MOST STUDENTS WATCH RECORDED LIVE LECTURES

99% of students watch recorded live lectures

88% of students find this either extremely or very useful

MOST STUDENTS USE CLOSED CAPTIONS, AND FIND THEM USEFUL FOR ENGAGING WITH LECTURES

92% of students use closed captions

57% always enable closed captions

97% find closed captions useful for engaging with lecture material

THE MAIN REASONS FOR FINDING CAPTIONS USEFUL WERE:

Helps with understanding with what the lecturer is saying (79%)
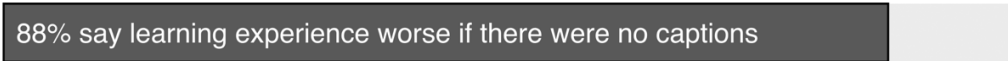
Helps to retain information (66%)

Helps with technical language or jargon (61%)

STUDENTS' LEARNING EXPERIENCE WOULD BE NEGATIVELY AFFECTED IF CAPTIONS WERE NO LONGER AVAILABLE

88% say learning experience worse if there were no captions

80% say learning experience worse if captions weren't corrected

EVALUATING STUDENT PERCEPTIONS OF THE BIOLOGICAL SCIENCES LECTURE CAPTIONING SERVICE

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INTRODUCTION

Closed captions are the text version of speech, provided alongside audio or video content, often taking the form of subtitles mirroring the spoken text in a video. They were originally designed to aid those who are deaf or hard of hearing, but are now used in a variety of contexts beyond this original scope. In the School of Biological Sciences at the University of Bristol, captions are provided for recorded lectures to help to enhance the students' learning experience and meet their accessibility requirements, in line with legal requirements.

The purpose of this report is to summarise and present the findings of our survey evaluating student perceptions of and experiences with the Biological Sciences captioning service. We hope that these results will ensure that the service meets the needs of students, and that funding is being appropriately and efficiently allocated. Currently, every synchronous (live) lecture in the School of Biological Sciences is recorded (given that the equipment and technology required is present). These lectures are made available to all students on the course on MediaSite, on the University of Bristol website. All lectures have auto-generated captions, which are often inaccurate. As such, all live lectures are captioned by captioners, recruited from postgraduate students within the department.

Our main research questions for this survey are:
- What proportion of students make use of closed captions?
- What are the reasons that students use closed captions?
- What would the effect be on students if captions were not provided?

LEGAL REQUIREMENTS

There is a legal requirement to provide captions for all lectures presented at UK universities. This is to meet the government's Web Content Accessibility Guidelines (WCAG). Principle 1 of the WCAG 2.1 guidelines states that:

> "Information and user interface components must be presentable to users in ways they can perceive."

The advice goes on to state that in order to meet this goal, text alternatives should be given for non-text content, and requires that closed captions are provided for audio and video. It is not specified in the legislation that the captions need to be corrected manually, but emphasis is made that it needs to be a suitable alternative to the audio. The Public Sector Bodies (Websites and Mobile Applications) Accessibility Regulations 2018 (PSBAR 2018) put this into legislation, requiring that all public sector bodies (including Universities) meet WCAG 2.1 by providing captions for all recorded content. The legislation also states that a public body does not necessarily need to comply with the WCAG accessibility regulation, if "doing so would impose a disproportionate burden on the public sector body". It is then stated that they

"must perform an assessment of the extent to which compliance with the accessibility requirement imposes a disproportionate burden".

The University of Bristol currently requires captions to be provided on all recorded live lectures in order to meet the legal requirements outlined in PSBAR 2018. However, according to the Digital Education Office (DEO), this is fulfilled by the auto-captioning that is generated by default on every lecture on MediaSite. There is currently no University of Bristol-wide policy requiring closed captions to be corrected for all lectures by individual departments. If corrected closed captions are not provided by a department, and a student requires them for accessibility reasons, the student is advised by the DEO to themselves contact the University's Disability Services, and they will be provided with hand-written corrected captions through this route. Despite there being no University-wide policy requiring them to do so, the School of Biological Sciences currently corrects closed captions on all their lectures, within a week of them being presented.

METHODOLOGY

We surveyed 121 undergraduate students in the School of Biological sciences between June and July of 2022. Our sample includes 40 1st year students, 40 2nd year students, 35 3rd year students and six 4th year students (Figure 1). Students were recruited via three emails during this period, and incentive was given via a chance to win one of four £50 gift vouchers. Ethical approval for this survey was obtained through the University of Bristol Faculty of Life Sciences and Science Research Ethics Committee (ethics approval code 11298). For the purposes of this study, closed captions were defined as: the subtitles mirroring the audio that appear at the bottom of a live lecture recording when you enable them using the "CC" button. Auto-generated closed captions have been produced using speech recognition technology and have not been checked for errors. Corrected closed captions have been checked by someone in the department to ensure that they are an accurate transcription of what the lecturer is saying.
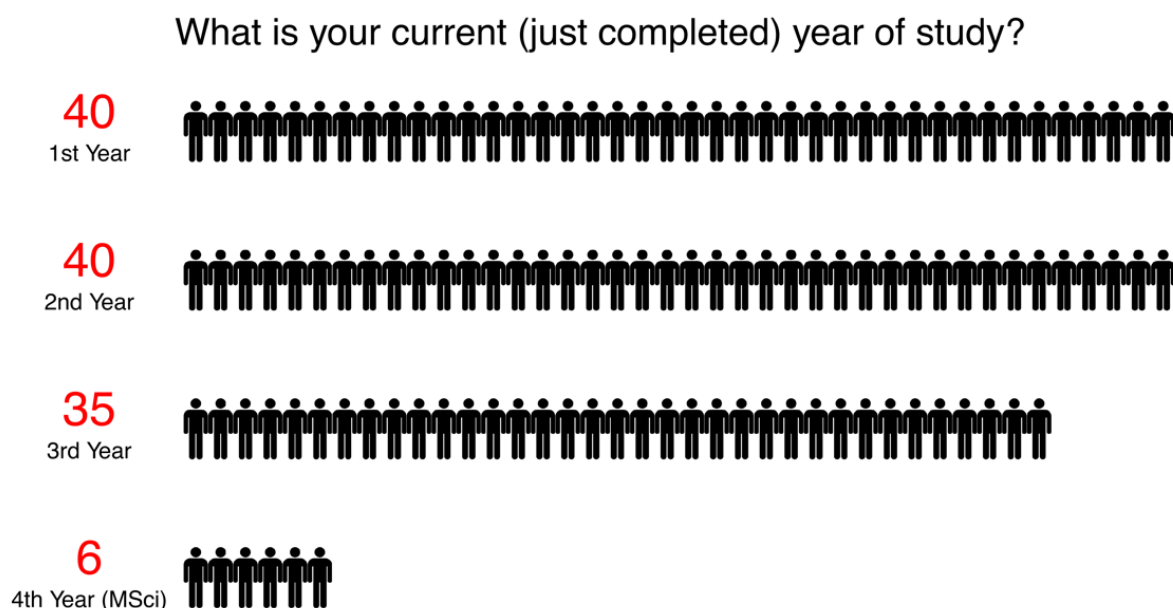

Figure 1. The 121 undergraduate participants in the survey by year of study.

RESULTS
Students' experience with recorded live lectures

The overwhelming majority of students have watched live lecture recordings on MediaSite (99%). Only one student among the 121 surveyed said that they never accessed any lecture recordings. 17% of students stated that they watched recordings of every lecture, and 30% of students said that they watched most lectures. A plurality of students (45%) said that it depends on the lecture whether they watch recordings on MediaSite (Figure 2).

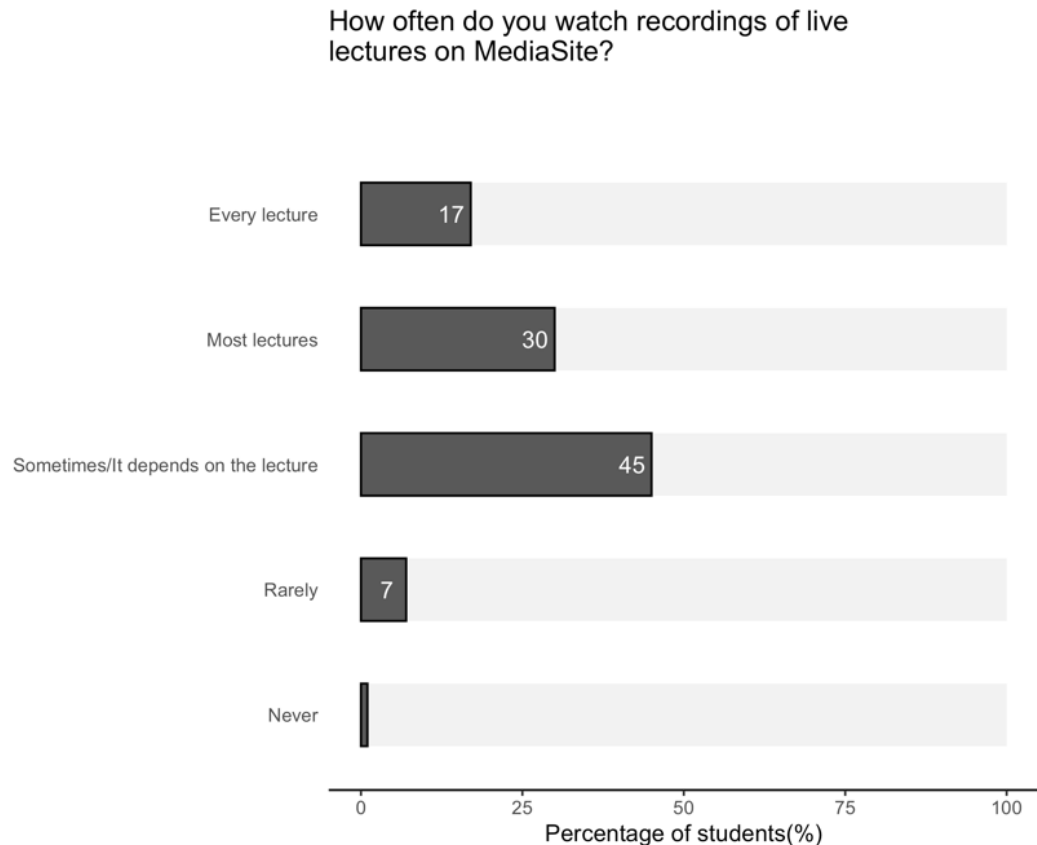How often do you watch recordings of live lectures on MediaSite?

Figure 2. Student engagement with live recorded lectures on MediaSite (n=121).

Most students accessed recordings of lectures within a month of the lecture being presented live. 54% of students accessed the lecture up to a week after presentation, before captions have been corrected by captioners. 57% of students watched it between a week and a month afterwards. Only 25% of students surveyed watched the lecture more than a month after its presentation (Figure 2).

How soon after a lecture is presented do you watch the lecture recording online?
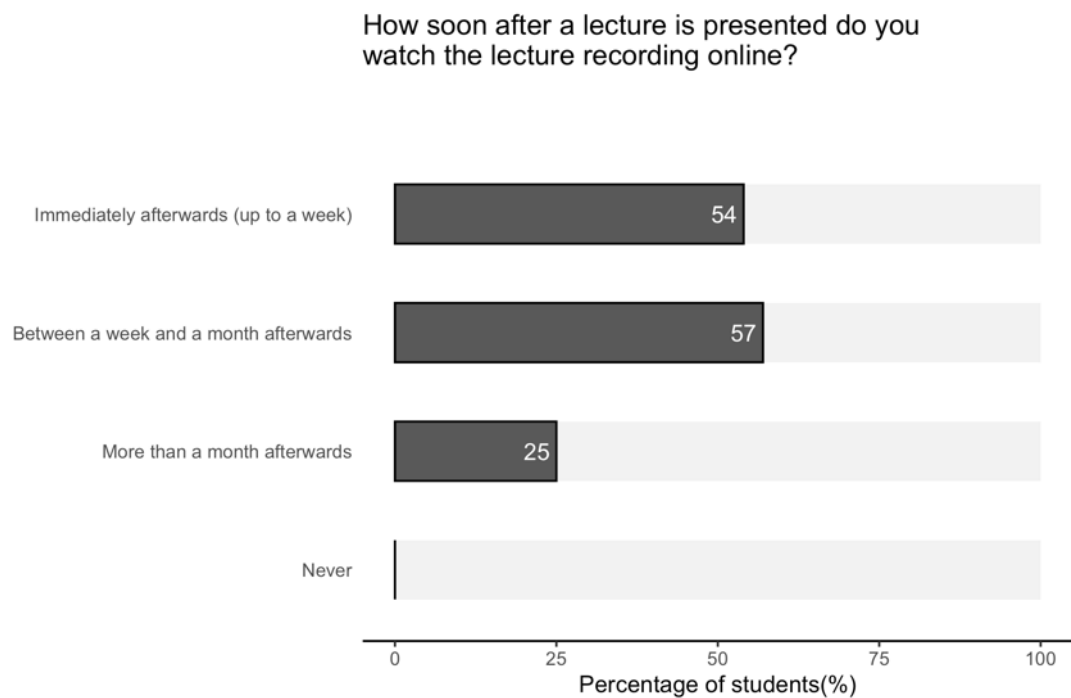

Figure 3. The timing of students' access of live lecture recordings on MediaSite (n=121).

We found that students hugely value being able to access recordings of lectures on MediaSite. 63% of students found the provision of live recordings of lectures extremely helpful, and 25% of students found it very helpful. No students stated that they found it not helpful at all (Figure 4).

How helpful do you find being able to watch recordings of lectures on Mediasite?
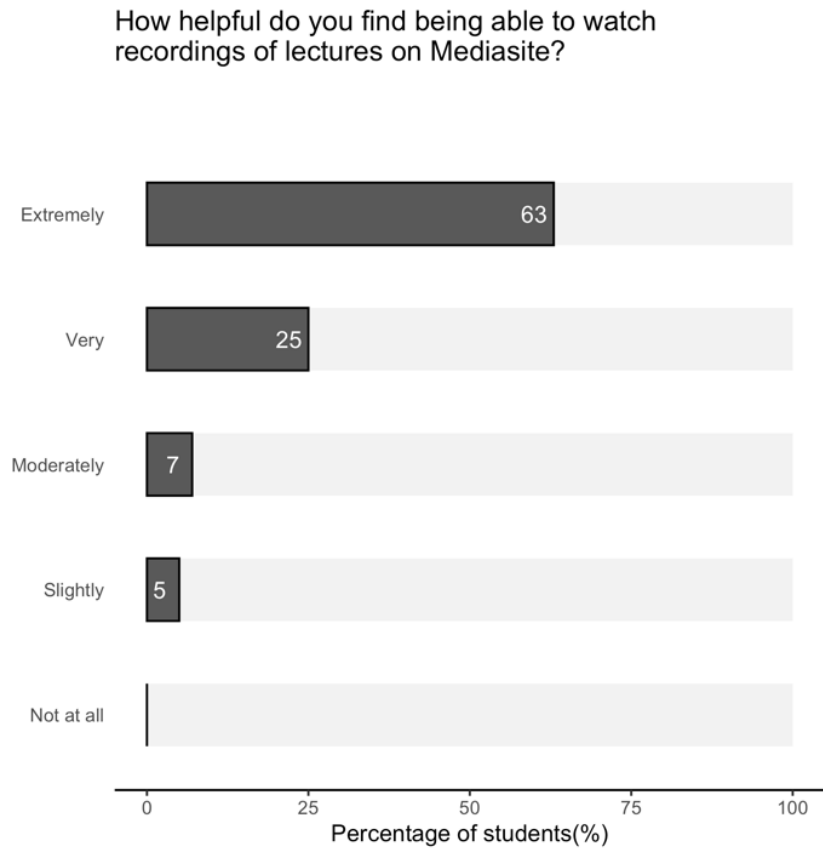

Figure 4. Students' perception of the value of recordings of live lectures on MediaSite (n=121).

The main reason students gave for accessing live lecture content was to make up for missing a live lecture (87%). 68% watched lectures online as a learning aid, and 60% used them for revision preparation.

What are your reasons for watching recorded live lectures? Tick all that apply.
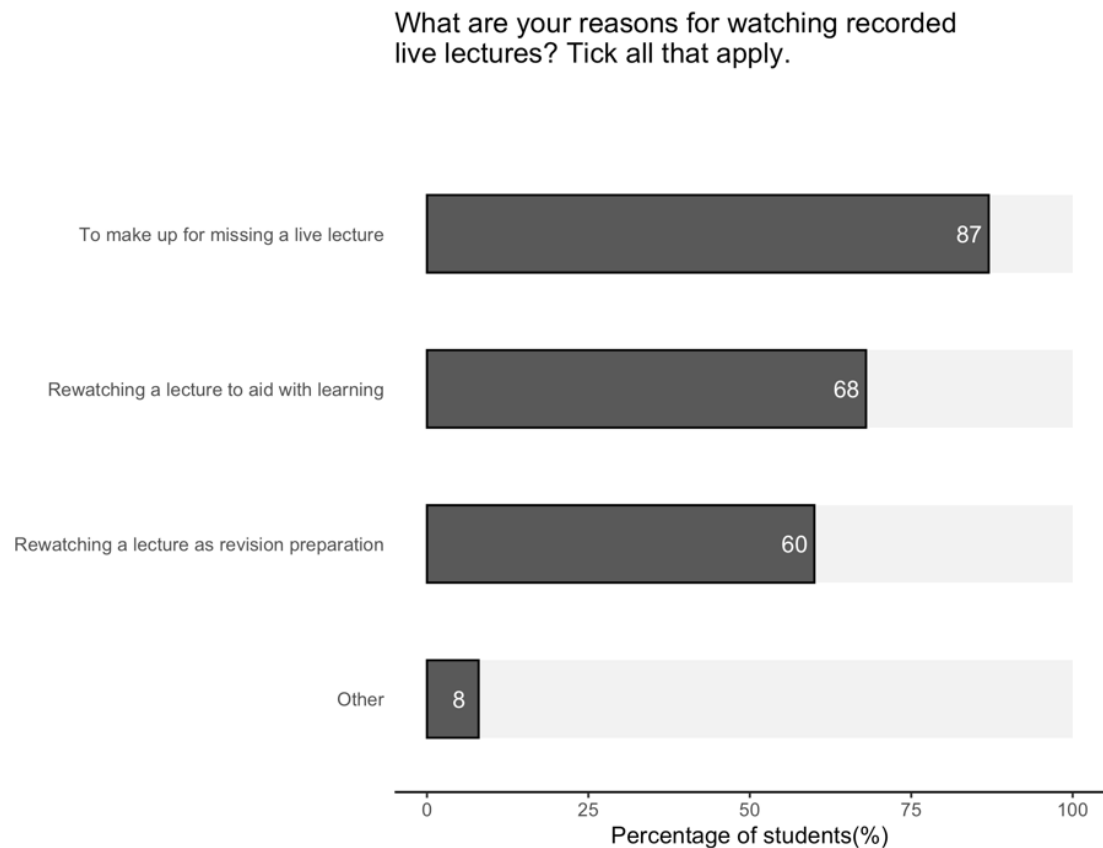

Figure 5. Students' reasons for watching live lectures on MediaSite (n=121).

Of those that stated "Other", five mentioned that it helps to take accurate notes, or that they watch it in person and then rewatch to take notes. Three mentioned that they watch lectures online for disability or accessibility reasons:

> *"I am deaf/hearing impaired and sometimes miss/mishear speech in a live lecture environment, so the recordings (and captions) are hugely useful for me to cover any missed content"*

> *"I cannot attend most in person lectures due to disability"*

> *"Because live lectures do not account for my accessibility needs and online lectures are better for my learning and mental health"*

Students' experiences with the Biological Sciences captioning service

78% of students were aware that corrected captions were provided for every lecture within the School, and 22% were unaware (Figure 6). Some reported in later questions that they knew they were corrected for some lectures but didn't know that they should be provided for all lectures. They report often needing to request them to be corrected by emailing the course organiser. This discrepancy is likely either due to an oversight when captioning the lecture, technical problems with MediaSite causing there to be a delay to the provision of captions, or poor communication with students about the provision of captions.

Are you aware that corrected closed captions
are provided for every live lecture
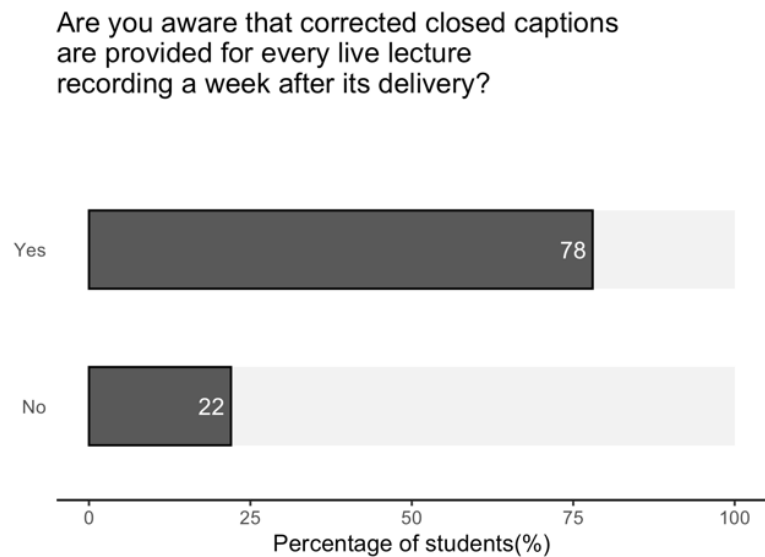recording a week after its delivery?

Figure 6. Students' awareness of the Biological Sciences caption correction service (n=121)

Regarding student use of closed captions, they are used by the overwhelming majority of students (92%). 57% of students said that they always enabled closed captions when they are available. 35% of students said that they only sometimes enabled captions, depending on the lecture. 8% of students never enable captions (Figure 7).

When watching recordings of live lectures, how often do you enable closed captions, when they are available?
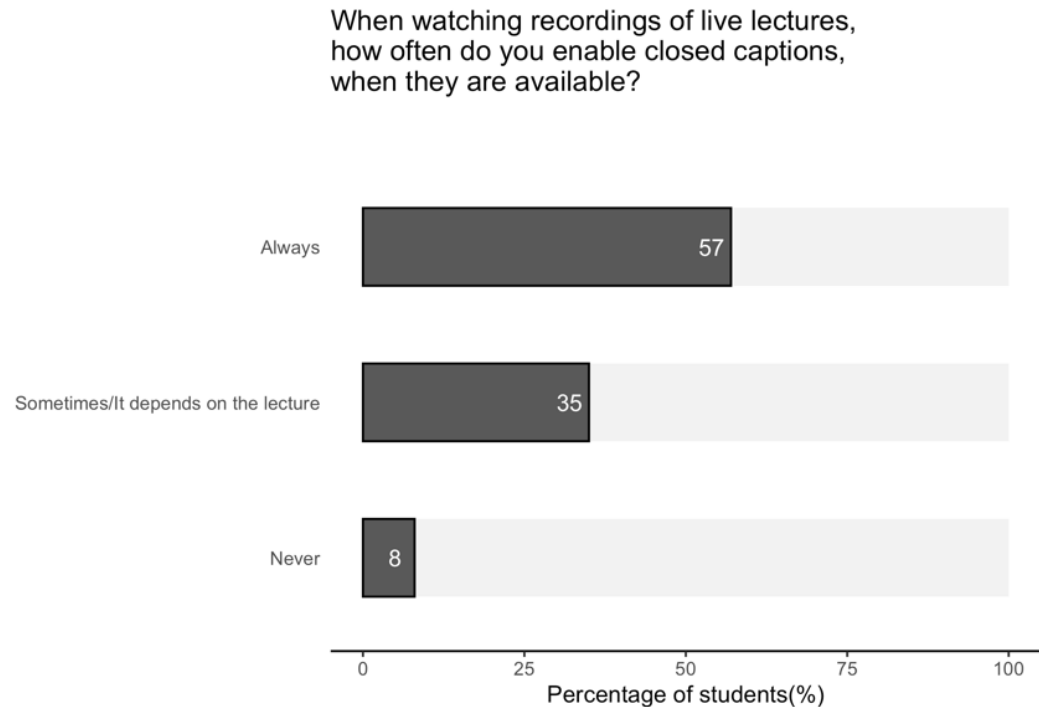

Figure 7. Student use of closed captions on lectures in Biological Sciences (n=121).

A majority of students find closed captions useful for engaging with the lecture material (93%). Seven students of 121 (6%) said that they do not find captions useful. Of these, five of the seven said that they do not have a need for captions and two said that they find captions to be a hindrance. These two individuals stated that they find closed captions to be a distraction, and that they block important information on the slides (Figure 8).
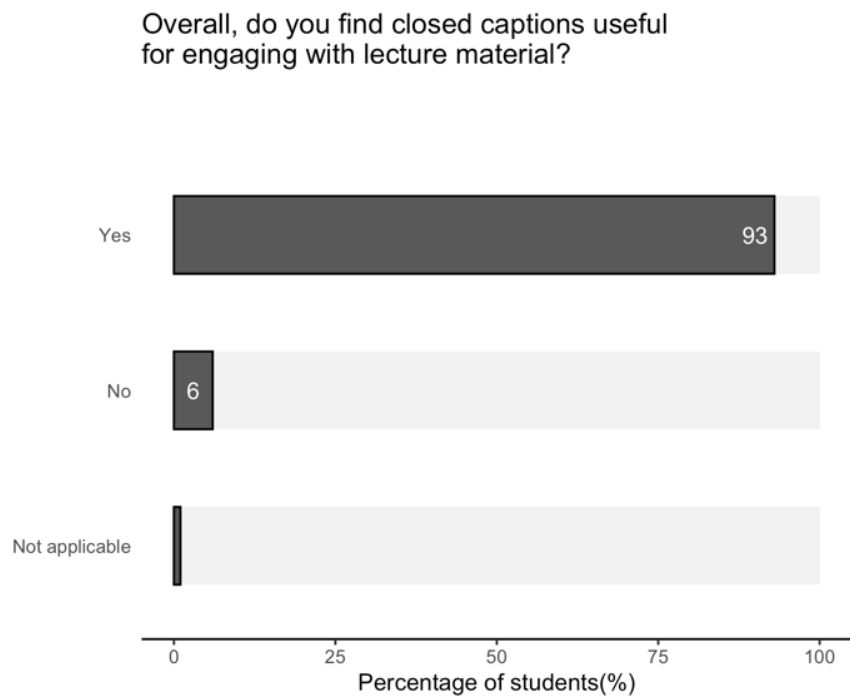

Figure 8. Student perceptions of the usefulness of closed captions for learning (n=121).

Of the 93% of students that find closed captions useful for engaging with lectures, we asked what their reasons were for this. We found that students often had many reasons for finding them useful. The most common was that it helped them to understand what the lecturer was saying (79%). Students also reported that it helped with retaining information (66%), helped with technical language (61%), and helped to negate potential issues with the recording audio (55%) (Figure 9). The answers students specified as "other" are all covered and discussed in the following question (Figure 10).

If you stated that you find closed captions useful for engaging with lecture material, what are your reasons for this? Tick all that apply.
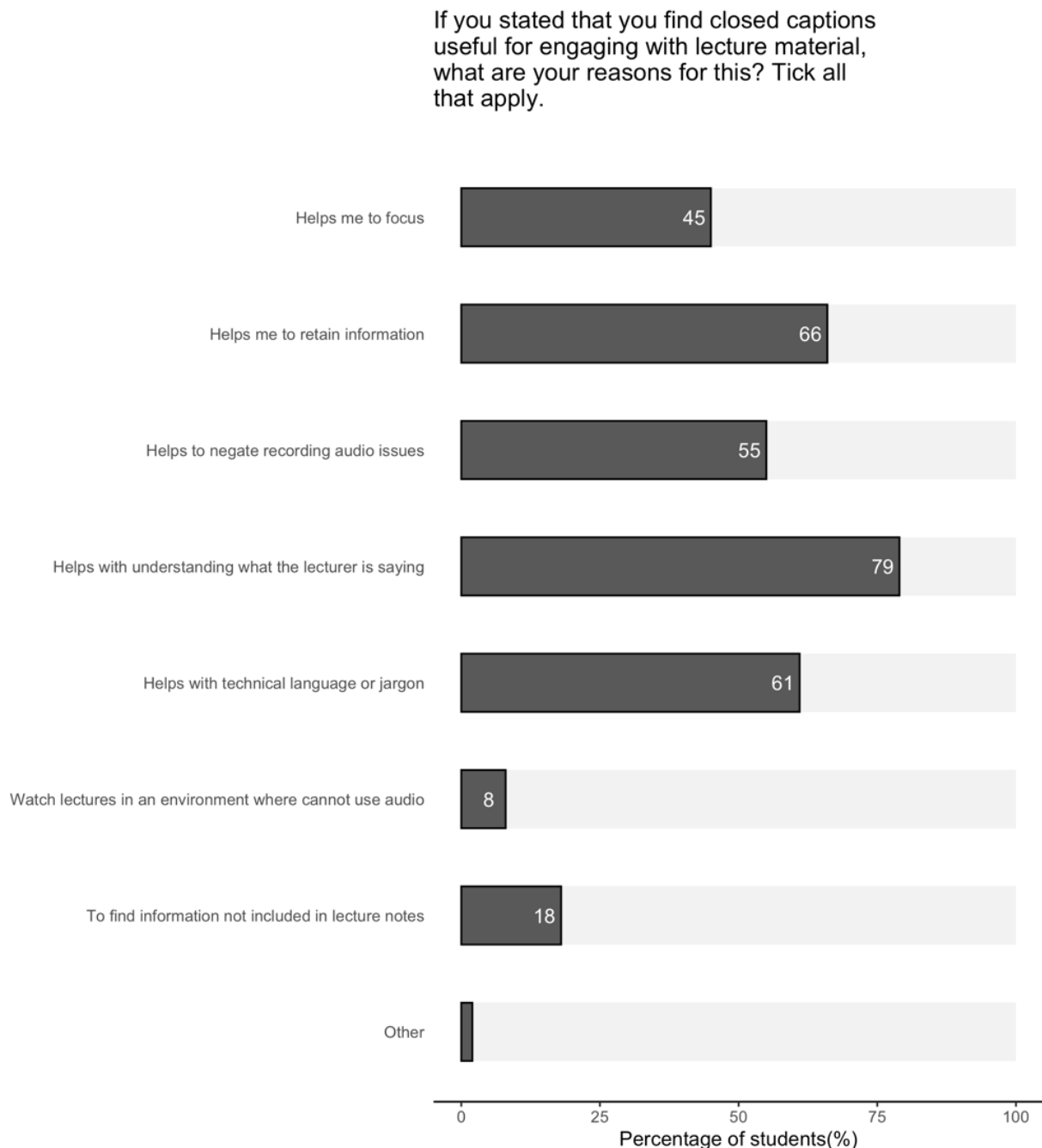

Figure 9. Students' reasons for finding captions useful for engaging lectures, of the 99 students that said this was the case.

We asked these 99 students to give their main reason for finding captions useful. These results are summarised below. We have split these into two main categories: those that value captions as an aid to learning, and those that use captions in order to understand what the lecturer is saying. For each category, we have broken it down into subcategories, and given an indication of the number of students giving each as their main reason for finding captions useful. Some students' main reason could not be put into a single category, and fit into two or more categories, and so was counted for both.
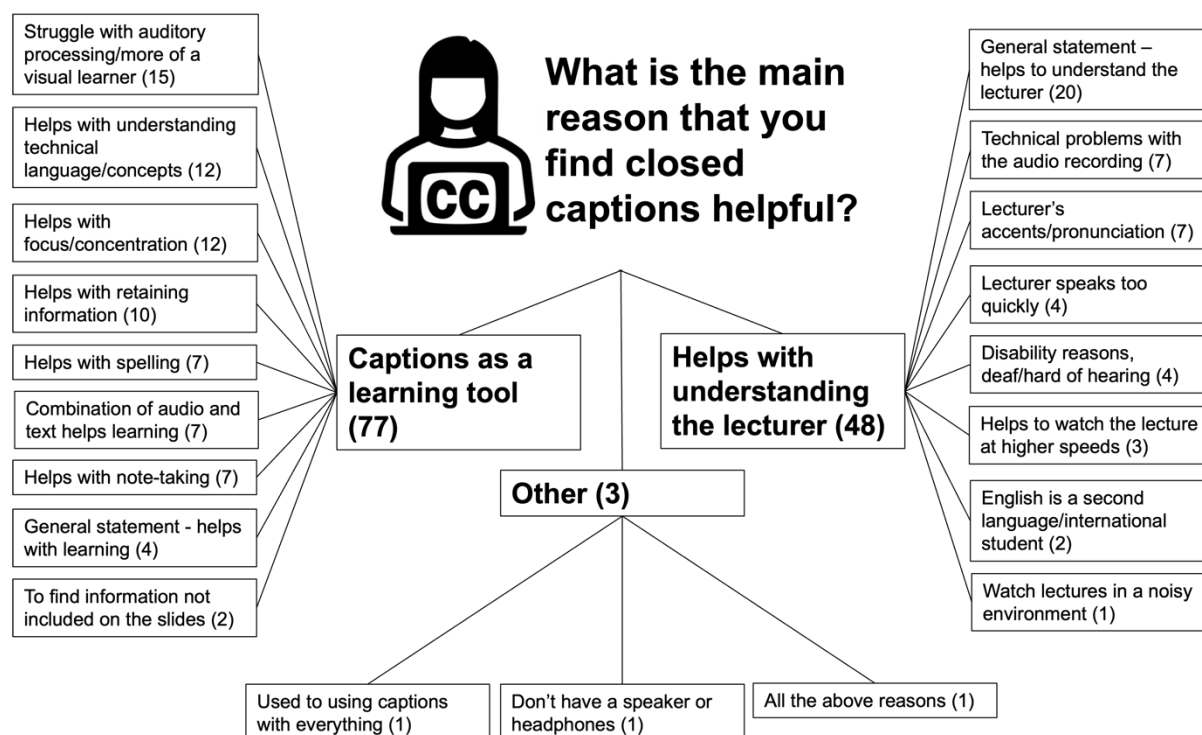

Figure 10. Main reasons that students stated for finding closed captions helpful. The numbers indicate the number of students giving each reason (n=99).

The following are some specific anonymous quotes of students' responses to this question, which highlight the students' general feelings about the provision of captioning in the department:

"I'm so used to CC on everything (shows, films, youtube) that I can't cope without it. Information doesn't sink in as easily without it."

"It is the only way I can engage with my lectures due to disability, and case-by-case disability support never happens at this university, so it is the only way to get the disability support I need."

"Its really helpful for me as I am an international student."

"Assisting in visualizing the spelling of key technical words, an area of weakness due to my dyslexia"

"If I am watching a lecture in a noisy environment (which I often do), closed captions are vital. Also, a lot of the lecturers have quite strong accents and the closed captions really help with understanding what they are saying."

"As stated above, closed captions are necessary on recorded material for me to be able to understand what is said, as I am deaf/hearing impaired."

A further breakdown of why students reported that closed captions helped with their learning experience, including anonymous quotes from students, is included here as Appendix A. A further breakdown of why students reported that closed captions helped them to understand what the lecturer was saying, including anonymous quotes from students, is included here as Appendix B.

The majority of students reported having experienced issues with the captions being incorrect during live lectures (65%).
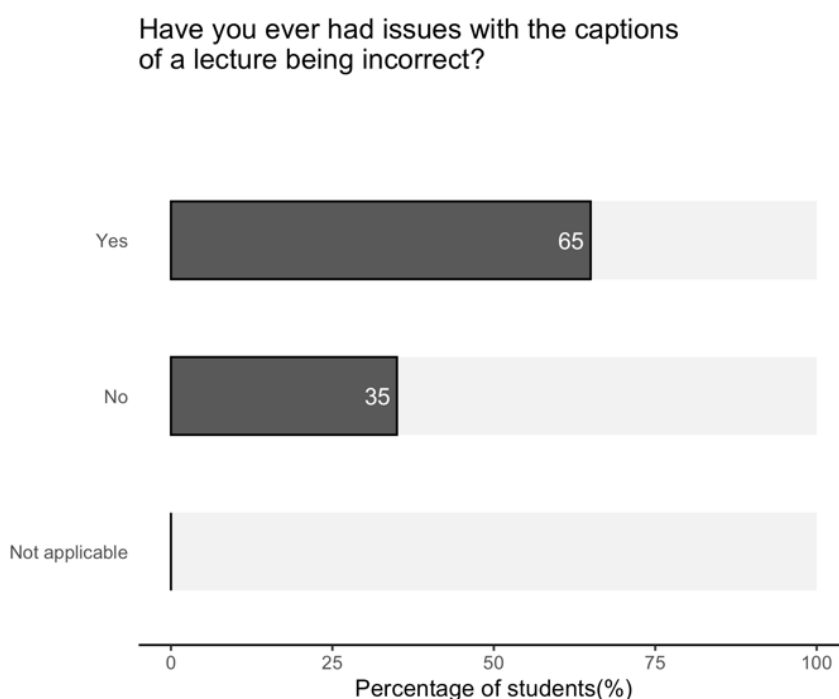
Have you ever had issues with the captions
of a lecture being incorrect?

Figure 11. Students' experience with errors in closed captions (n=121).

Student opinion on changes to the captioning service

Students were presented with three potential alterations to the provision of corrected captions in the School of Biological Sciences. These scenarios are summarised in Figures 12, 13 and 14 below. We have also included the main reasons students gave for their answers, and some anonymous quotes representative of the students' general feedback.

The first proposed scenario was: "If closed captions were not available for recorded lectures, neither auto-generated nor corrected closed captions". Despite the fact this is not being contemplated, we were interested in finding out what students' opinions on this would be, and how they think it would affect their learning experience. The response of students was overwhelmingly negative to this scenario, with 88% of students reporting that it would significantly or slightly worsen their learning experience. 11% of students reported that it would make no difference, which is roughly in line with the proportion of students who stated that they don't use closed captions (8%). 1% of students reported that not providing either auto-generated or corrected captions would make their experience significantly better (Figure 12).

If closed captions were NOT available for recorded lectures, neither auto-generated nor corrected closed captions, how would this affect your learning experience?

Figure 12. Students' response to the first proposed scenario, in which no captions are provided, neither auto-generated nor corrected closed captions (n=121).

Among the students who said that these scenarios would make no difference (11%), the most common reason for this response was that they don't use closed captions. The main reasons students gave for saying that it would worsen their learning experience (88%), was that they would no longer be able to understand what the lecturer was saying. The reasons

for this included: deafness or disability reasons; issues with the audio being poor quality; mishearing the lecturer; not knowing technical terms or how to spell them; and issues with understanding the lecturers' pronunciation or accent. Another reason given was that it would negatively affect their learning, by making it harder to concentrate or focus, and harder to retain information from the lecture. Some key quotes from this feedback, representative of other students' experiences, is provided below:

> *"Instead of figuring out what was said by myself using captions, I would have to email the lecturer for clarification, which might not get an immediate response back, so thats not ideal"*

> *"As a deaf person, I am unable to follow audio content which does not have accompanying closed captions or a transcript, so if these were not available then recorded material would be inaccessible to me - significantly affecting my ability to engage with course material."*

> *"I really heavily on closed captions and transcripts due to ADHD and other SpLDs. Also many lecturers are not very clear when speaking to it helps to have a visual aid."*

> *"There have been many occasions when I can't figure out what a lecturer is saying and differences in pronunciation, if I didn't have closed captions I just wouldn't understand what they were trying to explain."*

> *"There have been a few lectures where there were no captions and I struggled significantly more with understanding and concentrating."*

> *"I would have missed some of the lecture content, especially those that were not included in the lecture slides."*

> *"It really helps those audibly impaired and those whose English isn't their first language"*

The second scenario was: If that auto-generated captions were still available for every lecture recording, but corrected captions were not provided available". In this scenario, most students reported that this would make their learning experience significantly or slightly worse (80%). 20% stated that this would make no difference, and 1% reported that this would make their experience slightly better (Figure 13).

If auto-generated captions were still available for every lecture recording, but corrected closed captions were NOT available, how would this affect your learning experience?

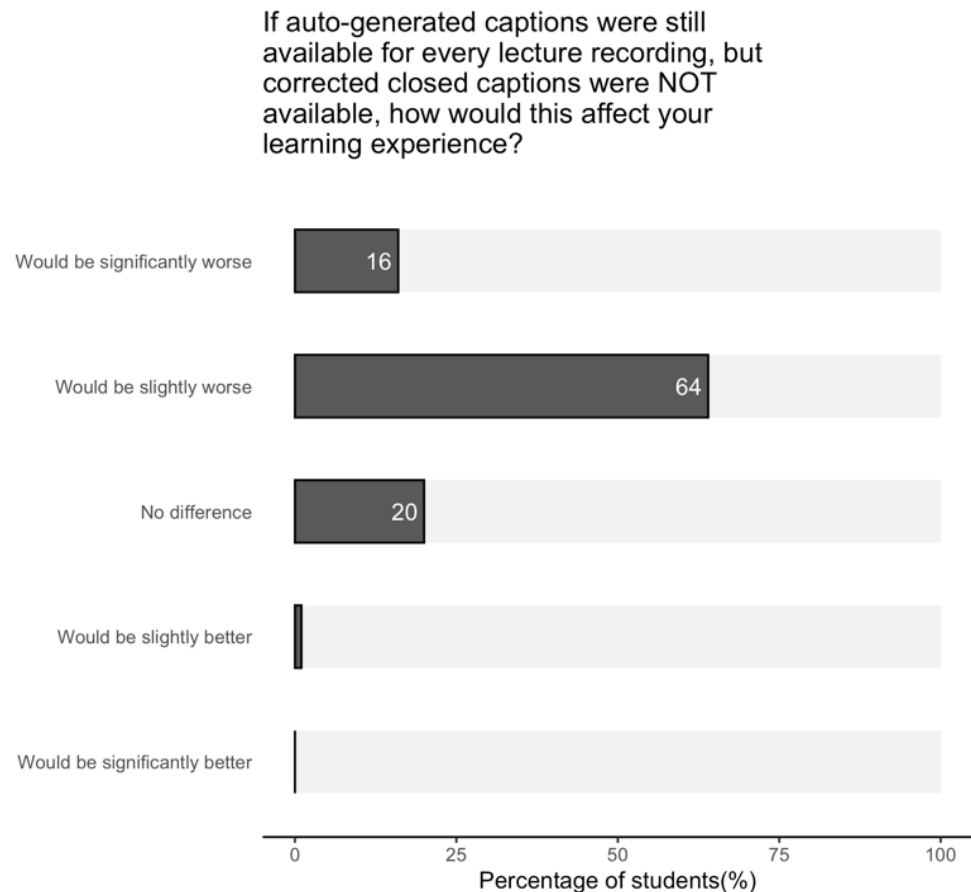| Response	Percentage
Would be significantly worse	16
Would be slightly worse	64
No difference	20
Would be slightly better	
Would be significantly better	

Percentage of students(%)

Figure 13. Students' responses to the second proposed scenario, in which only auto-generated captions were provided, and they are not corrected by captioners (n=121).

Students' feedback was generally quite similar as for the first scenario. However, students emphasised the importance of terminology being correctly spelt and defined, in particular for a scientific degree. Almost all students here reported there being an extremely high error rate during their experiences with auto-generated captioning, and that the accuracy is particularly important given the nature of the content and their degree. Some students mentioned that if the captions weren't corrected, then they would most likely not use them at all. They stated that inaccurate captions can be distracting, and it's better in this circumstance to not use them at all.

> *"Auto-generated 80% of the time is incorrect, due to the highly technical language used and various accents in the department staff. It causes additional confusion"*

> *"Corrected captions are useful for learning new course related vocabulary. They also help me follow the flow of the lecture better. I would still use the recordings although it would make harder for me to take in information as my flow of concentration would be broken by none sense or incorrect captions."*

"Auto generated captions can be unaccurate especially for scientific terms and not having correct captions for lectures is unfair on deaf students"

The third and final potential scenario presented to students was that auto-generated captions were generated for every lecture, but that corrected captions were only provided for certain lectures, upon students' request. Again, the response to this potential change was mostly negative, with 7% of students saying it would make their learning experience significantly worse, and 58% stating that it would make their experience slightly worse. Roughly a quarter or surveyed students (28%) said it would make no difference to their learning experience (Figure 14).

If auto-generated closed captions were available for every lecture recording, but corrected closed captions were only provided for certain lectures (upon students' request), how would this affect your learning experience?
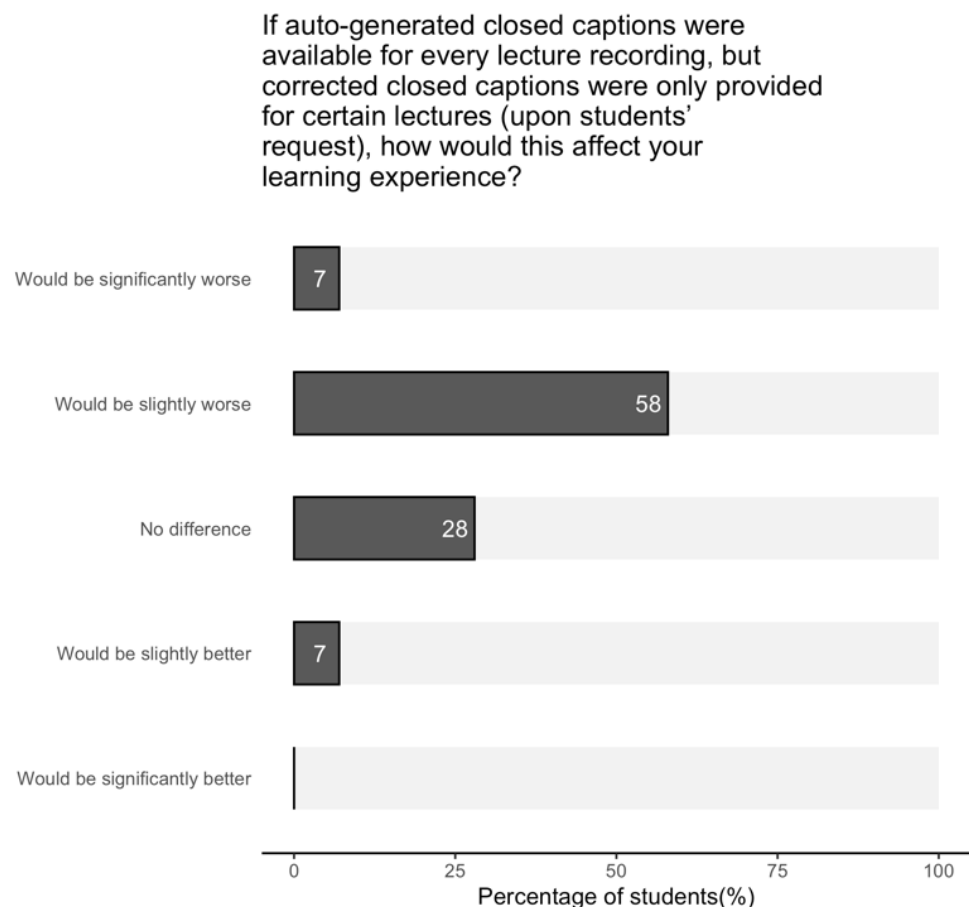
Figure 14. Students' responses to the third proposed scenario, in which auto-generated captions were available for every lecture, but corrected captions are only provided for lectures upon students' request (n=121).

Students were less negative about this scenario than if no captions were provided at all, but responses were generally slightly negative. Students argued that it would give them more hassle needing to request corrections for specific lectures. A few highlighted that it is unfair for disabled students, who need corrected captions for accessibility reasons, to have to request corrected captions for particular lectures, and mentioned that they would just end up requesting them to be corrected for every lecture. Some students mentioned that if only some lectures could be corrected, students would not necessarily agree on which lectures should be corrected.

"I would prefer for all captions to be corrected where possible, as the vast majority of lectures on my course (especially at third year level) contain complex or technical language which is poorly transcribed by automated captioning software, and even without technical language it is often inaccurate. I would otherwise have to personally request this for every recorded lecture I wish to view, which would be frustrating and potentially unfair since other more abled students may not be disadvantaged by a lack of corrected captions."

"It's already hard for disabled students, we shouldn't have to chase up the things we require to learn"

"Would not be as bad but would be a hassle to have to ask for them"

"Not all students will agree on which lectures should receive corrected captions so chances are one you wanted corrected would not get selected to be corrected"

"Although I don't use them much when I do use them there's no point if they're wrong"

"Information would be missed and time could be wasted waiting for them"

ADDITIONAL FEEDBACK/IDEAS FOR THE CAPTIONING SERVICE

Students were asked at the end of the survey to give any feedback or ideas that they had about the captioning service in the school. These are their responses:

Lecturers captioning lectures themselves
"The lecturers should rewatch and personally correct anything that wasn't correctly autocorrected, especially for key biological terms"

- This is not particularly feasible given lecturers' schedules, and is not the best use of lecturer's time. This is currently done through the captioners, consulting with the lecturer whenever there is confusion or ambiguity.

Captioners being consistent when they can't transcribe something
"I think its a great idea, and 99% of the time it works out fine. Occasionally there are a few errors, but the ones i have experienced have looked something like this "you can see that this species [?] is..." so it's very clear what bit is unclear, instead of writing in something random which would not be ideal"

- This is a great suggestion. I will advise all captioners to make clear when something is not transcribable, so that the students know exactly which part of the lecture is unclear.

Notify students when corrected captions are available
"Are there any ways to notify the students whenever the corrected close captions are available? It does not have to be an email or a notification, just bracketing it would be fine."

- Captions should be completed within 1 week, and students should be notified by the lecturer or course organiser if this is not going to be met. The 1 week schedule should be kept to, and lecturers/captioners should be reminded to notify students when this is not going to be met. This will be emphasised in the training materials given to both lecturers and captioners.

Several students highlighted that captions were often missing from lectures, even more than a week after their presentation.
"There have been multiple occasions across multiple units in which automated captioning has not been applied to lecture material (even after a week of it being uploaded). I am not sure whether this has been a fault with the software or otherwise. In these cases, I contacted my course rep who relayed the issue on and thankfully managed to resolve it - which is great but it is still frustrating that it happened in the first place. Perhaps it would be worth reminding lecturers to check that their material is captioned? Other than that, the uni captioning service has truly been a lifesaver in making recorded material accessible for me and I really do appreciate it!"

"Actually do what you say you do, and make captions available on all lectures as they currently are not."

"Ensure that captions are on every lecture (using the same software) because sometimes lecturers used different sites for their RePlay, some without captions and it was quite irritating"

- Captions should always be given for synchronous material in the School. Sometimes the 'within a week' deadline is not met for reasons out of the control of captioners and lecturers, usually due to technical issues. Technical problems can delay both the uploading and correcting of captions. Hopefully the streamlining of training will ensure fewer technical problems.

Analyse how quickly lecturers speak
"Quality of captioning depends on how fast the lecturer speaks, a way to solve this could be analysing how much content lecturers are trying to fit into a 50 minute lecture"

- This is not particularly feasible and is beyond the remit of the captioning service. In addition, lecturers' styles of teaching are varied and this is usually something to be valued, so long as they can be understood.

Correct captions on asynchronous material
"Captions on asynchronous material can be pretty dicey."

- Captions on asynchronous material is generally provided along with the lectures, but unsure if this is departmental policy.

Release corrected captions sooner
"Release correct closed captions sooner"

- Of course this would be great ideally. A week is already a very short turn-around time for captioners who are often also doing a full-time degree, so this is not particularly feasible.

Several additional comments voiced appreciation for the captioning service, and asked for it to be retained, which is encouraging.
"I really benefit from the corrected captions because my hearing is a bit crap"

"Correct captioning services are an essential accessibility requirement, for students with auditory impairments or auditory processing issues, or for students whose understanding of English may be facilitated by reading rather than hearing the lecture content. Closed captioning of lectures is an essential service that should be retained"

"I really appreciate the use of the closed captions and hope they continue to use them in the future"

"I think it's really beneficial for students and great that the effort is made for us."

"Keep it up I guess"

"It is a valuable service provided by the uni"

"I think the corrected captions are great!"

"Please continue to provide corrected closed captions for every lecture recording; they are much appreciated."

"It is really useful. Thank you and please keep providing corrected captions for all recordings."

APPENDICES

APPENDIX A: Anonymous quotes highlighting why students found that captions helped with learning, 77 of 121 students.

- Struggle with auditory processing, more of a visual learner

"I can process words better than audio so its more helpful for my notes."

"i need captions as it really helps me to retain information, even when watching tv, i tend to struggle with auditory processing"

"I can find it hard to understand just peoples voices"

- Helps with understanding technical language/concepts

"Mostly for visualizing technical jargon and concepts , i retain those better than if i had just heard the words"

- Helps with focus/concentration

"it helps me take in the information, and focus better, or if i cant fully understand what the lecturer is saying"

"Allows me to maintain focus. Otherwise may lose concentration"

- Helps with retaining information

"Helps me retain the info better"

"It's harder to retain the information just from audio memory"

- Helps with spelling

"Sometimes it's hrs to understand what the lecturer is saying and know how the terms they are discussing are spelt"

"Assisting in visualizing the spelling of key technical words, an area of weakness due to my dyslexia"

- A combination of audio and text is useful for learning

"Helps me better focus on what is being said with both ears and eyes"

"I find the information really sinks in for me if I can look at the words the lecturer is saying as well as hearing them audibly."

"I learn better with a combination of reading and listening and find it easier to understand"

- Helps with note-taking

"Easier to copy down notes"

"To check I am noting down information correctly"

- To find information not included on the slides

"To find information not on the slides"

"When it's hard to understand what the lecturer is saying or for spelling of complicated words. It's also useful when making notes that aren't added in the PowerPoint."

- To allow pausing and still see what the lecturer has said

"Allows pausing whilst still maintaining image of slide, with what the lecture has said alongside."

APPENDIX B: Anonymous quotes highlighting why students found captions useful for understanding the lecturer, 48 of 121 students

- General feedback – helps to understand the lecturer

"If I cannot understand the lecturer then the closed captions help and with understanding scientific terms"

"it helps me take in the information, and focus better, or if i cant fully understand what the lecturer is saying"

- Helps to negate technical issues

"Sometimes the audio is muffled or doesn't pick up well so it's hard to understand what the lecturer is saying"

"Poor audio"

"If the audio is unclear the captions help"

- English is a second language, international students

"I am an international student and sometimes I was not be able to catch what the lecturer was talking about due to my limited English ability."

- Find it hard to understand voices in general

"I can find it hard to understand just peoples voices"

"I struggle with understanding / processing information solely from audio, captions help me understand the content."

"I find it difficult to take in what someone is saying sometimes and would rather read it."

- Lecturer's accent or pronunciation

"Some lecturers, speak very quickly, or have strong accents (Not a bad thing!) so having captions, helps to understand the language used"

"I find CC very helpful when the lecturer has a strong accent or there're unfamiliar jargons."

"Some lecturers are difficult to understand (especially with very strong accents)."

- Disability

"I struggle with understanding / processing information solely from audio, captions help me understand the content."

"As stated above, closed captions are necessary on recorded material for me to be able to understand what is said, as I am deaf/hearing impaired."

"I have hearing difficulties so find it hard to understand an in person lecture when there are no closed captions."

"It is the only way I can engage with my lectures due to disability, and case-by-case disability support never happens at this university, so it is the only way to get the disability support I need."

"Assisting in visualizing the spelling of key technical words, an area of weakness due to my dyslexia"

- Lecturers' pace of speaking

"I really struggle with processing what people have said quickly so if I have a visual aid as well it helps me understand what is being said and retain the information."

"As they often help to know what the lecturer is saying especially if they talk quickly."

- Watching at higher speeds

"Makes lectures easier to absorb above 1x speed"

"Technical language and I can watch them at a faster speed"

- Watching in a noisy environment

"If I am watching a lecture in a noisy environment (which I often do), closed captions are vital. Also, a lot of the lecturers have quite strong accents and the closed captions really help with understanding what they are saying."