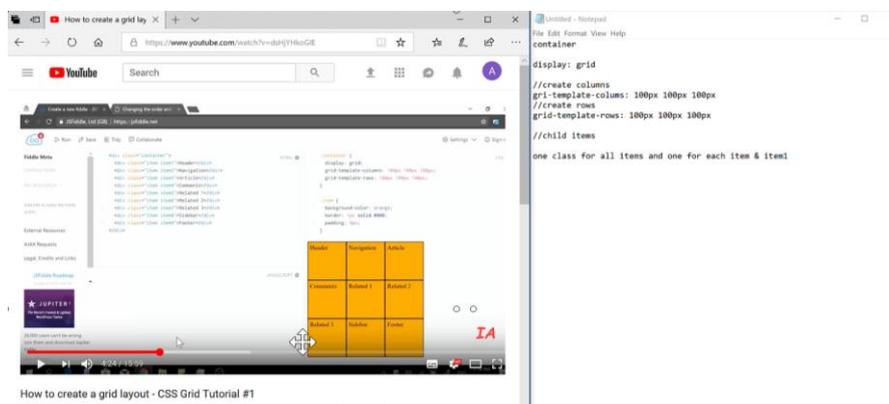
They set up their own working space by dividing the screen into two windows. Majority of the screen is taken by the window with the YouTube video open and the rest has the Notepad window.



P11's screen set up.

Inevitably, the video of the subject starts to play and P11 views it.

They make notes after they view content about the CSS grid. They just copy the code essentially.



P11's notes on Notepad during their viewing of the first 4:30s of the video.

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Observation session and informal debriefing transcripts/summaries



P11 typing their notes.

*P11 notifies the researcher they are done.
They send their notes to the Skype chat.*

Researcher goes to other room to make notes and observe the user.

P12 starts to watch the first 4:30s of the video after being prompted by the researcher.

They make comprehensive notes on the physical paper provided.

The notes are more than just copied code. It's not possible to see what they wrote explicitly due to the way the session was recorded.

They watch the whole video throughout with a small number of jumps by tabbing through.

They turn back to ask if they can watch the video again. They were told they are free to do whatever they want and proceed to see the section they want within the time.

They finish watching & finish making their notes within in the allocated 10 minutes.

P12 notifies the researcher they are done.



P12 writing their notes.

Researcher goes to other room to make notes, sitting further away from P11.

The participants starts their Skype call to collaborate and complete the first task together, implementing CSS grids.

P11: Did you send your notes?

P12: I didn't send my notes.

P11: How did you take notes?

P12: Do I just explain, or do I just send them by taking a picture? Because...

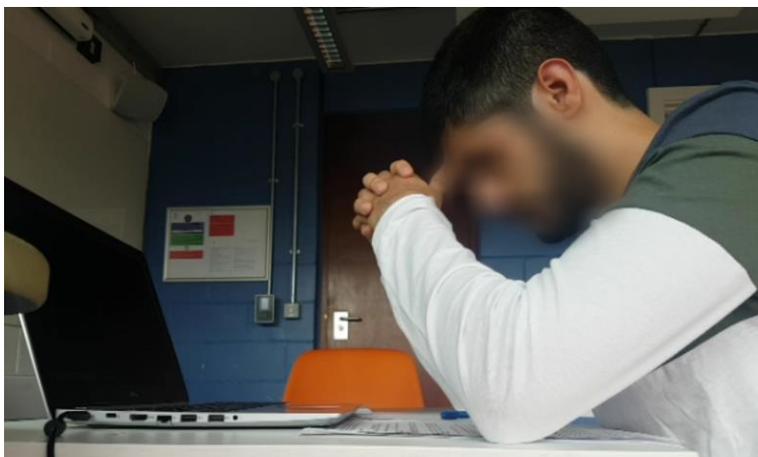
Appendix I

Observation session and informal debriefing transcripts/summaries

P11: It's fine. Let just start with the...

P12: Grid...so you have to...

P12 then uses their notes written down to talk to P11 about the task. Their task sheet and notes are noticeably closer towards the middle.



P12 talks about the task using their notes.

P12: According to my notes, we have to make...there is already parent item container. We have to add rows to turn them into lines.

Then its apparent the online code editor's collaboration tool is not working. So, the participants screen share by suggestion of the researcher. P11 opts to screen share.

P11: There doesn't seem like there's a container CSS, so I'll add one.

P12 looks at their notes during the conversation.

P12: Should I tell you what to write?

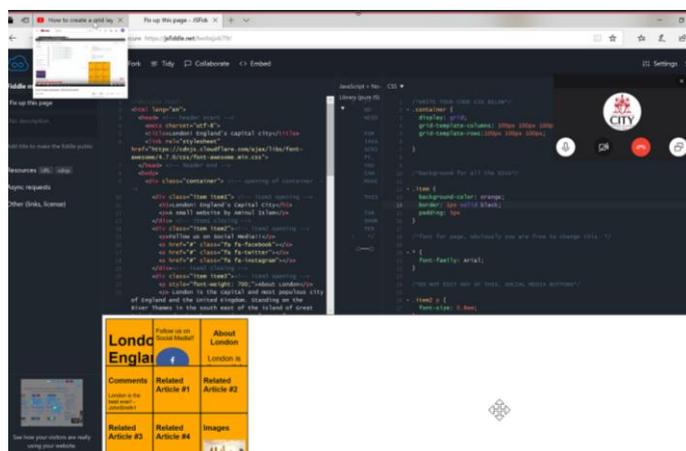
P11: Okay, I guess.

P12: You need the display grid and then write...

P12 tells P11 what to do explicitly. P12 continuously looks at his notes whilst doing this. P11 doesn't refer to their notes during this session.

As an edition they add a different colour to the CSS grid.

This concludes the section of the task. There was a crash during the call but there was minimal impact.



Product of the two-participants collaborating.

Appendix I

Observation session and informal debriefing transcripts/summaries

P11 has a 10minute slot to watch 4:30 – 8:30 of the required video about CSS grids.

They reopen Notepad to make their notes. They make a new Notepad document this time. They partition the screen as they did in their previous viewing slot.

They write notes as they hear about the relevant CSS properties. This time they make more notes opposed to just copying the code. Its also useful to note they didn't write notes about all the CSS properties required.

P11 then sends over their notes to Skype.

Researcher goes to other room to make notes and observe the user.

P12 has a 10minute slot to watch 4:30 – 8:30 of the required video about CSS grids.

They watch the video with little jumps skipping content. They also go backwards sometimes.

Their notes are still fairly comprehensive.

Researcher goes to other room to make notes and observe the user.

P11 has a 10minute slot to watch 8:30 – 12:32 of the required video about CSS grids.

They watch the video and use it to write notes to help them implement code.

They do not write notes 'about' the properties.

Researcher goes to other room to make notes and observe the user.

P12 has a 10minute slot to watch 8:30 – 12:32 of the required video about CSS grids.

They watch the video and use it to write notes about the row start and end properties.

Their notes are based on how the implementation is rather than about the properties.

Researcher goes to other room to make notes, further away from P11.

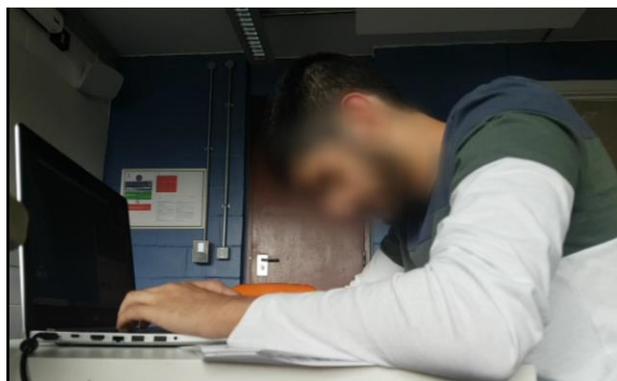
The final collaboration section of the session starts.

P12 shares screen knowing there was an error before.

Whilst writing the code P12 refers to his notes to help him in the beginning. P11 helps them by using their knowledge and never refers to their notes.

The rest of the collaboration involves him discussing with P11 about implementation instead of using notes.

The participants take longer than the 15 minutes required to code the page with CSS grids and the researcher just showed them the solution.



P12 referring to their notes whilst completing the session.

Session concludes.

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Observation session and informal debriefing transcripts/summaries

Informal debriefing for session 6

Researcher: Thank you for taking part, that was fun. Based on what's just happened, how was your experience and how would you personally describe it? Any one of you can answer it first.

P11: **It's always easy when you have a direct connection.** Waiting for some one's response made it more collaborative, easier.

Clarified Communication.

Researcher: So are you trying to say you can work in your own way then come together sort of thing?

P11: What I'm trying to say is, the benefit is to having a live conversation with one other.

Researcher: You didn't like the aspect of waiting sort of thing?

P11: Yeah, so if we didn't have the Skype there would have been a barrier.

P12: Communication it was much easier.

Researcher: If the Skype thing didn't exist, I didn't get you guys to work together. This would have been?

P11: I think the overall process would have been slower and less engaging I'd say.

Researcher: Anything to add to that?

P12: Once you're not listening to each other it's a bit more difficult to complete the project. We were doing some other project, it was the similar case. We either had to meet up at University but we found this app called discord and we could communicate. It was much easier that way...

Clarified Communication

Researcher: The collaborative aspect when you get together helps?

P12: Yeah.

Researcher: What was the worst thing about the situation for learning.

P11: I guess can we talk about the editor...

P12: **The fifteen-minute time. The ten-minute time.**

→ TIME ISSUES TO MAKE NOTES.

Researcher: Today you guys were constrained. That didn't help? Do you feel like if you had more time? If this was real life you'd give someone two hours?

P11: More time but I would say having preparation beforehand then doing it.

P12: Yeah *replying to P11.*

P11: I feel like that will be more efficient.

Researcher: Having more time would have been?

P11: Not necessarily enough time but having all the **preparation** for collaborating.

Note-preparation

P12: Doing everything beforehand then starting. Instead of **splitting it in times.**

Researcher: Then what was the best thing for learning?

P11: I would say the best thing was the engagement.

P12: Communicating with each other.

Researcher: What made the communication bad? I think we already covered this, it's the fact that your when not speaking to each other but when you do speak to each other its fine.

Both participants agree.

How were you referring to specific content in the video when you were making notes?

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Observation session and informal debriefing transcripts/summaries

P12: When I was writing notes, some of the comments the guy said in the video I was noting them down. Next to the code snippets. Later on, when I was talking to P11 I would refer back to that

P11: I would say the same, that's exactly what I did.

Researcher: Do you wish there was something that exists and would have put in this scenario? In terms of Technology.

P11: It would be useful to have something like this.

Researcher: Would you add anything else?

P12: I think video chatting is quite useful. Say your not in the same country but you're still a team. You can work more effectively.

Researcher: You opened up Notepad for your digital notes. Is there a particular reason why you did that?

P11: Purely to take notes while watching the video.

Researcher: You didn't make any physical notes, is there a reason why?

P11: The reason of being to send it to him through Skype.

P12: I wrote on paper because it was easier to annotate stuff. Whereas Notepad it is a sequence...a piece of paper I can basically brainstorm all the stuff. I would put arrows to refer parts of the video. For me writing on paper was easier.

NOTE TAKI 6 ETHN.

Researcher: How did you send those notes into the conversation?

P12: Through verbal communication.

So that's where video sharing comes in.

It was effective because I was able to read off my notes.

Researcher: When you guys were implementing, it was like you were using the notes for you. Not for a collaborative aspect.

P12: Not really, I was actually referring P11 through my notes. I had comments and stuff which I was conveying through communication. He understood what I was trying to say. My notes did go over to the conversation.

P11: I didn't use my notes because it was all in my head.

Researcher: Thanks...

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Observation session and informal debriefing transcripts/summaries

Session 7 (held on 06/09/18) – Asynchronous

Participants: 'P13' and 'P14'

Note: Due to an unknown error the webcam recording software used in this session crashed and lead to the external recording of P13 being lost.

Session starts.

P13 starts watching the first 4:30s of the video in a 10-minute slot.

They make notes on their physical paper.

They watch the video and makes notes. In fact, they take a very short time as they make notes and watch the video.

However, they only really are rewriting the implementation.

Once they finish they tell the researcher.

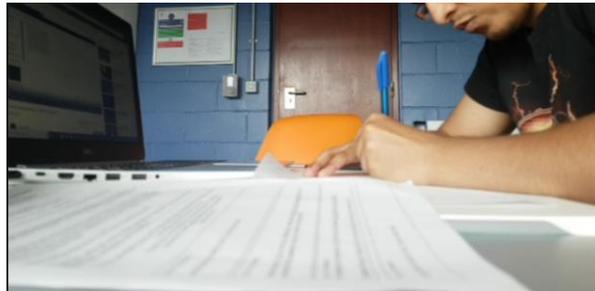
Researcher goes to other room to make notes and observes P14.

P14 starts watching the first 4:30s of the video in a 10-minute slot

They make notes on their physical paper.

They watch the video and makes notes. They also take a short time but pause the video sometimes to make notes. Their notes are more formal and structured. Their note space is in the middle (in front of them).

Once they finish they tell the researcher.



P14 making notes as they pause the video and make notes.

Researcher goes to other room to make notes and sits further away from P13.

The participants start their Skype call and aim to implement CSS grids.

There was some interruption as code from the previous session was still showing, the researcher had to remove this promptly.

They don't take too long to make the implementation and they used screen share to collaborate (P14 was screen sharing).

P13 talks about the parent container being already created. She says they need to add CSS. P14 looks at their notes briefly.

P14: So, what do you want to do first?

P13: Start off with the parent class, it was div class container. So obviously, you create a CSS container.

P14 looks briefly at their notes.

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Observation session and informal debriefing transcripts/summaries



P14 then codes the CSS using their notes but doesn't do it correctly and P13 uses their notes to help the P14 code correctly (i.e syntax + input errors). This section concludes very quickly. They do not collaborate using their notes but use it for their understanding.

P13 starts watching 4:30 – 8:30 of the video in a 10-minute slot.

They make notes on their physical paper.

They watch the video and makes notes. In fact, they take a very short time as they make notes and watch the video.

This is exact same process as beforehand.

Once they finish they tell the researcher.

Researcher goes to other room to make notes and observes P14.

P14 starts watching 4:30 – 8:30 of the video in a 10-minute slot.

They make notes on their physical paper.

They watch the video and makes notes in a way where they draw out the CSS grid concept with the relevant properties beside it.

This is exact same process as beforehand.

Once they finish they tell the researcher.

Researcher goes to other room to make notes and observes P13.

P13 starts watching 8:30 – 12:30 of the video in a 10-minute slot.

This is exact same process as beforehand.

Once they finish they tell the researcher.

Researcher goes to other room to make notes and observe P14.

P14 starts watching 8:30 – 12:30 of the video in a 10-minute slot.

They make very small notes that copies the implementation they can see on the screen.

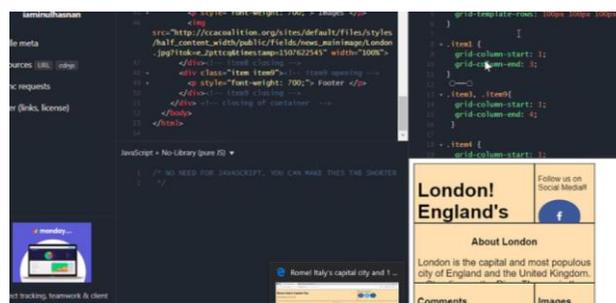
Once they finish they tell the researcher.

Researcher goes to other room to make notes and sits further away from P13.

The participants start their Skype call and aim to 'fully' implement CSS grids.

They discuss how to do the code but do not really use the notes.

The participants do not manage to get the page working like the task wanted but the researcher stepped in and said it was fine and concluded the session.



P13's and P14's implementation (see bottom right corner)

Appendix I

Observation session and informal debriefing transcripts/summaries

Informal debriefing for Session 7

Researcher: Based on what you just did, how was experience and how you would you describe it?

P13: Very easy to understand. The video made it easier to communicate with P14.

P14: Yeah.

Researcher: You say it's easier to communicate, do you mean the call or when your making notes.

P13: The call in general. He was the one writing so I can just tell him if there was anything he needs to do.

P14: Yeah if I made a mistake she will go and help me out. If I know something that could like yeah like lets just do this. I can ask her opinion if its correct or not. We can just both communicate if both of ours matches together.

Researcher: So when you guys were making the notes, how was that?

P14: It was straight to the point, it was simple. The explanation was simple.

Researcher: What was the worst thing about the situation?

P14: I would say the part of CSS.... *This answer was out of scope.*

P13: I didn't have a problem.

Researcher: What was the best thing?

P13: I guess the screen sharing. It's just being able to see each other's work made it a lot easier to understand.

P14: I would say communication. **When you're working with someone they can help you out also.**

Clarified Communication

Researcher: How did you refer to specific content using the notes? If you did...

P13: I did, we talked about the items and obviously took similar notes just in case it came up. **Then we asked if each other had something.**

Clarified Communication

Researcher: Both you guys used physical notes, is there a particular reason why?

P13 Physical notes is right there. The papers there and whilst your working you can just look at your laptop. You don't have to keep going on other applications.

P14: Yeah same thing. *In agreement to P13.*

Because it will be hassle, if you have two apps open are you going to look at the notes or the code. It's better to have physical notes.

Researcher: Do you feel like there was any technology that needed to be in this situation that would be helpful for this scenario.

P14. No.

P13. No.

Researcher: Thank you..

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<p>DiCot</p> <p>Unit of analysis – Table surface, the equipment and participants.</p> <p>Physical principles</p>	<p>P1 & P2 - Synchronous observation</p>
<p>Space and cognition</p>	<p>Both P1 & P2 keep their laptops in front of them to absorb the video content as the 'main' source of attention. The participants do not/barely move their laptop from the starting position. <i>This happens throughout the session.</i></p> <p>P2 moves their physical task sheet and notes around their work space often to support their writing about the video content and reading the task sheet etc. P1 kept everything in the same position. In fact, both participants have a dedicated space to refer to their notes when required during implementation of their web page. For P1 this was on the right-hand side (as set up) and P2 the left. <i>Pictures are provided in the transcript.</i></p> <p>P1 readily waits to pause the video often by placing his finger on the space bar, opposed to using the trackpad (mouse) on their laptop. <i>A picture is provided in the transcript.</i></p> <p>Both participants make their notes segregated according to each distinct video to help them refer to content when implementing HTML and CSS. <i>Also see notes provided in appendices as evidence.</i></p> <p>In the beginning of the call the participants read their digital task sheets independently and this was inefficient. This is not necessarily in conjunction with video use though. Reading the task sheet made the task longer. <i>See picture in the beginning of the transcript for session 1.</i></p> <p>P1 didn't want to full screen because it caused problems, i.e the screen was already lagging. <i>See transcript.</i></p>
<p>Perceptual</p>	<p>P1 explicitly says how they do not enter full screen because it causes disturbance. <i>See transcript.</i></p> <p>P2 often moves their notes around as mentioned beforehand (see space and cognition). <i>See transcript for pictures.</i></p> <p><i>This principle is very similar to space and cognition above. Findings put there can essentially be put here too.</i></p>

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Naturalness	<p>P2 looks closer into the screen when looking at content about DIVs. Videos could use a zoom feature when viewing? <i>See transcript.</i></p> <p>Digital task sheet (PDF) denotes properties of real task sheets just ‘through pixels’. <i>See image in the beginning of the transcript for this session.</i></p> <p>P1 uses their mouse as a pointer on videos, P2 can see it through the share screen. The cursor acts as a pointer/finger that would be used in the ‘real world’. <i>In transcript.</i></p> <p>The playlist is used like it is a contents page in a physical book when looking for and discussing a certain video. <i>See below.</i></p> <p><i>P2: Cool. Do you want to go over the HTML videos first then CSS? Or do you want to go in the playlist order?</i> <i>P1: Let’s just do the playlist, right (go in order)?</i></p>
Subtle bodily supports	<p>P1 shows their task sheet to P2 however the screen share barred the communication. Had the webcam for P1 be on, it would facilitate communication. <i>Image provided in transcript.</i></p> <p>P1 moves their head between the task sheet and screen to see what they need for the task often.</p> <p>P1 pauses the video with their hands often for communication once they hear P2 wanting to speak or when they have a point to raise. However, they were almost always ready to do this. <i>Image of action provided in transcript.</i></p> <p>P1 makes gestures that cannot be seen by P2 which could have helped communication.</p> <p>P1 also points at the screen to help them explain content but P2 cannot see them pointing at the screen. <i>Image provided in transcript.</i></p> <p>P2 points at the screen to help him understand and talk about the H2 tag but P1 doesn’t notice it. <i>Image provided in transcript.</i></p> <p>Before P2 talks about some content they look at their notes as a reference briefly.</p>

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	<p>P2 moves their notes around often to help them complete the task. When note taking he clarifies by looking between the screen and note page often. There is an instance P1 flips their notes to see content they can use in the implementation. <i>Image provided in the transcript.</i></p> <p>The participants write down a lot of notes with their physical resources and this requires bodily use that helps the process.</p> <p>Both participants nod their head during the call to understand point by point what the video tutor says. This is not seen by P2 because the point mentioned above.</p>
<p>Situation awareness</p>	<p>P1 and P2 constantly make each other aware of what their thinking and learning by mostly conversing. Voice is easily captured because of the voice integration over the Skype screen share.</p> <p>P1 and P2 were able to be 'synchronised' with the video content with screen sharing on Skype calls. If not, they usually tell each other what they are doing such as reading the task sheet and running a Google search in this case. The audio sharing also allowed P2 to watch the content as if it were playing from his machine.</p> <p>P1 would pause the video to conversate with P2 through Skype.</p> <p>Participants speak when they are in doubts or find something interesting to do with the task. When participants are not speaking it is clear they are gaining an intersubjective understanding and there is no need to speak. The participants spoke less as the session went on. <i>See transcript.</i></p> <p>There are many notes taken but only a few are referred to explicitly. The participants do not know what their partner is writing, Thus, a lot of 'thought' from the user is unused. Clearly, participants cannot share their notes as they write! <i>The notes participants created are provided in appendices.</i></p>
<p>Horizon of observation</p>	<p>Both participants can not watch in synchronised fashion because they are in different rooms, using different machines. Thanks to Skype it is possible for participants to see and hear the video content together in such a fashion due to share screen and audio features.</p>

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	<p>The participants can not share their notes since they opted to use a physical resource. The alternative is that the participants have to bring the notes into conversation and or memorise video content.</p>
<p>Arrangement of equipment</p>	<p>P1 did not change the set up that was provided in the beginning of the session.</p> <p>P2 moved his note sheet to the left-hand side and task sheet to the right. This was done to accommodate their 'writing' hand. <i>An image is provided in the transcript.</i></p> <p>Having the notes on the side allowed the participants to engage with note-making but still get information free flowing as the laptop played in their direct observation (in front of them). The physical task sheet was used for clarification if need be mostly by P1 in this couple. <i>Images of this are provided in the transcript.</i></p>
<p>Information flow</p>	
<p>Information movement</p>	<p>Information from the digital task sheet is put into the notes of both participants sheets in physical form. This ends up creating an intersubjective understanding of the activity.</p> <p>Information from the screen + audio share of P1 is directly shown on to P2's screen. These screens are viewed by the participants.</p> <p>Information from the screen/shared screen share is repeated or clarified by P2/P1 for example: <i>"So just as a note...CSS is meant for colouring and images and that".</i> This doesn't necessarily get stored as they are only speaking of it with each other.</p> <p>The Google search results by P2 about how to use bullet points is only seen by him which is problematic because P1 cannot see it. However, they do not need to use it, but this may be a problem of connectivism being used?</p> <p>The use of the webcam allows P1 to see P2's reaction.</p>

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Information transformation	<p>Information from the video content (digital) is transferred to written text multiple times on to both user's physical sheets of notes. <i>See notes pages provided in appendices.</i></p> <p>One interesting transformation is the digital video being referenced as 'timestamps' when they are being written down. <i>"Alright, I'm going to timestamp it (content about HTML tags). All of the rules, just in case".</i> Information goes from video to short term memory to the collaboration tool. Example: implementation of with tag, see transcript.</p> <p>Information from notes moves to verbal communication on the Skype call to help complete the task. Example: implementing images, see transcript.</p>
Information hub	<p>The task sheet allows participants to know what they have to do. In this case the physical & digital task sheet was used.</p> <p>The clear 'most important' communication hub was the Skype window where the screen is being shared and the participants use their voice to communicate with each other. However, P1 and P2 did try read the digital task sheet again and it was too long for them to discuss fully.</p> <p><i>P1: We got it on here anyway! (the task sheet) So if we need to look back...we got it on paper. So that should be fine.</i></p>
Buffering	<p>Notes provide buffering for participants to use later.</p> <p>Participants pause the video to be able to talk about doubts etc.</p>
Communication bandwidth	<p>The voice chat allows participants to speak to one another with no real problem.</p> <p>Screen share doesn't allow the participants to see what both participants are doing.</p> <p>Web cams do not necessarily show everything the user is doing. Only one user can share their web cam during screen sharing.</p>

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Informal communication	Participants pause video to be able to see what needs to be done to complete the task.
Behavioural trigger factors	When participants are in doubt they let the other user know and they discuss the issue.
Artefacts	
Mediating artefacts	None.
Create scaffolding	Participants use their notes to help them complete the task, they reference content they wrote from video. P2 stacks their notes in a way to go complete the task by seeing his notes chronologically. P1 flips their paper to see what is happening. Task sheet can be used to help participants complete the task, done by P1 often.
Representation: goal parity	The participants use the task sheet to see what they need to do. They do not necessarily list them but helps them plan goals.
Coordination of resources	Participants clearly watched the videos together with the use of screen sharing.

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External Cognition	P1 & P2 - Synchronous observation
Memory	Notes take away the burden of having to memorise everything needed during the task. Looking at the task sheet at points allows the participants to refresh their mind on what's required. The task sheet can be used to help participants complete the task, done by P1 often.
Computational offloading	None.
Process	P2 wrote a checklist to see what else they need to do when completing the task. This is done just to refresh their mind on what needs to be done.
Perception and action	P2 stacked their sheets of notes in chronological order to be able to see what may be relevant to the task. P2 moved their notes around often to facilitate their writing. <i>Images are provided for these actions.</i>

Instances of related theories in P1 & P2 observation.

Connectivism	<p>P2 started to use Google searches for the implementation of bullet points. This venture is stopped as P1 finds out how to code the tag correctly. The intention to use other resources were there.</p> <p><i>P1: Hold on, why does this say ul? Do you reckon that's bullet points? Let's try it.</i></p> <p><i>P2: You know what, I'm going to Google it quickly. It says your allowed to use alternatives.</i></p>
Social Presence	<p>Voice chat allows participants to know what the other user is thinking. They can conversate with their microphones.</p> <p>Only the video (web cam) of P2 is showing which is not useful. The video doesn't necessarily capture everything and is small when minimised so P1 missed P2 calling for him at one point.</p> <p>Screen sharing allows P2 to see what P1 is doing.</p>
Student Agency	<p>The participants have a lot of conversation regarding what video they will watch, they end up skipping a chunk of videos on CSS. They use previous knowledge gathered to just get the CSS task completed rather than learn comprehensively. Below shows an example of P1 talking about skipping content.</p> <p><i>P1: Literally all we need is: titles, which we know how to do; three chunks of texts, which we know how to do</i></p> <p><i>P2 almost completed a search on Google before P1 figured how to implement the relevant tag anyway.</i></p>

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	Both participants preferred the use of written notes.
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<p>DiCot</p> <p>Unit of analysis – Table surface, the equipment and participants.</p> <p>Physical principles</p>	<p>P3 & P4 - Synchronous observation</p>
<p>Space and cognition</p>	<p>Both P3 & P4 keep their laptops in front of them to absorb the video content as the 'main' source of attention. The participants do not move their laptop from the given position. <i>This happens throughout the session.</i></p> <p>P3 & P4 makes use of their physical task sheet when referring to what needs to be completed with the video playlist. They do not use the digital task sheet to help them complete the task. It helps them continuously search for content and finish the task.</p>
<p>Perceptual</p>	<p>The video goes through spatial representation as it becomes a bigger viewport through P4 enabling cinema mode.</p> <p><i>This principle is very similar to space and cognition above. Findings put there can essentially be put here too.</i></p>
<p>Naturalness</p>	<p>P3 uses the Skype chat like sticky notes (Post-its) whilst watching video? They are used as reference points.</p> <p>P4 uses the timeline preview feature (<i>see screenshots in transcript</i>) like flicking through pages in a book. This feature is used multiple times.</p> <p>The playlist is used like it is a contents page in a physical book when looking for a certain video.</p> <p>During the implementation, P4 can see P3's cursor in the collaborative mode. This is not necessarily linked to video use but shows how collaboration can excel. The cursor acts like a pointer.</p>
<p>Subtle bodily supports</p>	<p>They both agreed that P3 would raise their hand if they need to speak.</p> <p>P3 puts their thumbs up to allow P4 to clarify they can hear video audio during the screen and audio sharing of P3's laptop. <i>Images of this are provided on the transcript.</i></p>

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	<p>P3 points to the screen at some points of video content regarding CSS but P4 doesn't necessarily see this.</p> <p>P3 and P4 briefly orientates their head to the task sheet slightly to know what they need to learn with video. P3 also points at the task sheet to understand what's needed with the video.</p>
<p>Situation awareness</p>	<p>From the get go P3 and P4 were able to be 'synchronised' with the video content with screen sharing on Skype calls. Later on, audio sharing was enabled to allow P4 to watch video as if it were being viewed on his own laptop.</p> <p>P4 uses the web cam to tell P3 about a gesture but they could not see it (they have screen share on). <i>An image of this is provided on the transcript.</i></p> <p>P3 uses the camera to give an OK about their viewing situation as their web cam 'works' after putting on screen share. They do this by putting their thumbs up. <i>An image of this is provided on the transcript.</i></p> <p>P3 also uses the screen share to see what P4 is doing with his screen share.</p> <p>P3 and P4 do not necessarily talk about the content together initially. In this session P3 and P4 situation awareness is facilitated by intersubjective understanding. The participants are more focussed to go through the content with the 'synchronised' view provided by screen & audio sharing. They basically talk a lot less.</p> <p>P3 sent their notes to the Skype Chat but this goes unnoticed. P3 Had to remind P4 that they has made notes</p> <p>P3 talks about the task sheet without P4 looking at it too, it seems as if the understanding of task sheets was intersubjective.</p>
<p>Horizon of observation</p>	<p>Both participants can not watch in synchronised fashion because they are in different rooms, using different machines. Thanks to Skype it is possible for participants to see and hear the video content together in such a fashion due to share screen and audio features.</p> <p>The participants were able to share and see notes as there was use of Skype by P3.</p>

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Arrangement of equipment	<p>Both P3 and P4 did not change the setup they were provided with. They viewed the video with a free-flowing manner. The laptop screen in front of them provided a large amount of information. The task sheet being on the side allowed them to reference/clarify things it when need be.</p> <p>They didn't write notes and this was left untouched. This allowed P3 to make notes using Skype and send them to P4.</p>
Information flow	
Information movement	<p>Information from the task sheet is put into both participants conversation verbally. This ends up creating an intersubjective understanding of the activity at hand. Both participants only looked at the physical sheet once during the call.</p> <p>The use of the webcam allows P4 to see P3's reaction (<i>Example: thumbs up & raising hand to speak</i>).</p> <p>Information from the screen + audio share of P4 is directly shown on to P3's screen. These screens are viewed by the participants. However, P3's screen does not share when he does his individual work. P4 doesn't know what's going on with P3. They then move information verbally about their findings.</p>
Information transformation	<p>P3 makes digital notes about tags after watching the video. (P4: Do you want to move on? P3: No, let me just write down the links (<i>referring to the <a> tag</i>)). Information moves from digital video to digital text? P4 doesn't really remember this and needed to be reminded by P3.</p> <p>There is also a use of screenshots, but it never gets used in conversation. (Video to Photo)</p> <p>Information moves from video into conversation, i.e participants build their representation of the learning content and phrase it to their partner (speech). Example: P3 looking at how the tag works.</p>
Information hub	<p>The task sheet allows participants to know what they have to do. In this case the physical sheet was used in quick glances.</p> <p>The clear 'most important' communication hub was the Skype window where the screen is being shared and the participants use their voice to communicate with each other about what's going on.</p> <p>The chat feature provided by Skype was used in this case to learn about some tags.</p>
Buffering	Participants pause the video to be able to talk about doubts etc.

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Communication bandwidth	The voice chat allows participants to speak to one another with no real problem. Screen share doesn't allow the participants to see what both participants are doing. Web cams do not necessarily show everything the user is doing. Only one user can share their web cam during screen sharing.
Informal communication	Participants pause video to be able to remember what needs to be done to complete the task.
Behavioural trigger factors	When participants are in doubt they let the other user know and they discuss the issue.
Artefacts	
Mediating artefacts	None.
Create scaffolding	P3 & P4 glanced at their task sheets once.
Representation: goal parity	The participants use the task sheet to see what they need to do. They do not necessarily list them but helps them plan goals.
Coordination of resources	Participants clearly watched the videos together with the use of screen sharing, but they diverged into different roles and let each other know what is going on.

External Cognition	P3 & P4 - Synchronous observation
Memory	Participants look at the task sheet and this simply helps them to figure what they need to do. Through one glance they remember what the task requires to do with video. They only use for Skype to make notes of relevant HTML tags
Computational offloading	None.
Process	None as no external tools were used.

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Aggregated coding

Perception and action	None as no external tools were used.
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Instances of related theories in P3 & P4 observation.

Connectivism	P4 started to get annoyed with how it's harder to use video to see how to implement tags. P4 resorted to using Bing to guide the implementation required for the task. There was use of the Skype chat although it can be argued it is already part of the current system. Google Docs use was attempted but dropped. <i>Screenshots of participants doing this are provided in the transcript.</i>
Social Presence	P4 can see what P3 is doing but P3 cannot see P4. This is due to screen sharing barring P4 to use his camera. But it also means P3 cannot share their screen. They use voice to be able to speak and make sense of each other often.
Student Agency	The participants skip videos and not bothered to watch the videos that are provided. P4 goes on to use other websites (see above). This happens purely because P4 deems the use of videos as extraneous. The two participants also move their video viewing speed to 1.5x to move quicker through the content. The participants also decided to make no notes what's so ever. P3 made some digital notes.

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Aggregated coding

<p>DiCot</p> <p>Unit of analysis – Table surface, the equipment and participants.</p> <p>Physical principles</p>	<p>P5 & P6 - Synchronous observation</p>
<p>Space and cognition</p>	<p>Both P5 & P6 keep their laptops in front of them to absorb the video content as the 'main' source of attention. The participants do not move their laptop from the given position.</p> <p>P6 uses the physical task sheet to know what to do with the video content. They are not keen on using the digital task sheet.</p> <p>P5 writes notes but moves it into the centre of his work area to be able to write properly/facilitate note taking. P6 kept it in the position it started in (right-hand side).</p>
<p>Perceptual</p>	<p>As mentioned above P5 moves their notes to the centre.</p> <p><i>This principle is very similar to space and cognition above. Findings put there can essentially be put here too.</i></p>
<p>Naturalness</p>	<p>Digital task sheet (PDF) denotes properties of real task sheets just 'through pixels'.</p> <p>The playlist is used like it is a contents page in a physical book when looking for and discussing a certain video.</p> <p>P6 uses the timeline preview feature like flicking through pages in a book. This feature is used multiple times.</p>
<p>Subtle bodily supports</p>	<p>P6 looks at the physical task sheet provided by moving their head to the left-hand side where it is.</p> <p>P6 points to his screen with a pen with viewing the playlist opposed to using his mouse. P5 points to the video content on the video when implementing CSS but P6 cannot see this.</p> <p>P5 makes many notes and refers to notes often that require movement whilst the video is playing.</p>

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<p>Situation awareness</p>	<p>P5 & P6 start by conversating about the task using the video and voice chat features.</p> <p>Unlike the other two synchronous sessions they didn't use screen and audio share features until later. First, they watch one video independently and ask each other how far off they are into the video. Then they continue watching. Through some exploration they use the screen share eventually to watch the 2nd video.</p> <p>The voice chat fails to work and capture attention from P6 during the screen share many times. However, the pair manage to conversate when needed to complete the task. They also use the voice chat to enquire doubts etc. They use the screen share to work together on the task. They pause the video etc to be able to hear each other.</p> <p>Clearly, participants cannot share their notes as they write!</p>
<p>Horizon of observation</p>	<p>Both participants can not watch in synchronised fashion because they are in different rooms, using different machines. Thanks to Skype it is possible for participants to see and hear the video content together in such a fashion due to share screen and audio features. Beforehand, they tried other strategies that were extraneous to their idea of viewing together.</p> <p>The participants used physical notes that they can only see so they had to bring the notes in to the conversation.</p>
<p>Arrangement of equipment</p>	<p>P5 & P6 did not change much of the setup they were provided with. They viewed the video with a free-flowing manner. The laptop screen in front of them provided a large amount of information. The task sheet being on the side allowed them to reference it when need be, particularly by P6.</p> <p>P5 moved their notes to the middle to allow them to see everything in their direct view (i.e in front of them) as they used the digital sheet that was provided. There was no need for them to look anywhere else.</p>
<p>Information flow</p>	
<p>Information movement</p>	<p>Information from the task sheet is put into both participants conversation verbally. This ends up creating an intersubjective understanding of the activity at hand. Each looked at the digital sheet at the beginning of the call. P6 did start to look at the physical notes instead. Later on, each user looked at a different thing to understand the task. P5 looked at the digital version whereas P6 looked at the physical version.</p>

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	<p>At first, participants view videos independently then opt to use share screen + audio. P6's screen is directly shown on to P5's screen. These screens are viewed by the participants on their laptops.</p> <p>After viewing the videos independently they use verbal communication to talk to each other about their current time mark. Participants clarify to each other about HTML tags through verbal communication on the Skype chat after/during watching the video.</p> <p>The participants make use of internet (Google) and copy information into their task. This is not video use though, it more of a connectivism based information movement.</p>
Information transformation	<p>Whilst watching the video user's write down physical notes based on viewing the digital video content.</p> <p>P5 uses their written notes to help the user complete the task through speech. <i>See notes for further evidence.</i></p>
Information hub	<p>The task sheet allows participants to know what they have to do. In this case the physical and digital sheet was used. P6 had difficulties opening the pdf and prolonged the session.</p> <p>The clear 'most important' communication hub was the Skype window where the screen is being shared and the participants use their voice to communicate with each other.</p>
Buffering	<p>Notes provide buffering for participants to use later (during task).</p> <p>Participants pause the video to be able to talk about doubts etc.</p>
Communication bandwidth	<p>The voice chat allows participants to speak to one another with no real problem.</p> <p>Screen share doesn't allow the participants to see what both participants are doing.</p>
Informal communication	<p>Participants pause video to be able to remember what needs to be done to complete the task.</p>
Behavioural trigger factors	<p>When participants are in doubt they let the other user know and they discuss the issue with their partner.</p>

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Artefacts	
Mediating artefacts	None.
Create scaffolding	Participants use their notes to help them complete the task, they reference content they wrote from video. P5 guided P6 with what to do by referring to notes and the digital task sheet.
Representation: goal parity	P5 looked at the task sheet often to help them out and figure what needs to be completed. P6 only does this once.
Coordination of resources	P5 and P6 watched the videos together and completed all tasks together using the screen share feature with P5 mostly verbalising their thoughts with P6 acting on it. When they were watching independently they didn't speak about it but managed to tell each other what they are doing.

Appendix J
Aggregated coding

External Cognition	P5 & P6 - Synchronous observation
Memory	<p>Participants use their notes to help them complete the task, they reference content they wrote from video. P5 guided P6 with what to do by referring to notes.</p> <p>P5 looked at the task sheet often to help them out and figure what needs to be completed. P6 only does this once.</p>
Computational offloading	None.
Process	The digital sheet was used rather than a physical sheet by P5 to see if they were completing the task.
Perception and action	P5 moved their notes to the center and enabled them to write as information flowed to them.

Instances of related theories in P5 & P6 observation.

Connectivism	Rather than exploring with the video, P5 was not trusting the video and used Google to find the solution. They asked P6 to use Google and manipulate any code they find. The pair manipulated code from W3 schools to finish their task.
Social Presence	P5 can see what P6 is doing. This is due to screen sharing but it bars P6 to use his camera. They use voice to be able to speak to each other.
Student Agency	<p>The students are unmotivated to go through a comprehensive viewing and skip video about how to use <div> tags and most CSS videos. They take a short cut on just viewing how to style text.</p> <p>The two participants also move their video viewing speed to 1.5x to move quicker through the content.</p> <p>Participants used code from online to complete their task instead of exploring video.</p> <p>Participants used written notes.</p>

Appendix J
Aggregated coding

<p>DiCot</p> <p>Unit of analysis – Table surface, the equipment and participants.</p> <p>Physical principles</p>	<p>P7 & P8 – Asynchronous observation</p>
<p>Space and cognition</p>	<p>Both P7 & P8 keep their laptops in front of them to absorb the video content as the ‘main’ source of attention. The participants do not move their laptop from the given position.</p> <p>P7 used their screen space by dividing the two windows he was viewing. The YouTube video P7 was viewing took half the screen and the other half was taken up by Google Docs during note taking. <i>Screen recordings screenshots, see provided in the transcript.</i></p> <p>P8 segregated their notes depending on the sections of the video they were watching in accordance to the task.</p>
<p>Perceptual</p>	<p><i>This principle is very similar to space and cognition above. Findings put there can essentially be put here too.</i></p>
<p>Naturalness</p>	<p>P7 wrote notes digitally. Notes written digitally shares features to physical note-taking, for example typing is synonymous to writing/typewriters.</p> <p>P7 is able to divide their screen like a physical work space/pieces of paper because Windows allows the feature to ‘snap’ windows according to the user’s preference,</p> <p>When P7 sends their notes it comes as if it is on a board allowing P8 to attend to it. See the screenshot provided for evidence in the transcript.</p>
<p>Subtle bodily supports</p>	<p>P8 often looks at their note-taking paper and writes a lot, this requires bodily support but perhaps not subtle? This is not really coded on the transcript but it’s clear it happens throughout.</p>
<p>Situation awareness</p>	<p>There isn’t any situation awareness whilst the participants make notes and they watch video. Their notes are too their self. The collaborative task was done to see how participants express their notes. Participants got to know about other participants work through conversation and not explicitly discussing or using it later in collaboration.</p>

Appendix J
Aggregated coding

Horizon of observation	The participants can only see their notes, task sheet(s) and video (/laptop) during the asynchronous session. The collaborative aspect was only done to see what people do when asked to express their notes.
Arrangement of equipment	<p>P7 used the physical note sheet then opted to using their laptop. This allowed all attention to the be to the screen.</p> <p>P8 used the physical note sheet but was able to view information on the laptop in front of them and write with no real issue. These notes were comprehensive.</p> <p>They only used the task sheet provided to understand the time slots and this isn't really part of the task process.</p> <p>It should be noted the participants did not move any of the equipment for their 'preference'.</p>
Information flow	
Information movement	Participants view the video independently through their screen.
Information transformation	Information from the screens are put into digital and physical text forms.
Information hub	There is no information hub as the participants actually do not send their notes until the Skype call starts. Participants only shared information in the Skype call.
Buffering	Notes provide buffering for participants to use later (during task).
Communication bandwidth	<p>Notes can be read by other participants, but it is not done.</p> <p>Participants conversate over the collaboration instead.</p>
Informal communication	N/A
Behavioural trigger factors	N/A
Artefacts	
Mediating artefacts	<p>None.</p> <p>Notes? They are not compulsory though.</p>

Appendix J

Aggregated coding

Create scaffolding	Participants use their notes to help them complete the task, they reference content they wrote from video. P8 does this where as P7 used digital notes.
Representation: goal parity	N/A
Coordination of resources	N/A

External Cognition	P7 & P8 - Asynchronous observation
Memory	Participants use their notes to help them complete the task, they reference content they wrote from video. P8 does this where as P7 used digital notes.
Computational offloading	None.
Process	None.
Perception and action	None.

Instances of related theories in P7 & P8 observation.

Connectivism	None.
Social Presence	None.
Student Agency	Both students used their choice of note-taking showing people have their preferences. They have different note preferences.

Appendix J
Aggregated coding

DiCot	P9 & P10 – Asynchronous observation
Unit of analysis – Table surface, the equipment and participants.	
Physical principles	
Space and cognition	<p>Both P9 & P10 keep their laptops in front of them to absorb the video content as the ‘main’ source of attention. The participants do not move their laptop from the given position.</p> <p>P9 used their screen space by dividing the two windows he was viewing. The YouTube video P9 was viewing took half the screen and the other half was taken up by Microsoft Word during note taking. P10 does the same thing.</p> <p>P9 moved their physical task sheet to read the task and understand what to do with the video.</p> <p>P9 and P10 segregated sections of their notes up into the sections the task made.</p> <p>P10 readily waits to pause the video often by placing his finger on the space bar, opposed to using the trackpad (mouse) on their laptop.</p>
Perceptual	<p>As mentioned above P9 moved their task sheet from one position to another to aid their reading.</p> <p><i>This principle is very similar to space and cognition above. Findings put there can essentially be put here too.</i></p>
Naturalness	<p>P9 and P10 wrote notes digitally. Notes written digitally shares features to physical note-taking, for example typing is synonymous to writing.</p> <p>P9 and P10 is able to divide their screen like a physical work space/pieces of paper because Windows allows the feature to ‘snap’ windows according to the user’s preference,</p> <p>P9 highlights text with their cursor for P10 to see.</p>
Subtle bodily supports	<p>P10 readily had their hand positioned on the space bar when watching video.</p>

Appendix J

Aggregated coding

Situation awareness	There isn't any situation awareness whilst the participants make notes and they watch video. Their notes are too their self. The collaborative task was done to see how participants express their notes. Participants got to know about other participants work through conversation and not explicitly discussing or using it later in collaboration.
Horizon of observation	The participants can only see their notes, task sheet(s) and video (/laptop) during the asynchronous session. The collaborative aspect was only done to see what people do when asked to express their notes.
Arrangement of equipment	P9 started off with writing notes on their physical note sheet then moved to using their laptop. This allowed all attention to the screen. P10 does the exact same. P9 only used the task sheet provided to understand the time slots and this isn't really part of the task process.
Information flow	
Information movement	Participants view the video independently through their screen.
Information transformation	Information from the screens are put into digital and physical text forms. Information from the video is also screenshot and turned into images (once by P9). Notes created by P9 turn into a document and notes created P10 turn into digital text messages and screenshots once.
Information hub	P9 and P10 sends their notes over to the Skype chat for each to view but they do not really view it explicitly.
Buffering	Notes provide buffering for participants to use later (during task).
Communication bandwidth	Notes can be read by other participants, but it is not done. Participants conversate over the collaboration instead.
Informal communication	N/A
Behavioural trigger factors	N/A

Appendix J

Aggregated coding

Artefacts	
Mediating artefacts	None. Notes? They are not compulsory though.
Create scaffolding	Participants use their notes to help them complete the task, they reference content they wrote from video. P9 and P10 used digital notes but started with physical notes.
Representation: goal parity	N/A
Coordination of resources	N/A

External Cognition	P9 & P10 - Asynchronous observation
Memory	Participants use their notes to help them complete the task, they reference content they wrote from video. P9 & P10 used digital notes.
Computational offloading	None.
Process	None.
Perception and action	None.

Instances of related theories in P9 & P10 observation.

Connectivism	None.
Social Presence	None.
Student Agency	Students used their digital notes opposed to physical notes. They used physical notes for a short moment.

Appendix J
Aggregated coding

DiCot	P11 & P12 – Asynchronous observation
Unit of analysis – Table surface, the equipment and participants.	
Physical principles	
Space and cognition	<p>Both P11 & P12 keep their laptops in front of them to absorb the video content as the 'main' source of attention. The participants do not move their laptop from the given position.</p> <p>P11 divides their screen into two windows. Most of their screen is taken by the YouTube video and about a third is taken up by Notepad.</p> <p>P12 puts their physical task sheet and notes sheet in the middle of their work space, with the laptop in the back but still giving it the most attention.</p>
Perceptual	<p>P12 puts their physical task sheet and notes sheet in the middle of their work space, with the laptop in the back but still giving it the most attention.</p> <p><i>This principle is very similar to space and cognition above. Findings put there can essentially be put here too.</i></p>
Naturalness	<p>P11 is able to divide their screen like a physical work space/pieces of paper because Windows allows the feature to 'snap' windows according to the user's preference,</p> <p>P11 reopens Notepad and starts a new document for each segment of the video they watched. It represents a new piece of paper.</p>
Subtle bodily supports	None.
Situation awareness	<p>There isn't any situation awareness whilst the participants make notes and they watch video. Their notes are too their self. The collaborative task was done to see how participants express their notes. Participants got to know about other participants work through conversation and not explicitly discussing or using it later in collaboration.</p>
Horizon of observation	<p>The participants can only see their notes, task sheet(s) and video (/laptop) during the asynchronous session. The collaborative aspect was only done to see what people do when asked to express their notes.</p>

Appendix J
Aggregated coding

Arrangement of equipment	<p>P11 opted to using their laptop. This allowed all attention to the be to the screen.</p> <p>P12 used the physical note sheet but was able to view information on the laptop in front of them and write with no real issue. Their notes were more comprehensive. P12 did make their notes in the centre.</p> <p>They only used the task sheet provided to understand the time slots and this isn't really part of the task process.</p>
Information flow	
Information movement	Participants view the video independently through their screen.
Information transformation	Information from the screens are put into digital and physical text forms.
Information hub	P11 sent their notes to the Skype chat. P12 doesn't.
Buffering	Notes provide buffering for participants to use later (during task).
Communication bandwidth	<p>Notes can be read by other participants, but it is not done.</p> <p>Participants conversate over the collaboration instead.</p>
Informal communication	N/A
Behavioural trigger factors	N/A
Artefacts	
Mediating artefacts	<p>None.</p> <p>Notes? They are not compulsory though.</p>
Create scaffolding	Participants use their notes to help them complete the task, they reference content they wrote from video. P12 used physical notes throughout their note-taking.
Representation: goal parity	N/A
Coordination of resources	N/A

External Cognition	P11 & P12 - Asynchronous observation
Memory	Participants use their notes to help them complete the task, they reference content they wrote from video. P11 & P12 used their physical and digital notes respectively.
Computational offloading	None.

Appendix J

Aggregated coding

Process	None.
Perception and action	P12 wrote their notes in the middle.

Instances of related theories in P11 & P12 observation.

Connectivism	None.
Social Presence	None.
Student Agency	Students using their notes preference.

Appendix J
Aggregated coding

DiCot	P13 & P14 – Asynchronous observation
Unit of analysis – Table surface, the equipment and participants.	
Physical principles	
Space and cognition	<p>Both P13 & P14 keep their laptops in front of them to absorb the video content as the 'main' source of attention. The participants do not move their laptop from the given position.</p> <p>P14 structures their notes based on the video segments the task required them to watch. Their notes is also placed in front of them.</p>
Perceptual	<p>P14 placed their note space in front of them.</p> <p><i>This principle is very similar to space and cognition above. Findings put there can essentially be put here too.</i></p>
Naturalness	No observations/findings.
Subtle bodily supports	None.
Situation awareness	<p>There isn't any situation awareness whilst the participants make notes and they watch video. Their notes are too their self. The collaborative task was done to see how participants express their notes. Participants got to know about other participants work through conversation and not explicitly discussing or using it later in collaboration.</p>
Horizon of observation	<p>The participants can only see their notes, task sheet(s) and video (/laptop) during the asynchronous session. The collaborative aspect was only done to see what people do when asked to express their notes.</p>
Arrangement of equipment	<p>Both participants used paper to write their notes. They were able to write a substantial number of relevant notes and watch the video. P14 made their notes in front of them and made a good amount of notes.</p> <p>They only used the task sheet provided to understand the time slots and this isn't really part of the task process.</p>
Information flow	
Information movement	Participants view the video independently through their screen.

Appendix J
Aggregated coding

Information transformation	Information from the screens are put into physical written text forms.
Information hub	Both participants relied on their physical notes during the Skype chat.
Buffering	Notes provide buffering for participants to use later (during task).
Communication bandwidth	Notes can be read by other participants, but it is not done. Participants conversate over the collaboration instead.
Informal communication	N/A
Behavioural trigger factors	N/A
Artefacts	
Mediating artefacts	None. Notes? They are not compulsory though.
Create scaffolding	Participants use their notes to help them complete the task, they reference content they wrote from video. P13 and P14 used physical notes throughout their note-taking.
Representation: goal parity	N/A
Coordination of resources	N/A

External Cognition	P13 & P14 - Asynchronous observation
Memory	Participants notes helps them understand the video.
Computational offloading	None.
Process	None.
Perception and action	P14 wrote their notes in the middle.

Instances of related theories in P13 & P14 observation.

Connectivism	None.
Social Presence	None.
Student Agency	Students of note preference is paper.

- city: London
- Facts about city

vid 1:

CSS = colouring and font
HTML = formatting

HTML tags: explained in vid 1 at 3:25

`<p>` `</p>` = paragraphs facts
`<small>` smaller writing
`<h1>` headings `</h1>` h1-h5 3:51
`<blockquote>` quotes `</>` most important ← least
``

(right-click explore element)

vid 2:

CSS ⇒ design

vid 3:

tag → attributes at 3:22

best ``... `` 6:48

`` ⇒ bold

vid 4:

h1 most important

`<small>` `<mark>` ⇒ highlight
↓
all text

<sub>
<sup>
<pre>

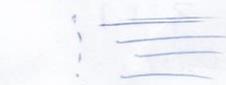
vid 6:

src attribute = source.

src = "img/... ip2" width = "100%" 3:41

alt =

<div>



<td = " "

class = " "

<div>

 bullet points

LONDON

- Some facts - Google
- Formatted titles
 - ↳ heading - h1
- Chunks of text - p1
- Images - CSS
 - ↳ colours → presentation / HTML
 - ↳ format
- styles - block notes
- Bully = Bullet points
- ignore java script = JavaScript.

④ HTML - VIM - what is HTML.

- ↳ `<p>` paragraph text `</p>` = 3 chunks
- ↳ `<h1>` heading `</h1>`
- ↳ `<blockquote>`
- ↳ ``
- ↳ `<h2>` - `</h2>`
- ↳ `<h5>` - `</h5>`

<code><p></code>	
<code><h1></code>	<code></h1></code>
<code><blockquote></code>	
<code></code>	

Titles - `<h1>` to `<h5>` smaller

3 texts - `<p>` `</p>`

Styles - `<blockquote>`,
↳ color

Bonus - How to do bullet points? =

Images - `` = online image paths (.jpg)
↳ width

SOME FACTS - 1 para
↳ Target Attracts
↳ TFL

① Intro para
↳ WIKI

LONDON IGNORE JAVA SCRIPT

VID 1. 3:13 - 3:28
↳ FORMAT RULES

<p>VID 1 HTML</p> <hr/> <p>VID 4 HEADINGS + TEXT</p> <hr/> <p><code><small></code> <code></small></code> <small>small</small> <code><sub></code> <code></sub></code> <small>DOWN</small> <code><sup></code> <code></sup></code> <small>UP</small></p> <p>↳ <code><pre></code></p>	<p>VID 2 CSS PRESENTATION ↳ BS</p> <hr/> <p>VID 5 Headly Structure</p> <p><code>h1</code> to <code>h5</code> = hierarchy. Sub sections Headly Structure</p>	<p>VID 3 HTML SYNTAX [Attributes] (3:22) ↓</p> <p>h1 h2 <code><h1 style="color: red"></code> ↳ 5:00</p> <hr/> <p>Emphasizing <code></code> <code></code> 6:00</p> <hr/> <p><code></code> <code></code> BOLD</p>
---	---	---

VID 6 - img tag

① ``

② img folder = Google URL

③ Resizing Images \rightarrow CSS

width="100%"
height="100%"

3:44

div tag

`<div>` = sections

\rightarrow CSS

NOT RELEVANT = HTML TUTORIAL FOR BEGINNERS 14:18 + CLASSES

`<div id="header">`

h2 = facts about London.

VID 8 CSS to HTML - 2014

① <style>

② <style> — in the 'head'

~~bullet point~~

Bullet point

CHECKLIST

3rd para ✓

bullet ✓

titles ✓

Images ✓

styled

Bold

← Emphasis

Color

✓

HTML tag.
<p> _____ </p> paragraph
<a> _____ link to another page.

<h1> _____ </h1> heading.

Let's see what you mean.

Google developer list.

Notepad

<p> mm </p>

<h1 class = "myclass" style = "color: red;" >

New folder.

Are img. <img src = "img / fish - banner

Appendix K
Participant Notes – P6

<p> — </p>

<a> —

<h1> — </h1> → can go all the way to 5

<unblock quote> — </unblock quote>

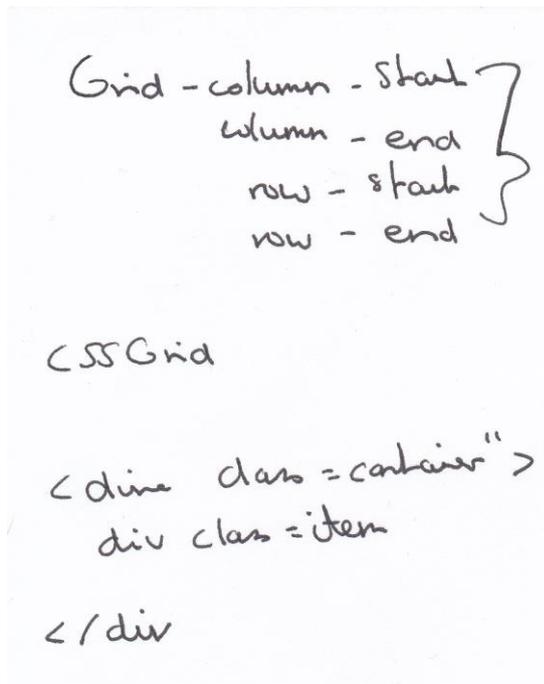
CSS is under sources

Notepad

attributes can be used in tags.

Ⓟ Brackets

free images.com



HTML

```
<div class="container">  
<div class="item item1">Header</div>  
<div class="item item2">Navigation</div>  
</div>
```

CSS

```
.container{  
  Display: grid;  
  Grid-template-columns: 100px 100px 100px; // 3 columns  
  Grid-template-rows: 100px 100px 100px; //3 rows  
}
```

```
.item 1{ //how far across the columns are in the grid  
  Grid-column-start: 1;  
  Grid-column-end :4;
```

//Lines of grid correspond to column start and end

CSS links to class

Header and Navigation pushed other elements to new rows

Appendix K
Participant Notes – P7

// Occupies 4 rows in

.item{ //This is defining what the grid looks like

Background-color: orange;

Border: 1px solid #000;

Padding: 5px;

.item3, item4{

Grid-column-start: 1;

Grid-column-end: 3;

}

Item8{

Grid-row-start: 3;

Grid-row-end: 5;

// covers 3-5 row (vertical)

Grid-column-start:3;

Grid-column-end:4;

//column starts at 75% to right

}

// stretches from 1st to 3rd columns

grid-

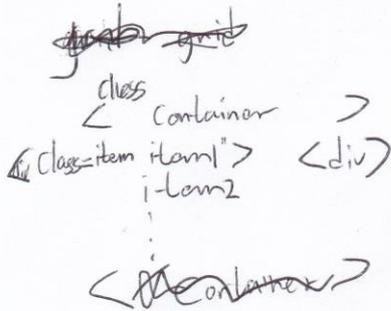
6 rows

3 columns

Item8{

User 2 Notes

0:00 - 4:30s (how CSS Grids are implemented)



.css

```
.item {
  background-color: red;
  border: 1px
} padding: 5px
```

.container

```
{
  display: grid;
  grid-template-columns: 3px
  grid-template-row: 11
```

① Create CSS that contains the parent class as one of its blocks.

② Use "grid-template-columns" and "grid-template-row", each of which require 3 sizes in px, as attributes.

the parent class

4:30 - 8:30

individual item 5

grid-column-start: 1;

grid-column-end: 4;

3

Repeat, just put comma to block.

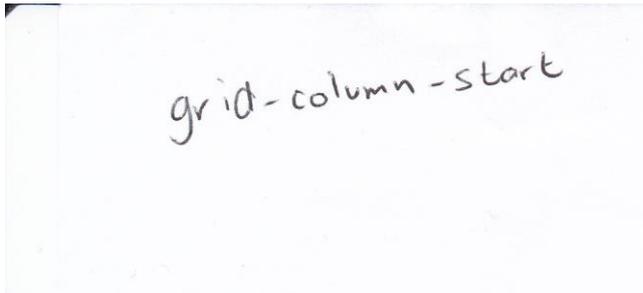
- Sizes are auto if not assign in parent class (gtr gtc)
- 1 to 4 is 3 col

8:30 - 12:32

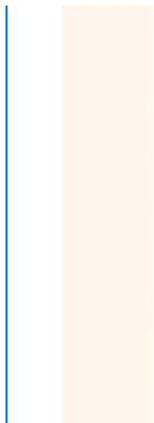
~~grid-column~~

When element is out of space it becomes empty space.

grid-row-start



- Html structure to create layout



properly differentiate the various elements.

```
1. <div class="container">
2.   <div class="item item1">Item 1</div>
3.   <div class="item item2">Item 2</div>
4.   <div class="item item3">Item 3</div>
5.   <div class="item item4">Item 4</div>
6.   <div class="item item5">Item 5</div>
7.   <div class="item item6">Item 6</div>
8.   <div class="item item7">Item 7</div>
9.   <div class="item item8">Item 8</div>
10.  <div class="item item9">Item 9</div>
11. </div>
```

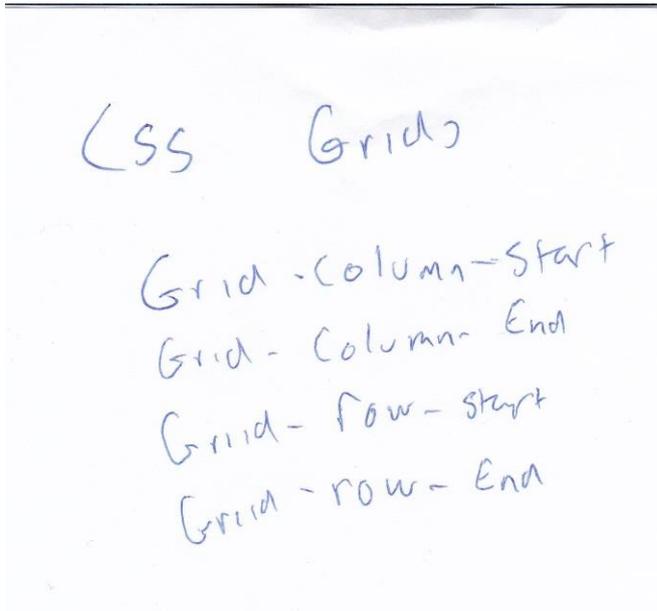
- Jsfiddle
- Container is the parent
- 9 children elements
- Each has class item has similar class because they share common things
- They also have their own class as they will have individual styling(?)
- Css of .item
 - Background-color is orange
 - Border is 1-x solid #000
 - Padding of 5px
- Css of .container
 - Use display:grid
 - Define structure using
 - Grid-template-columns: 100px 100px 100px
 - Grid-template rows: 100px 100px 100px
- Order of your html structure does not matter

- **4:30-8:30**
- Individual elements:
 - Header to go full length of the grid
 - `.item1 {`
`Grid-column-start: 1;`
`Grid-column-end: 4;`
- 1-4 correspond to the grid lines, so there are 4 lines in a 3 column table
- Same thing applies to rows (horizontally)
- This will push the last two grids to another row
- Adding multiple classes to a CSS function will apply it to more than one item
- Because we specified that the grid is spaced out with 100px and we defined grids to start at fixed lines on that grid, any items that get pushed out of the original grid, will not have the styling applied to it
- In future we need to modify the grid structure to take into consideration all of the items

8:30-12:30

- We now have 5 rows
- `.item3, .item4`
 - `Start 1`
 - `End 3`
- By default, the empty space left behind doesn't get filled, it will leave a blank space and it will get filled later on in the video using code
- `.item8`
 - `Grid-row-start: 3`
 - `Grid-row-end: 5`
 - `Column start: 3`
 - `Column end: 4`
- If you don't specify an end column, then it will always just fill 1 cell
- Footer should stretch from beginning to end of the column
- `.item9` can be added to `item1` and `item 2` CSS function

Appendix K
Participant Notes – P10



User 2, 19:03

Css Grids
grid-column-start
Grid-column-end
Grid-row-start
Grid-row-end

Css Grids
grid-column-start
Grid-column-end
Grid-row-start
Grid-row-end

```
Item1 (
  Grid-column-start 1;
  grid-column -end 4;
)
```

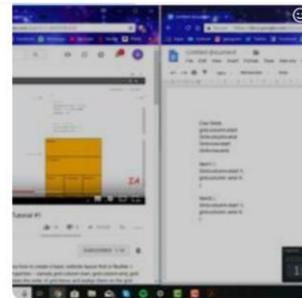
```
Item2 (
  Grid-column-start 1;
  grid-column -end 4;
)
```

8:30 - 12:30

```
Item2 (
  Grid-column-start 1;
  grid-column -end 3;
)
```

```
item1{
  Grid-row-start-3
  grid-row-end-5
  Grid-column-start 3;
  Grid-column-end 4;
```

- 1.cell takes up 2 spaces now
2. Sidebar and related nav
- 3.



User 2, 20:18

8:30 - 12:30
Item2 (
 Grid-column-start 1;
 grid-column -end 3;
)

item1{
 Grid-row-start-3
 grid-row-end-5
 Grid-column-start 3;
 Grid-column-end 4;

1.cell takes up 2 spaces now

Appendix K

Participant Notes – P11

File Edit Format View Help

container

display: grid

//create columns

grid-template-columns: 100px 100px 100px

//create rows

grid-template-rows: 100px 100px 100px

//child items

one class for all items and one for each item & item1

File Edit Format View Help

article column line 3

sidebar column 3 and 5

sidebar row 3 4

File Edit Format View Help

grid-column-start: 1;

grid-column-end: 4;

//value depends on grid line

How CSS Grids are implemented: HTML Structure

```
div class = "container" > ← parent  
<div class = "item item" > ← children Element  
  item1 </div>  
</div>
```

4 grid properties:

- grid-column-start
... - end
- grid-row-start
... - end

Grid Structure: (basic styling) CSS

```
container {  
  display: grid;  
  grid-template-columns; ← To define template  
  ... - rows;  
}
```

```
item {  
  background-color: orange;  
  border: 1px solid #000;  
  padding: 5px;  
}
```

how to make use of the: grid-column-start
... - ... - end

item 1 { ← can add more items after (,)

```
background-color: orange;  
grid-column-start: 1;  
... - ... - end: 4;
```

↓
stretch from first grid line to last

font, line, padding

Using grid properties:
(grid row start & end)

```
item 3 {  
  ...  
}
```

```
Item 8 {  
  ...-row-start: 3;  
  ...-row-end: 5;  
  ...-column-start: 3;  
  ...-column-end: 4;
```

← sidebar

<div class = "container"> ← Parent

</div>

```
.container {
  display: grid;
}
  grid-template-columns: 100px 100px 100px
  grid-template-rows: 100px 100px 100px
```

```
.item {
  background-color: orange;
  border: 1px solid black;
}
```

```
.item1 {
  grid-column-start: 1;
  grid-column-end: 4;
}
```

```
.item3 {
  grid-column-start: 1;
  grid-column-end: 3;
}
```

```
.item8 {
  grid-row-start: 3;
  grid-row-end: 5;
}
  grid-column-start: 3;
  grid-column-end: 4;
```

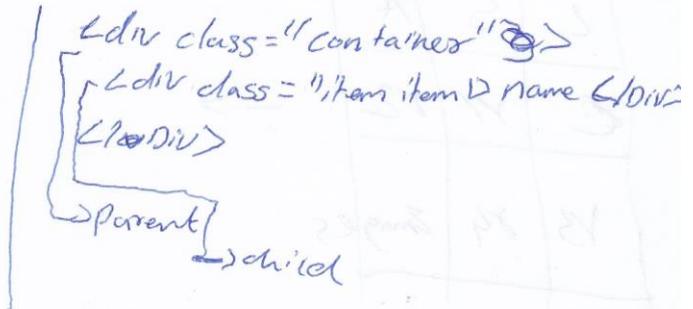
Children

- ↓
- Header — same
- Navigation — same
- Article
- Comments
- ↳ Sidebar
- Footer
- Related 1-3

Note 1: How CSS Grids are implemented (video: 0 to 9:30)

Key words

- 1) - grid-column-start
- 2) " - " - end
- 3) grid-row-start
- 4) " - " - end



CSS:-

• item {

background-color: orange;
border: 2px solid #000;
padding: 5px;

}

• container {

display: grid;

grid-template-columns: Three value (100px 100px 100px)

grid-template-rows: same as columns

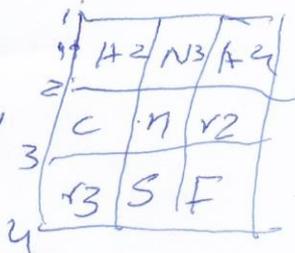
Video (4:30 to 8:30)

• item {

grid-column-start: 1

grid-column-end: 4

}



Video (8:30 to 12:32)

1) 1/4

2) 1/5

- 1 - grid-row-start: 3;
- grid-row-end: 5;
- 2 - grid-columns-start: 3;
- grid-columns-end: 4;