Utilising Computer Animation for Grasping the Dynamic Content in Construction Site Surveying

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As we all know the impact of the recent COVID-19 health crisis has been enormous, reaching all aspects of our lives and still evolving. In addition to the direct health impact of the virus, the lockdown response to the pandemic has severely disturbed and curtailed the normal activities of education. Lecturers and teachers from all disciplines and levels of study are now creating new ways of delivering teaching, assessing progress, and providing pastoral care to their students. Students have had to acclimatise to a new set of learning conditions, particularly working from home, with the absence of the normal institutional attendance and the accompanying face-to-face interaction with their tutors and fellow peers.

The COVID-19 health crisis has accelerated the digitalisation of the education sector beyond our wildest expectations. For both teachers and educational managers, the immediate future will involve acquiring more creative ways of harnessing digital technologies for teaching and assessment delivery as well as enriching class group discussions and interactions. In many respects our reference points and methods of operating and thinking have been redirected and challenged. This is particularly true for those aspects of the curriculum that engage with developing practical skills and the associated meta-skills.

The pace of change in the recent months has accelerated as never before. Negotiated, these new and evolving realities can inevitability push us beyond our comfort zone. And yet, despite the rapid pace of change and associated challenges we do have good foundations to build on. Digital technologies have been penetrating FE for more than two decades now – it is part of the sector's DNA.

The critical role digital technologies play in education is reflected in our teacher training for the FE sector. In the following, I will be drawing on my recent experiences, studying for the TQFE at the University of Dundee. As part of my assignments I conducted an action research project focused on the flipped classroom (FC) approach for my SCQF Level 6 construction class. The FC approach adopted animation videos as delivery tool on the YouTube medium. Thus, for me, the COVID-19 lockdown occurred at a point where I had recently completed my research project and was investigating new approaches that would help me utilise animation for my teaching. This newly acquired skill was promising a way to tackle

the emerging challenges associated with teaching through lockdown and in the immediate future.

The literature on the flipped classroom (FC) approach points to a palpable shift away from the intensity of the classroom teaching, whilst enabling each learner to make sense of the information at their own pace. This shift is designed to free up extra time to enhance learner understanding through a focus on problem-based, in-class practice, where open dialog would be commonplace (Mason et al., 2013). In other words, the FC action research I adopted was exploring how I can create more time in the classroom to enable students to share personal experiences about their learning journey. Thus, for my action research study, the aim was to utilise FC to shift my role from didactic teacher towards that of a facilitator of learning (Moore, 2009).

The FC model requires that the students would use their own time to study the theory (Little, 2015), hence allocating classroom time to the more practical – orientated tasks. Whilst exploring the logistics, I found that delivering the theory via an online animated video would be a promising prospect. It was also apparent that I would need an artefact that would summarise the core theoretical concepts, be relatively short and capture the students' attention whilst allowing them to watch it as many times as required. Critically, the video needed to be an entry point to the theory whilst also acting as a stimulus for digging deeper – encouraging the learner to explore more through peer discussion and independent thinking. However, there was a fundamental challenge to overcome. My group was diverse, with students of different ages and backgrounds and therefore, any video artefact needed to appeal to both millennial students – who are said to be more accustomed to digital technology within the context of teaching and learning (Phillips and Trainor, 2014), and those deemed outside this category, who are more accustomed to traditional face-to-face teaching and learning environments.

Recent studies have shown that students from various backgrounds can reap unique benefits from animated videos: increased engagement, interest, understanding and a greater flexibility in self-directed learning (Liu and Elms, 2019). This customized multimedia resource (Gorissen et al., 2012) is claimed to provide entertaining visual cues alongside valuable instructions, for an inclusive teaching and learning experience (Adams et al., 2014).

Getting to grips with the software

There is a lot of choice out there but I opted on a digital product called Animiz; a software that allows any lecturer with a basic knowledge of PowerPoint to animate their presentations using various characters with pre-set gestures, add subtitles, embed videos, and even zoom in using different camera views. In its open source version, this platform is packed with functions that allow lecturers to relay the

information to their students in an entertaining and contemporary way. There is a watermark sticking in the top-left corner that cannot be removed on the free version unless you opt for one of the paid versions of the software. Throughout my attempt to produce the artefact, I experienced a number of challenges. Care must be exercised when creating and building subject content as the software crashes quite often, especially when multiple animated elements are added in. The errors that occurred during the development of the video were a major inconvenience suggesting that the use of a high-end computer may be beneficial in avoiding these issues.

Admittedly, throughout these early development stages the recurrent complications and associated delays in progressing and finalising the different stages of the artefact was exasperating. Indeed, at certain points I did question whether an animated video was necessary, or would any PowerPoint presentation have sufficed? However, as I adjusted to the intricacies of the software – building up confidence and skills on the way – I realised that utilising the animated video approach to unpack theoretical aspects has considerable potential and scope, and could be a viable approach for other areas. For me, the learning curve was relatively rapid and once I gained initial confidence, I was eager to widen my horizons through exploring other animation platforms. In doing so I discovered that the shift to other animation tools was relatively undemanding and an easier transition than when learning a new one from scratch. The exposure to other animation software had given me a palpable sense of a newly developing skill set. However, a cautionary note is need here; all animation software demand your full commitment and it does take time to adjust to their "moods", so patience and diligence is not only recommended, it is an ingredient for success.

Once the animated video artefact was finalised, I asked a number of colleagues to view it and provide feedback. After making the necessary adjustments the next stage was to get it out there to the students and evaluate its impact. I was interested in two research questions: how effective was the animated video in helping learners grasp and understand the underpinning theory of Site Surveying? and to what extent did the animated video stimulate and shape discussions and interactions in the classroom? The method adopted involved dual sequential approach – exposing the students to the animation followed by classroom discussions on what they learned. The classroom discussion was guided by a series of structured questions aimed at engaging learners and teasing out the level of their understanding on the theory covered by the animation. Direct observations were used to gain insight into the range and scope of the classroom discussions (depth and breadth of understanding) and group dynamics (student engagement and interactions with each other). In these discussions I observed that learners came to realise the value of their own experiences; they were taking a critical perspective on the topic and learning to use this reflection to help them process the knowledge gained and to engage with the complexities of Site Surveying.

A questionnaire (Figure 1) was produced to gather the students' views on the strengths and weaknesses of the artefact. Using quantitative data, I then measured the extent of the artefact's impact. The data gathering process followed recognised ethical protocols. Figures 2 through 15 in the appendix present the data collected from the fifteen participants. Overall, the survey revealed that the animation video had a positive impact on developing underpinning knowledge and theoretical understanding.

The data analysis also revealed that the group enjoyed watching the animation and grasped the concepts in a significantly shorter time (50 minutes on average) compared with my cohorts in the previous years, which needed on average, six hours of lecture (2 sessions) to grasp the basics. The students watched the video 2.4 times before feeling confident that they understood the topic and the consensus was that they were unaffected by not being able to ask follow-up questions whilst viewing it. The video's features such as background tracks, voiceover and visual cues also received positive feedback from the class. These features aided in capturing the students' curiosity and providing learning through entertainment (Adams et al., 2014). Moreover, the animation seemed to help learners to consolidate their knowledge, suggesting deep learning was taking place.

For me, animation offers a new set of dynamic tools to make the underpinning theory of any topic more accessible to learners. The actual process of conceptualising, designing, and building the animation not only encourages one to think more deeply about the role of theory within the subject but also how animation relates to different learning theories. Indeed, at different stages of the animation it is possible to create a mind map of how the technology appeals to certain learning theories. It is something I wish to explore in more detail with this particular artefact.

Overall, I found that the animation approach allows for new levels of creativity, providing more scope to convey potentially complex knowledge, in accessible ways. However, it is important to note that one needs to be reflective and have a structured story board to help frame and inform the sequence of events in the timeline. Without this initial framing there is the danger that the information learners notice and process most readily in the animation may not be the information that is of the greatest value. Conversely, information that inadvertently gets a relatively low-key and unassuming segment in the overall animation may be very important for critical underpinning knowledge. At each sequence of the animation development, you are always thinking about the intended aims – the knowledge conveyed and the learner's cognitive ability to absorb, process and make connections. Throughout, you continually ask separate and interlaced questions such as: what is being communicated here and how does it capture learner attention? How does the dynamic character of the animations help the learner to

process the information? How does this dynamic sequence correspond to the previous and following sequences? Does the animation build the different layers or strata of the theoretical knowledge in a clear and coherent way? Most importantly, keep it brief to avoid any students losing interest along the way, or worse, falling asleep.

The attention to detail – from choosing the right images, songs, visual cues, to abiding by the copyright rules – can make this approach a highly versatile one, and can make the difference between a student watching the video or not, being engaged in learning, or simply a passive recipient of knowledge. It is a powerful tool that, if used adequately, can relieve the pressure of intensive lecturing, enabling the educators to be more reflective, focusing on active learning theories and techniques (Phillips and Trainor, 2014). Learner feedback is important and should be used to inform new versions and provide important insight into how this technology can be utilised in other topics.

Consequently, this gives way to more time being redirected towards preparing additional resources, such as classroom tutorials and games. Overall, the early indicators suggest that the video used for the FC, greatly enhanced my teaching, and freed more time for classroom discussions.

In summary, this action research project provided me with new perspectives on education, such as the value-adding benefits of enjoyment and entertainment to the students' experience, observing the sustainability of the teaching approach and tailoring delivery to reach out to all students. I now have more appreciation on how teaching can be more dynamic and flexible rather than being rigid and confined within the classroom. For me this animation approach breaks away from the boundaries found within the traditional classroom lecture setting and sets a new process in motion, one where the learners – through sharing their learning experiences – become an intricate part of the design and delivery of the lessons. With this ongoing pandemic and the subsequent blended learning approach heavily hanging on the lecturers' shoulders, animated videos can be considered as a 'dues ex machina'.

The link to artefact can be found below:

https://youtu.be/WkaNfBDGObA

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Appendix

Figure 1: Student Questionnaire

Site Surveying Lesson 1

Questionnaire

Student Name (optional) .....

(Please insert your name if you would like to participate in the follow-up Focus Group)

Instructions:

Please tick the box that best describes your opinion on the following statements.

Use the following scale to provide the extent to which you agree/disagree with the statements:

Completely Disagree – 1 **Completely Agree - 10**

No	Statement	1	2	3	4	5	6	7	8	9	10
	Interaction and Understanding										
1	It was easy to understand the explanations in the video.										
2	The topic was explained better in class.										
3	For me, the video was fully explanatory.										
4	I did not like the fact that I could not ask questions.										
5	If all the lessons would have been provided with such video, my understanding would have been improved.										
6	Please tick the number of times you had to watch the video to fully understand the topic.										
	Personal time (FC)										
7	I did not like that I had to watch the video in my own time.										
8	The video took too much of my personal time.										
9	I do not have time to watch the video at home.										
10	The video is too long.										
	Features and Entertainment										
11	This is an entertaining/interesting way of learning.										
12	The music in the background was distracting										
13	There were too many visual elements that were distracting me										
14	Please tick the approximate length of time you spent with the video before understanding the topic. (1 unit/every 30 minutes of time spent) i.e. 3 hours – tick "6"										

Figure 2: Statement 1 data

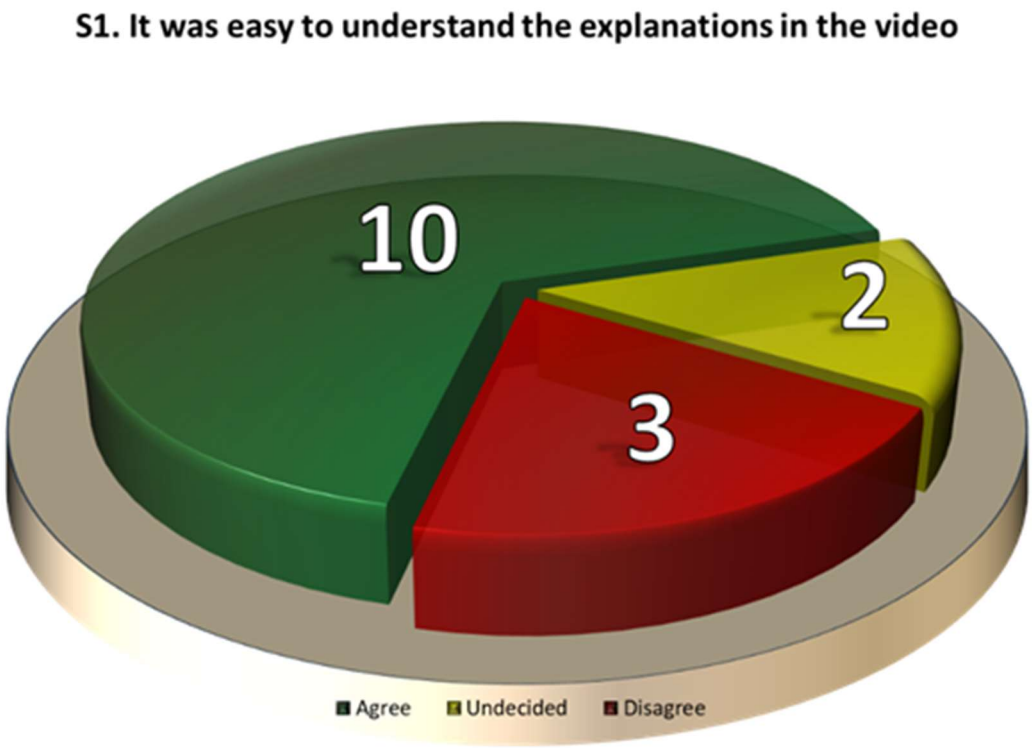

Figure 3: Statement 2 data

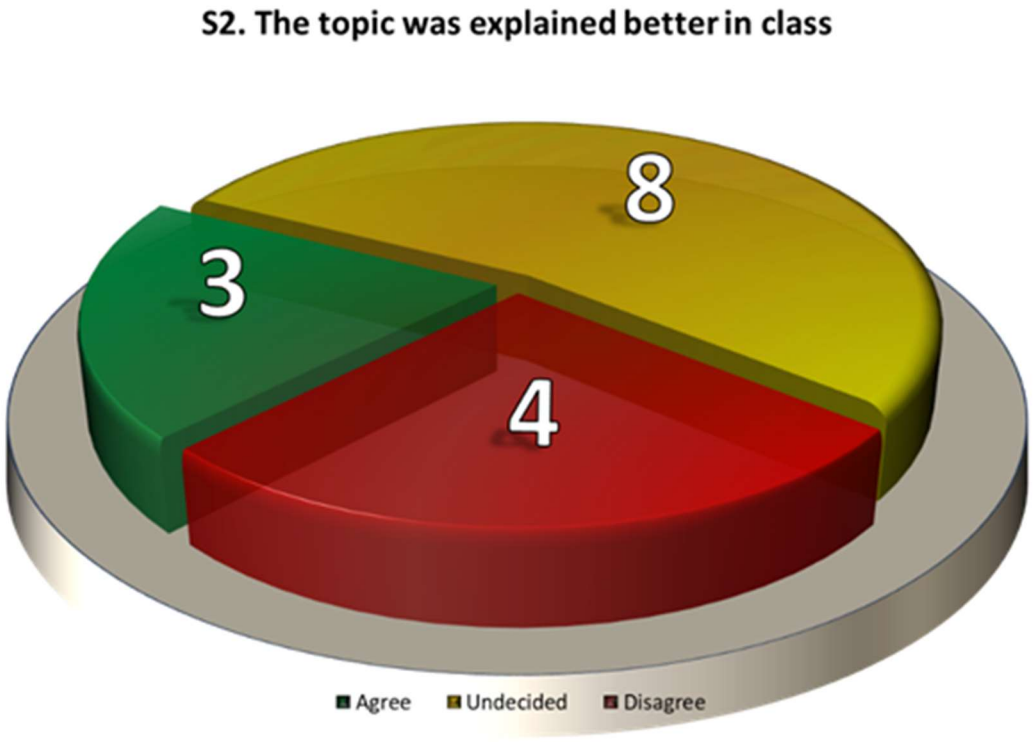

Figure 4: Statement 3 data

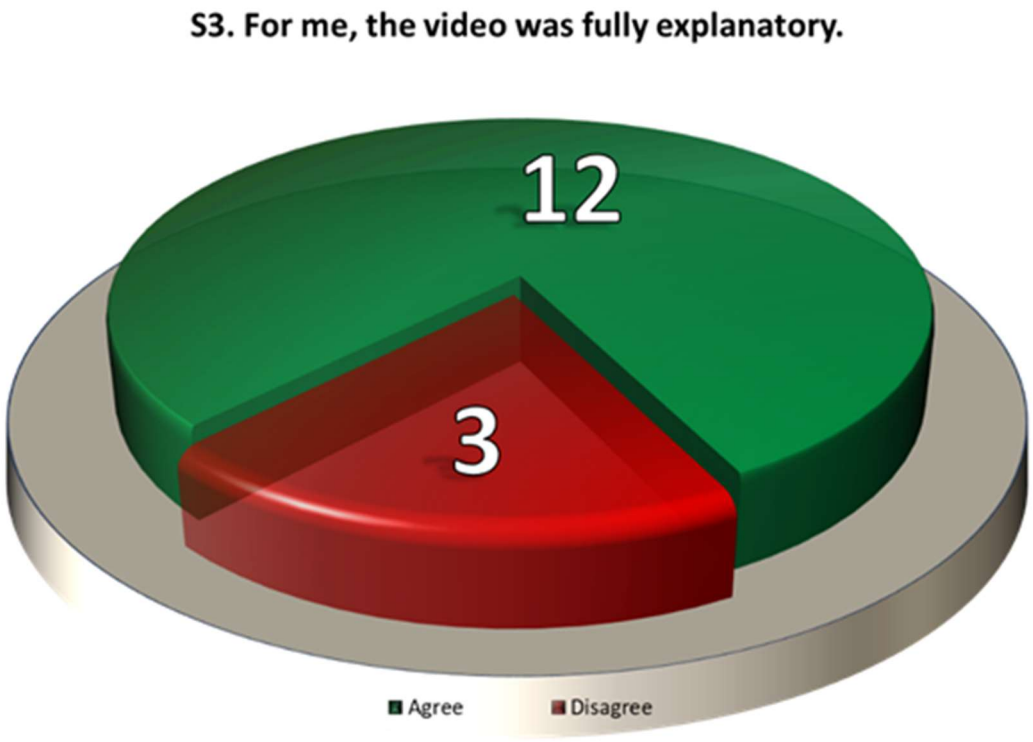

Figure 5: Statement 4 data

Figure 6: Statement 5 data

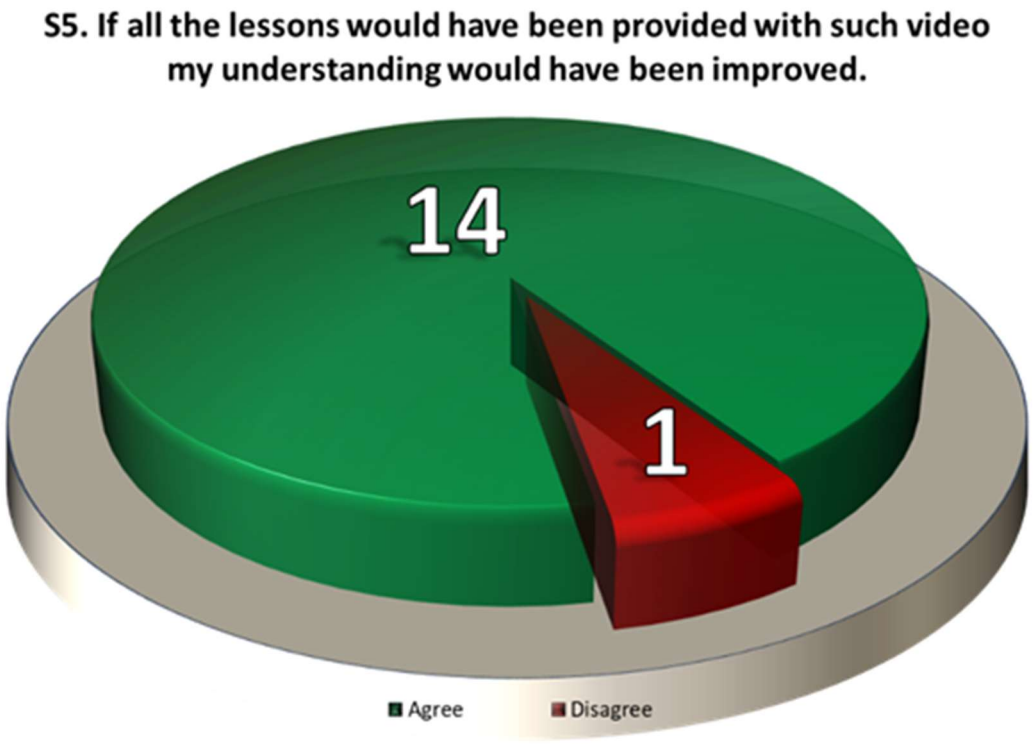

Figure 7: Statement 6 data

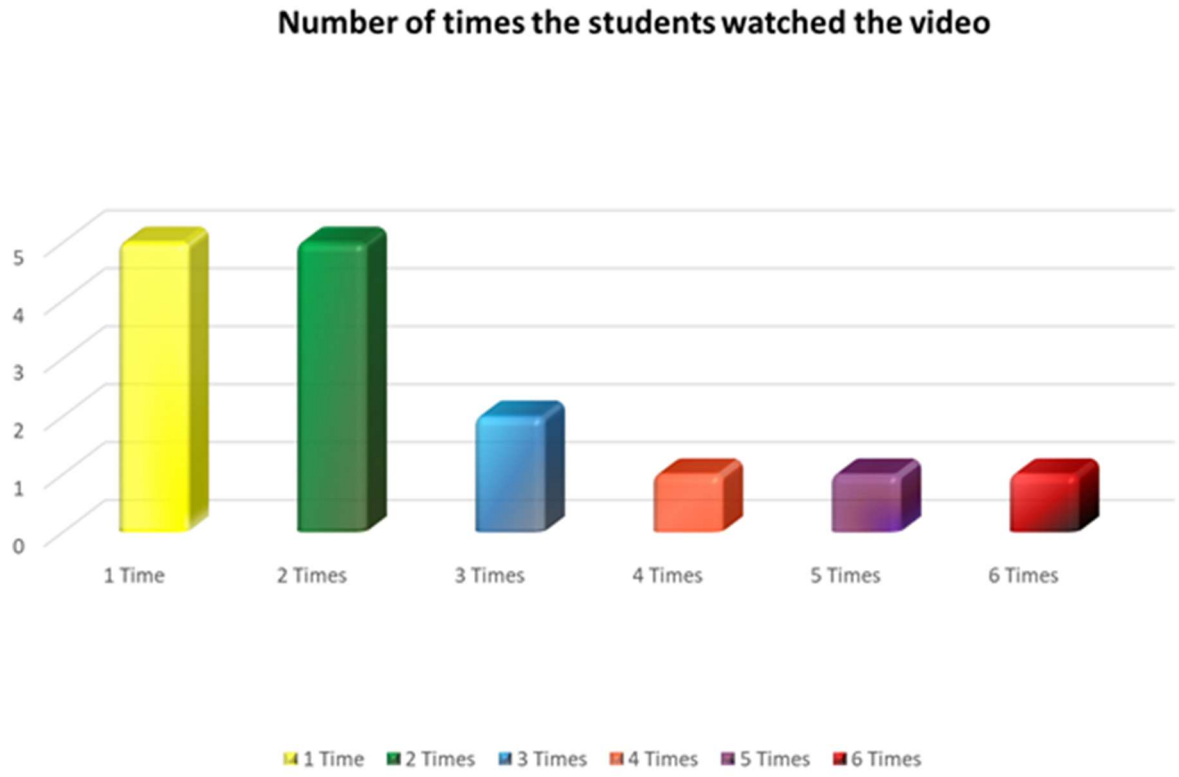

Figure 8: Statement 7 data

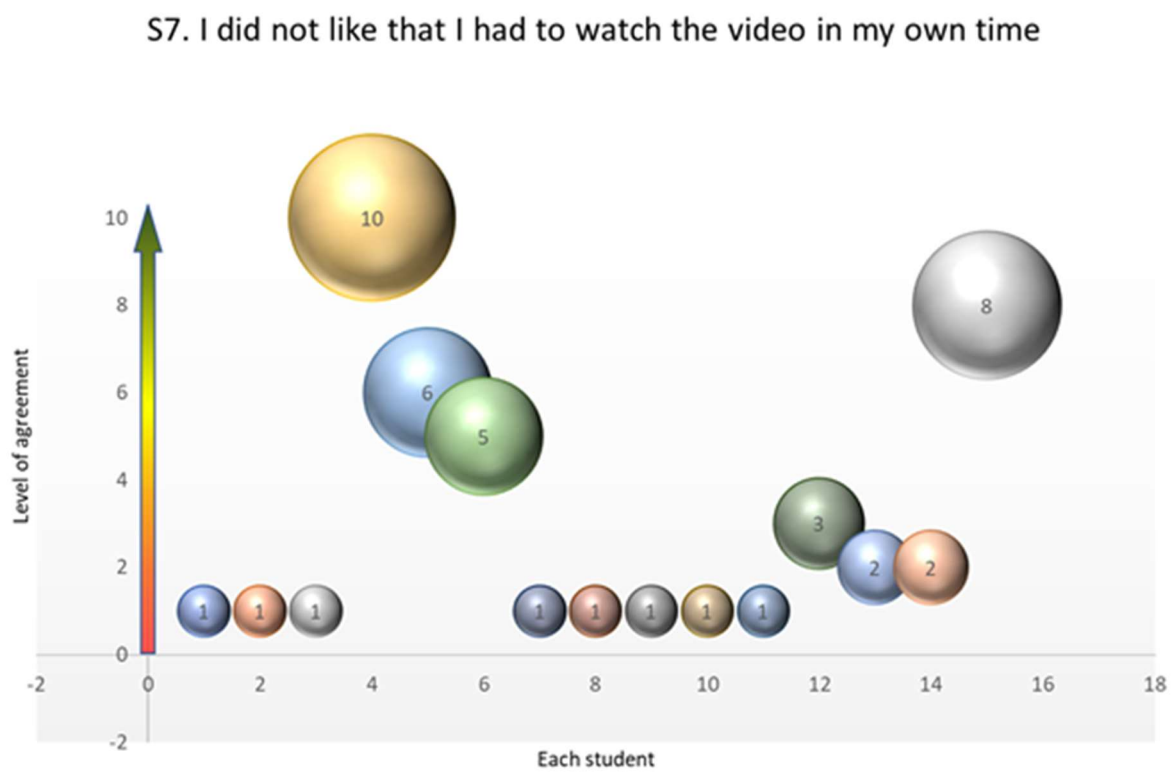

Figure 9: Statement 8 data

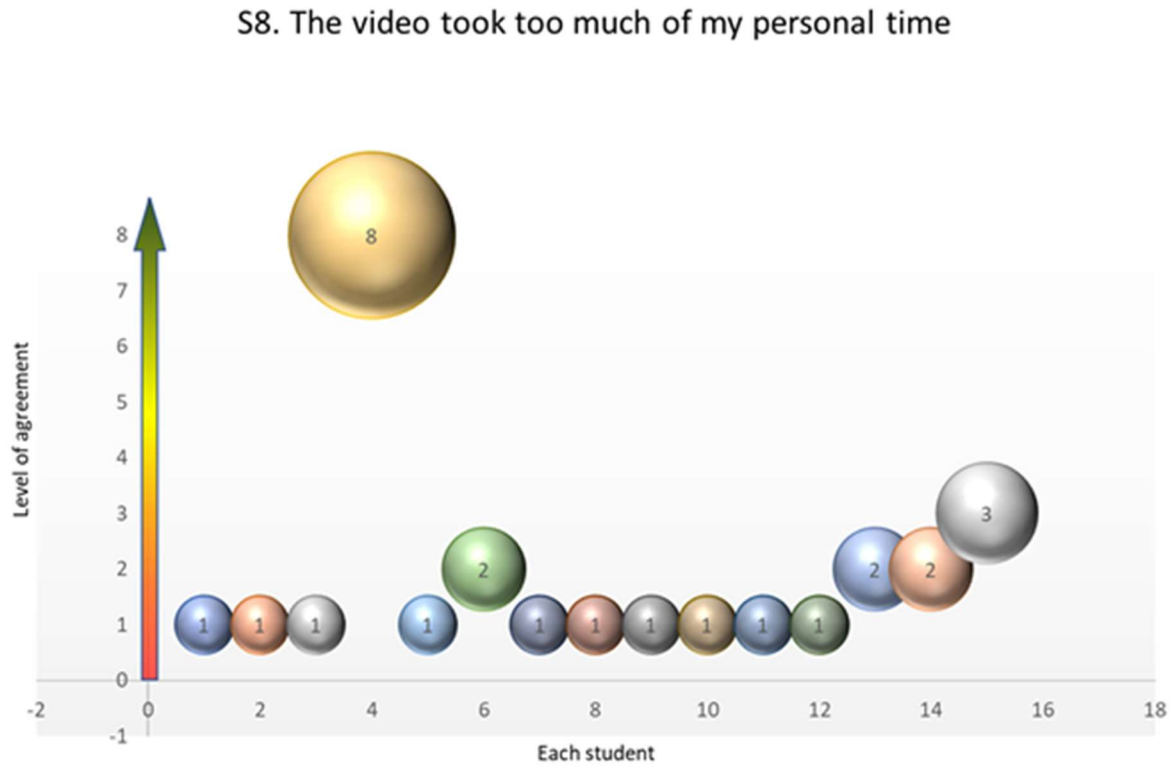

Figure 10: Statement 9 data

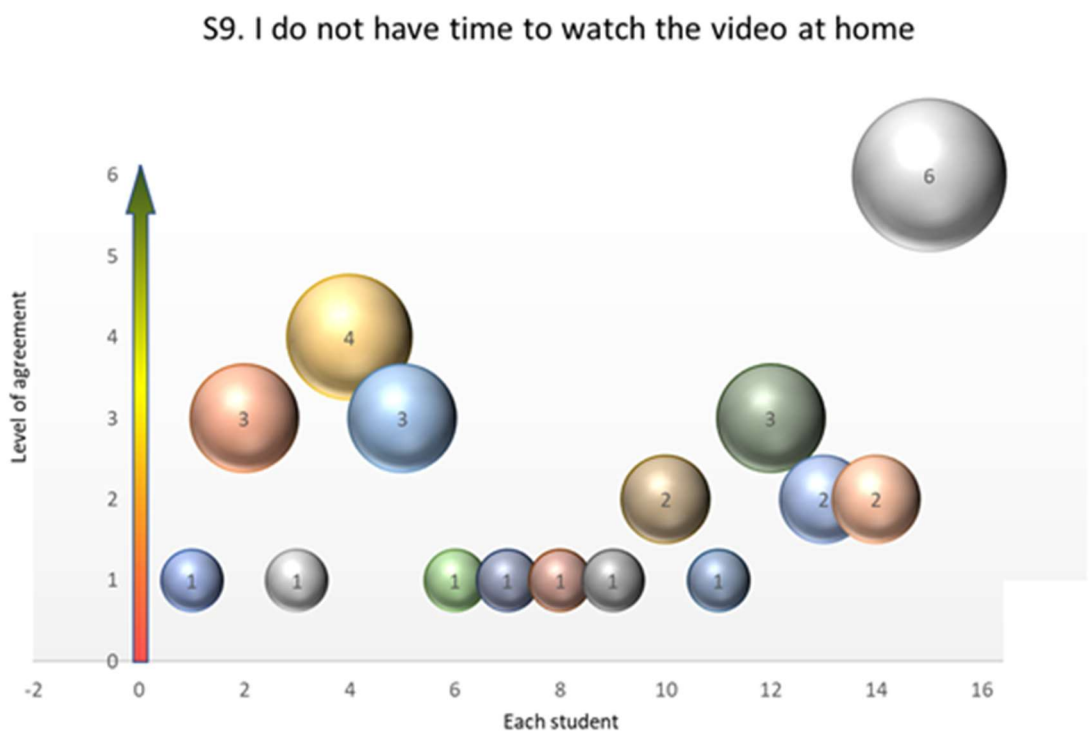

Figure 11: Statement 10 data

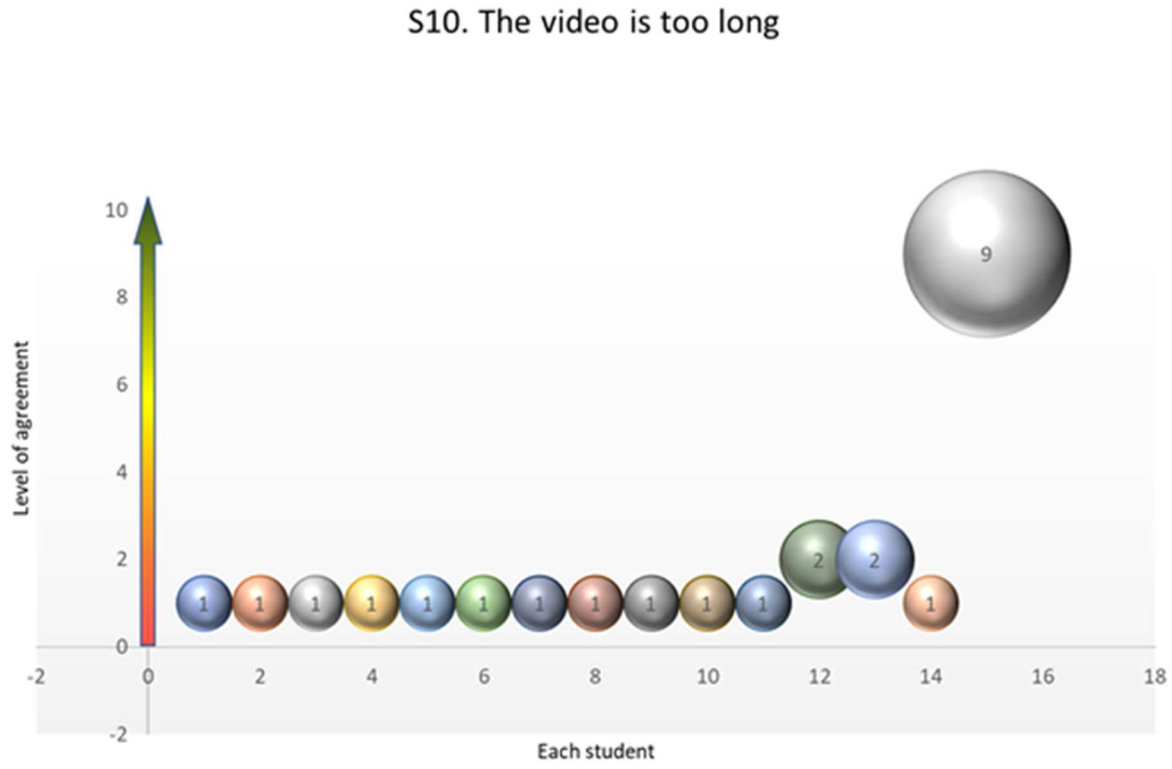

Figure 12: Statement 11 data

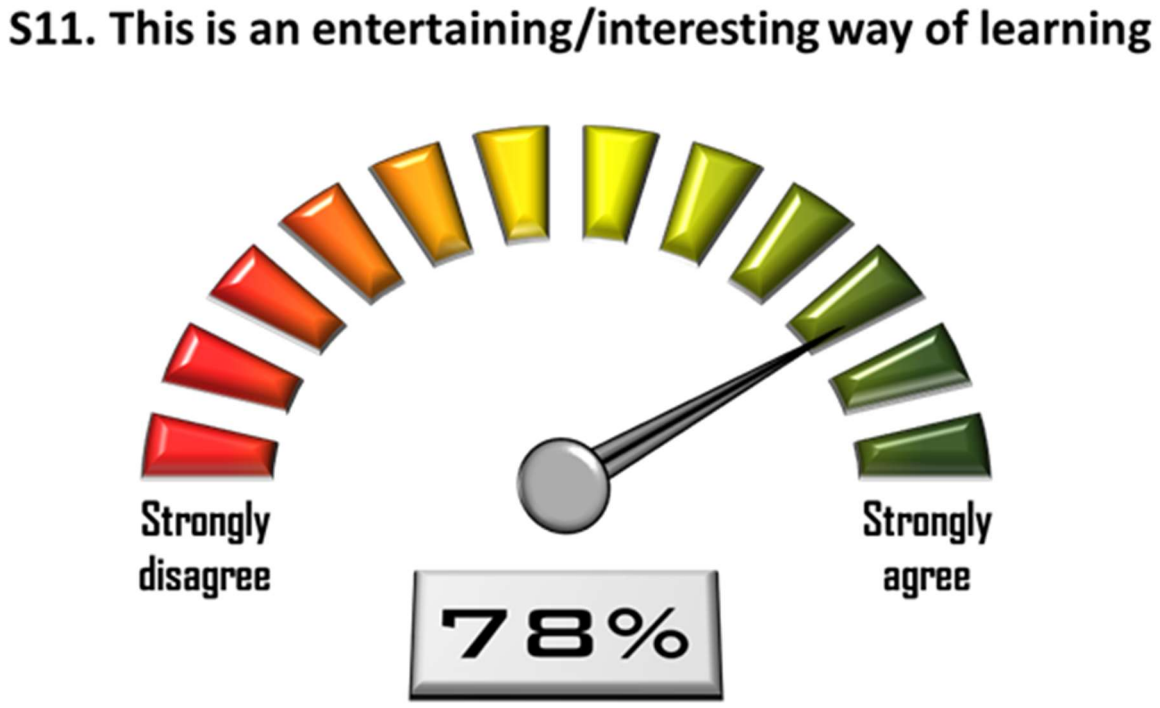

Figure 13: Statement 12 data

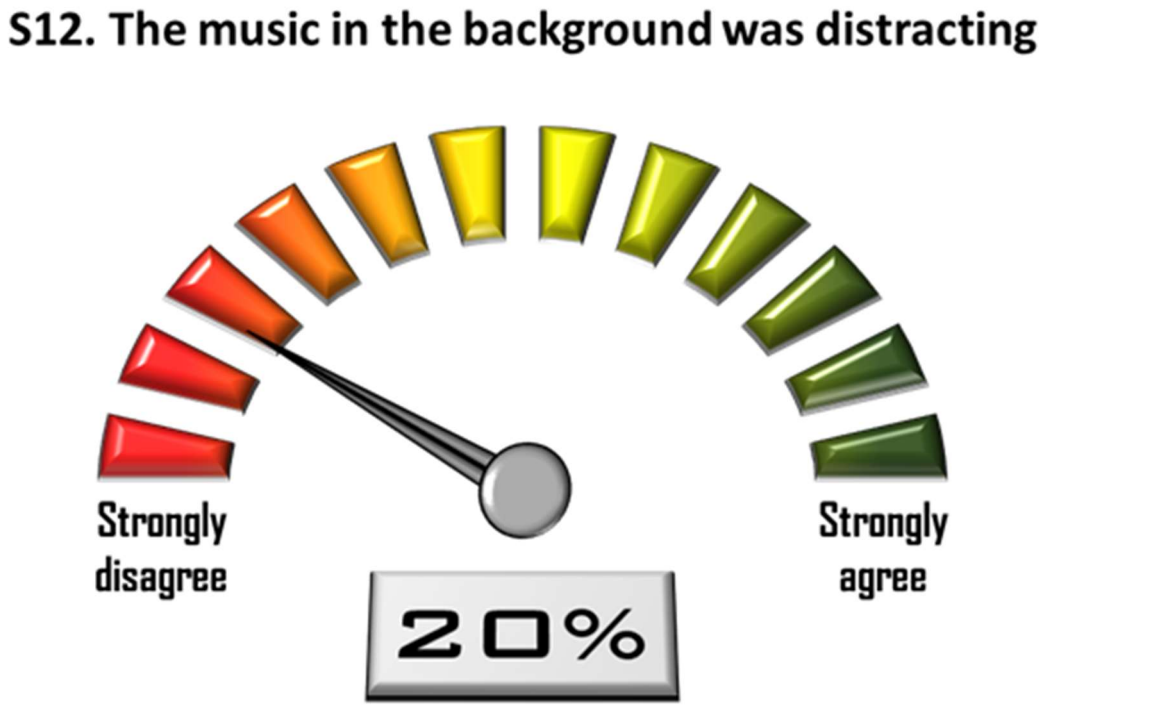

Figure 14: Statement 13 data

S13. There were too many visual elements that were distracting me

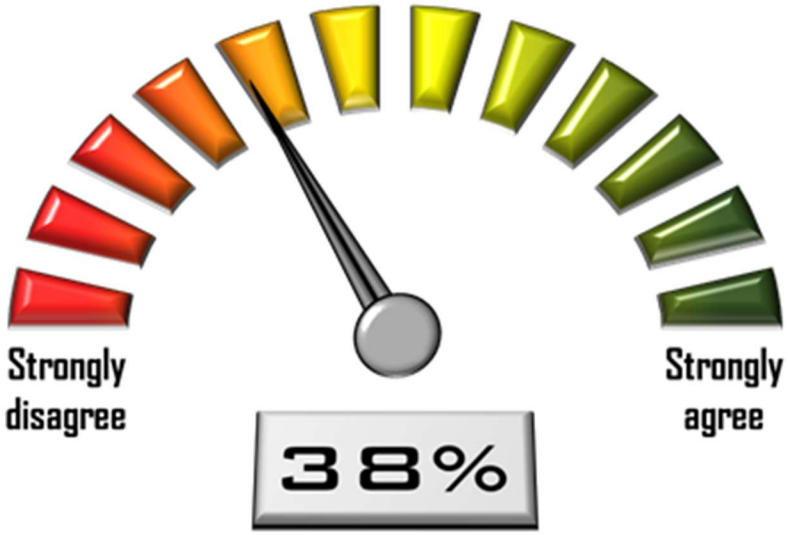

Figure 15: Statement 14 data

S14. The length of time spent on the video before understanding the topic.