Curtin University

# MAINSTREAMING CAPTIONS FOR ONLINE LECTURES IN HIGHER EDUCATION IN AUSTRALIA

## Alternative approaches to engaging with video content

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# Mainstreaming Captions for Online Lectures in Higher Education in Australia

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# Table of Contents

# List of Figures

# Glossary

| | |
|---|---|
| ADA | Americans with Disabilities Act 1990 |
| ADHD | Attention deficit hyperactivity disorder |
| ASD | Autism spectrum disorder |
| BSA | Broadcasting Services Act 1992 |
| Curtin | Curtin University |
| CAP | Curtin Access Plan |
| CVAA | Communications and Video Accessibility Act |
| DAIP | Curtin's Disability Access and Inclusion Plan |
| DDA | Disability Discrimination Act 1992 |
| DTA | Digital Transformation Agency |
| MOOCs | Massive Open Online Courses |
| NAD | National Association for the Deaf (US) |
| NESB | Non-English speaking background |
| OLT | Office for Learning and Teaching |
| OUA | Open Universities Australia |
| TEDF | Curtin's Teaching Excellence and Development Fund |
| UNCRPD | The United Nations Convention on the Rights of People With Disabilities |
| WCAG 2.0 | Web Content Accessibility Guidelines 2.0 |
| W3C | World Wide Web Consortium |

# Acknowledgements

# Executive Summary

Captions can be defined as the text version of speech and other sound in traditional audio visual media such as films, television, DVDs and online videos. Captions are usually provided to enhance audio content and are typically recognised as benefitting two main groups – people with hearing or learning difficulties and those who come from a non-English speaking background (NESB).

Universities worldwide are also beginning to see benefits in captioning in different contexts as they increasingly adopt online modes of delivery, particularly online recorded lectures. The provision of captions on recorded lectures is a relatively new technology at Curtin University (Curtin), only being introduced in 2012. However, in a worldwide context, universities in the US have been encouraged to caption their online lecture content since 2010 following the introduction of the Communications and Video Accessibility Act (CVAA) or risk legal action under the Americans with Disabilities Act 1990 (ADA). While current legislation in Australia is not so demanding, it is perhaps only a matter of time before we follow the more inclusive American model.

There is therefore a need to explore the opportunities captions could represent in the context of online recorded lectures, and how this could benefit all students who are expected to engage with lecture content, not just those within the above two groups. These might include students with disabilities, older students, those with diverse learning styles, and students who experience difficulty accessing online videos for reasons related to issues with their environment (noise) or with technology (connectivity or equipment). Additionally, captioned video has the potential to significantly improve digital archival of files by indexing the full text, thereby facilitating searching and retrieving lecture content for all students.

Recorded lecture technologies currently in use within Australia are already designed to support captions. For example, the lecture recording platform in use at Curtin – Echo360 – has inbuilt software allowing for the addition of broadcast quality captions as well as full transcripts. The lecture recordings can be supplemented by several tools which enable captions to be easily integrated and accessed. There is also flexibility in the method of presentation – depending on viewer preference, captions can be viewed either in a separate window or overlaid on the video screen; toggling between these modes is as simple as clicking a button. Other features of Echo360 designed to assist learners with revision and note taking include downloadable transcripts, bookmarking and searchable content – students are able to search for keywords in both the captions and the lecture slides. It is important to note that none of these elements require additional development from educators

as they are already integrated within Echo360's lecture recording technology. The mainstream adoption of captions and transcripts would therefore be a relatively simple shift.

This report details findings of Curtin's Teaching Excellence and Development Fund (TEDF) funded project *Alternative Approaches to Engaging with Video Content.* The project sought to determine the usefulness of captioned recorded lectures as a mainstream learning tool for a range of stakeholders. In addition to reviewing relevant university, national and international literature and policies, the project surveyed 56 students enrolled in three key units in the Internet Communications degree program in which captions had been mainstreamed for the purpose of the project.

The research attempted to answer the following questions:

> *Do students as a diverse population benefit from personalised learning approaches, and accommodations designed to assist students with disabilities? Do these approaches benefit the entire student cohort, and how do all students utilise captioned lectures as part of a personalised approach to learning?*

This report has three parts. Part 1 reports on a comprehensive literature review of the use of captioning in higher education conducted as part of this study. Material was sourced through library and web searches using combinations of the search terms *caption, transcript, lecture* and *education.* Reference lists from relevant publications were also reviewed for additional sources. The literature review identified two key areas of prior research – the benefits of captioned online lectures for 'at risk' students (such as students with disabilities, including hearing, cognitive and learning disabilities, NESB students and mature aged students) and the benefits to the entire student cohort (particularly with regards to acknowledging diverse learning styles and enhancing access to technology).

Part 2 presents an analysis of policies regarding online and recorded lectures and the provision of captioning services and covers Federal legislation, internal Curtin policies regarding disability access, and policies offered by external partners. In Australia, while lectures are not subject to the entertainment-related captioning requirements of the Broadcasting Services Act 1992 (BSA), universities *are* bound by the accessibility requirements of the Disability Discrimination Act (DDA) 1992 and the Disability Standards for Education 2005. However, following changing international cultural sentiment around the mandated provision of captions for online on demand videos services in the entertainment arena (see Ellis, Kent, Locke and Merchant, 2016 regarding Netflix's appeal against the push to caption its catalogue), activists have also initiated disability discrimination complaints against American institutions Harvard and the Massachusetts Institute of Technology (MIT)

who do not currently caption their video lectures (Lewin, 2015). Universities are therefore becoming the next target in the ongoing debate as to whether the internet – and specifically online lectures – constitutes a place of public accommodation. Curtin acknowledges this by offering captions on all of their Massive Open Online Course (MOOCs) in line with US legislation, yet to date they have not followed suit with regards to their more 'traditional' online lectures.

Part 3 of the report is concerned with the findings of and offers discussion on the results of the survey and interview stages of this research with the 56 students who participated in the project. These students were enrolled in three units which trialled mainstreaming captions in 2015 and 2016. Insights were gained into both how students actually used the captions and how they anticipated using them in the future should Curtin embrace them as a mainstream approach. The survey data were triangulated with five follow-up interviews with students, teaching staff and support staff such as disability support officers. In summarising the findings, in addition to the 'expected' benefits to disabled and NESB students, there were three further benefits noted:

- Lecture captions are also beneficial to students without disabilities, assisting them to absorb and review educational materials.
- A very high level of engagement with the Echo360 lecture system was reported – over 90% of students accessed online lectures and the majority (over 70%) viewed them once or more per week.
- Captions assist all students make use of the recorded materials, for example the additional features of Echo360 such as the search function and downloadable transcripts.

If made available, students will utilise captions as part of a personalised approach to learning. Captions assist students undertake revision of course content, either via keyword searches or complete transcripts. Students who utilise captions as part of revision frequently re-engage with course content. However, the approach taken to the provision of captions in the Australian higher education sector continues to be located as a disability issue whereby specific students must request their availability as part of an access plan via dedicated disability offices. We therefore recommend the Australian university sector expand the use of captions from a purely assistive technology for people with disabilities to a mainstream instructional technology.

# Introduction

Captions are the text version of speech and other sound in audio visual media. Historically they have been provided for people who cannot understand audio either due to hearing impairment or language difficulties, yet their mainstream benefits are also becoming increasingly recognised. Captions can be either open (meaning they are visible to every user) or closed (this allows the user to turn them off and on). Captions are available on the majority of broadcast television, on many DVDs, in some cinema sessions and increasingly on online videos, for example video on demand services such as Netflix and even user-generated content such as YouTube.

With universities increasingly making use of online learning management systems to deliver lectures and learning materials, it is time to consider the potential this accessibility feature might represent in an academic context. In Australian universities, many courses provide lecture notes as a standard learning resource; however, captions and transcripts are not usually provided unless required for a particular student (Worthington, 2015), that is their use has been limited to those that request it through dedicated disability support officers. These students with disability represent a small but increasing portion of an already diverse student population in Australian universities. Between 2001 and 2015 the percentage of disabled students enrolled at Australian universities almost tripled from 21,000 to 60,000, increasing from 3.14% to 5.80% of the domestic student population (Department of Education and Training, 2016). People with disabilities are still underrepresented in higher education in Australia where 18.5% of people identify as having a disability (Australian Bureau of Statistics 2009). In order for this group to succeed at university, many of these students will require their learning materials in an alternative format such as captioned lectures.

This introduction will therefore consider the benefits of online lecture captioning from an Australian perspective for both the disabled and non-disabled student population. It outlines a brief timeline of the history of captioning, both in an entertainment and educational context, and offers a particular focus on the concept of increased access through universal design as well as Curtin's role in promoting this both in Australia and on an international stage.

## Benefits of Online Lecture Captioning

Universities have long recognised the importance of promoting accessible online environments and encouraging an individualised approach to learning for all students – both students with disability and those without (Alty, Al-Sharrah, & Beacham, 2006; Kinash, Crichton, & Kim-Rupnow, 2004). Indeed, this idea of increasing student engagement in

online delivery through a personalised approach to learning is a vital area of concern in contemporary international pedagogy.

According to one study, students claimed to engage more with video over other forms of multimedia (Everett & Wright, 2012); this use of video in online teaching and learning also has the added benefit of including students with disabilities, if it is made accessible (Ellis, 2011), for example by captioning the video content. Research has found that captioned video improves the educational experience for all at risk students, including those without hearing impairments (Bowe & Kaufman, 2001), or from a NESB (Griffin, 2015). Further research has found that one in three Australian students with disability benefit from captioned lectures (Cap That!, 2015) and accessibility for students with disability improves when captioning is mainstreamed as part of the online educational environment (Seale, 2014). Closed captions also improve both comprehension and vocabulary for the majority of the student population (Podszebka, Conklin, Apple, & Windus, 1998) – they enable easy comprehension of vocabulary that is spoken very quickly or with with accents, mumbling or background noise, as well as clarification of full names and technical terminology. This is of particular note with the increased internationalisation of higher education (Montero Perez, Peters, Clarebout, & Desmet, 2014; Montero Perez, Van Den Noortgate, & Desmet, 2013). Users of captioned online videos also report higher user engagement and better user experience (Griffin, 2015). Captions also assist students watching content in sound-sensitive environments like offices and libraries and offer the opportunity to increase search engine functionality (MIT, 2016), allowing students to jump to the exact point in a lecture they are looking for during assignment revision.

## History of Captioning

While captions are most often associated with making film and television (entertainment) content accessible to people who are either D/deaf or hard of hearing, their significance within education has been evident since the technology first evolved, as has their mainstream commercial benefits. During the 1950s, educators at schools for the D/deaf and hard of hearing in the US captioned movies for their students (Downey, 2007, p. 70). In 1971, Malcolm J. Norwood, at the time the chief of Media Services and Captioned Films, reflected on the ways captioned movies had potentially improved the educational outcomes for D/deaf or hard of hearing students (Norwood, quoted in Perkins, 1971, p. 3):

> *When the Office of Education began to caption motion pictures for deaf children and adults some 11 years ago, the subtitles were geared to a reading speed of 120 words per minute. Believe me, we had our share of complaints regarding the speed of the*

*captions. Approximately one and a half years ago, we unilaterally increased the reading speed from 120 words per minute to 144 for all films aimed at adult audiences. We haven't received a single squawk. I mention this to you as a matter of interest for if captions have contributed to the advancement of our deaf population, what will they do for the general population?*

Norwood's remarks opened the *First National Conference on Television for the Hearing-Impaired* in 1971. This conference was convened in the hopes of establishing the Deaf community as a key audience demographic and potential untapped market. At the time, a number of television programmes received government funding to trial the broadcast of captions as a commercial venture, and advocates for the Deaf were beginning to focus on the rights of all citizens to be able to access television as a public service.

While the history of captioning in the US was prompted by social groups and activism, the teletext system adopted in the UK was devised as more than closed captioning for the D/deaf and hard of hearing – it was seen to have commercial applications and mainstream benefits as well (Schlesinger, 1985). Similarly, in Australia, captions first became available on television through this teletext system in 1981 when the Australian government provided a grant to establish the Australian Captioning Centre (see Figure 1 for a detailed timeline). This centre provided captioning for the ABC, Nine and Ten networks, while Seven adopted its own in-house captioning service. However, throughout the 1980s access to captions was only available via expensive hardware, most viewers were unable to afford the technology and, without significant numbers making use of available captions, broadcasters were therefore not inclined to increase captions on television. It was not until the 1990s and a combination of internationally led activism, the adoption of several new pieces of legislation (specifically an amendment to the BSA (1992)) and the availability of more affordable hardware for consumers, that captions became more widely available. Now, captions must be made available on 100% of content on Australian broadcast television between 6am and midnight.
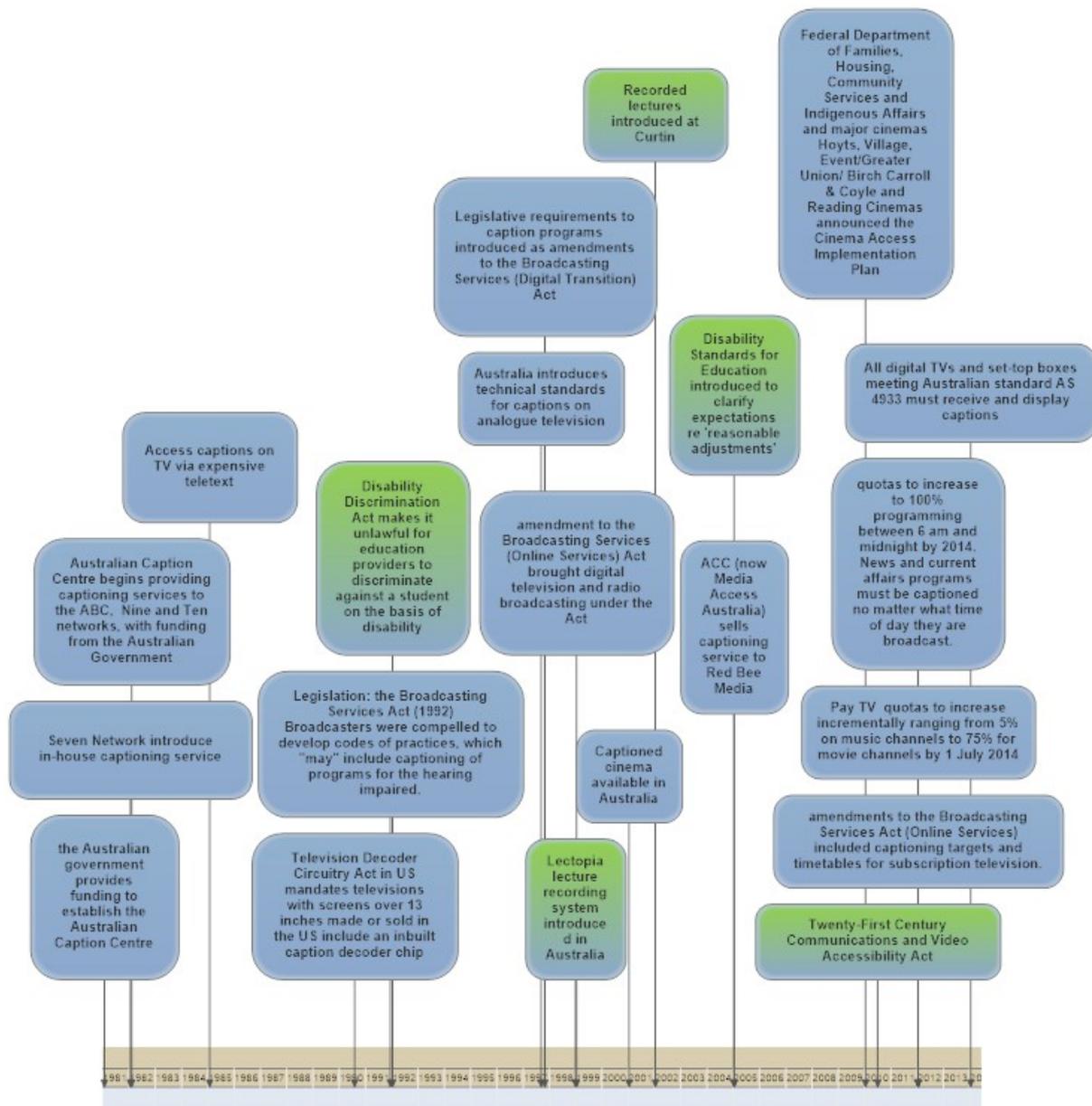
*Figure 1: A timeline of captioning in Australia*

The provision of captioned recorded lectures in higher education has followed a similar progression to that of other accessible media in this country. Just as radio preceded television, audio recorded lectures first became available via the Lectopia system developed at the University of Western Australia (UWA). Initially called iLecture, it was first used at Curtin in 2002. In 2007, the system evolved to incorporate limited video intended to capture documents (Chang, 2007). As Figure 2 shows, in 2007 Lectopia was acquired by the US-based Anystream Apreso who then formed Echo360. This more economical system of captioned recorded lectures was then introduced at Curtin in 2012, again following the introduction of international activist intervention and national and international legislation.
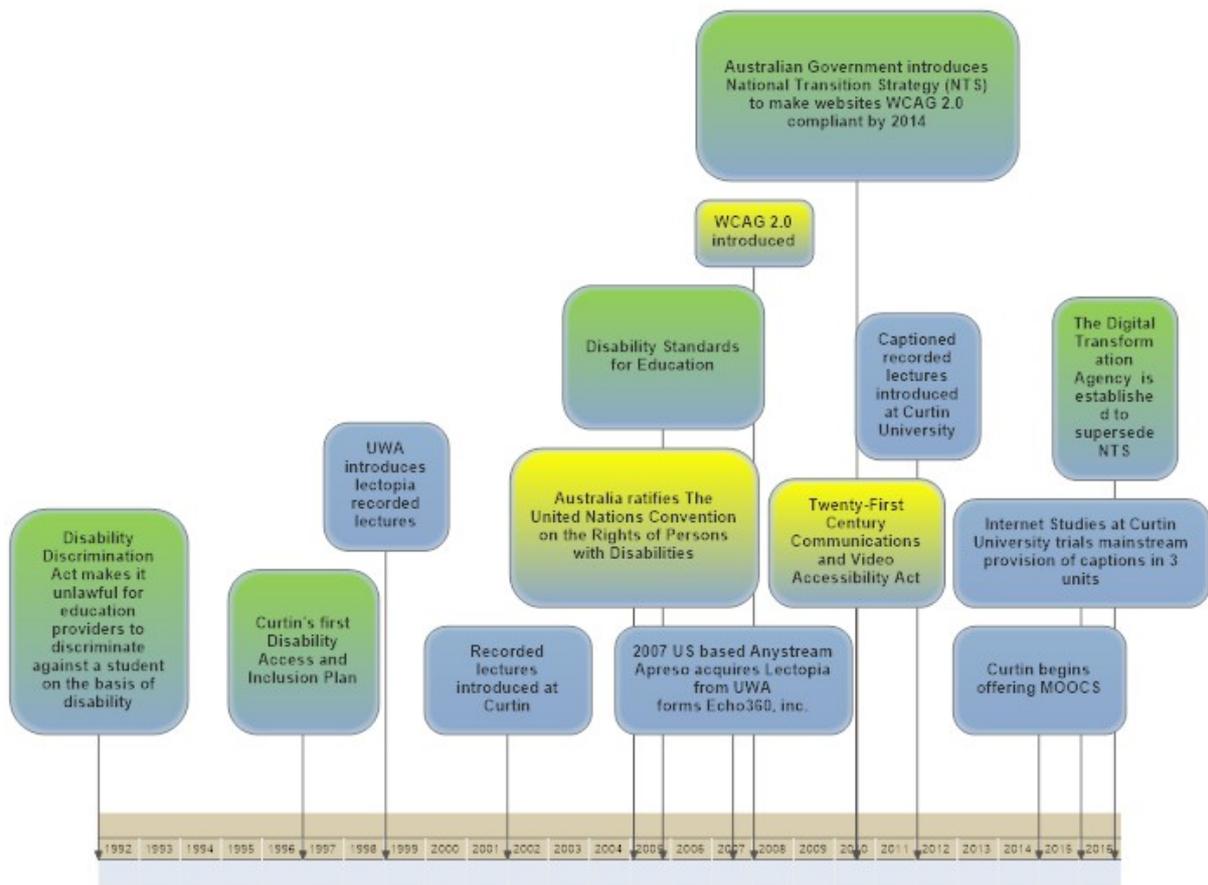
*Figure 2: A timeline of captioning online lectures in Australia*

## Towards More Inclusive Education

With regards to increasing the ease of access to such services, in 1997 Curtin was the first Western Australian university to introduce a Disability Services Plan; this was prior to the 2004 amendments to the Disability Services Act 1993 (WA) which mandated the provision of such plans. The 1997 plan pledged a commitment to an inclusive environment for people with disabilities. However, a shift in Curtin's approach to disability inclusion is evident in the intervening 20 years. Initially, Curtin's commitment to disability inclusion could be described as a reactive 'removing barriers' approach, where now there are attempts to take a more proactive model of shared responsibilities and inclusive design via Curtin's Disability Access and Inclusion Plan (Curtin University, 2016b). This vision also extends to how disabled students access technology. Broadly speaking, the importance of information technology to people's experience of disability has been approached from two distinct traditions. The first approach emphasised the need for specialised, often expensive, technology and support, a reactive model. More recently, a second, more proactive, tradition has encouraged disability technology to be designed as part of mainstream technological systems, a concept known as universal design.

Universal design uses curricula and materials that are flexible enough to accommodate a wide variety of learning styles and needs (Ash, 2011), with the additional benefit of long-term cheaper adoption and adaptation (see Ellis & Goggin, 2016). Through a commitment to this idea of universal design, Curtin seeks to create an environment accessible to the widest range of people – their vision is that there is no longer a need to remove barriers, the idea being that these barriers should not exist in the first place. This concept of mainstreaming disability access in education also has many social advantages. It creates a more inclusive environment for students with disability who no longer have to wait for course materials, nor make use of substandard materials. Significantly, a mainstream approach to accessibility is also more readily accepted by the general population (Innes, 2016) and could have the added benefit of reducing or removing disability stigma and giving students greater control over decisions around disclosure of their disability (Kent, 2015; Ellis & Kent, 2011). In addition, such adjustments introduced to assist students with disability often also have far reaching benefits for the non-disabled population (Alltree & Quadri, 2007). For example, the iLecture / Lectopia platform, while conceived with students with disabilities in mind, is now a vital teaching and learning resource for almost everyone (Ellis & Kent, 2008) and has resulted in the widespread and timely availability of this resource.

Yet, with each new form of audio visual technology, the debate around barriers to the provision of captions re-emerges. Key points of contention focus on how to enable viewers to turn captions on and off easily (Ellis & Kent, 2008) and whose responsibility it is to provide the captions – the creators or distributors of the video. However, at Curtin, the technology to provide closed captions to online lectures (meaning only those that want to use it can turn it on) is well established; Echo360 already offers this feature. Further, with universities being both the creator and distributor of the content, there is no question as to whom is responsible. It can therefore be argued that placing captions on all recorded lectures would be a true example of universal design – the lectures would not need to be adapted in individual cases, and people who required them, such as those with hearing difficulties or from NESB, could readily access the information straight away rather than having to organise special adjustments. The only remaining factor therefore seems to be cost. However, the clear cultural and inclusivity benefits for mainstreaming captions, particularly in relation to assisting those students from a NESB, may assist with commercial objectives. In the ever-increasing internationalisation of education, the provision of captioned recorded lectures – providing another tool for students to personalise their educational environment – could provide Curtin with a competitive edge, both within an international and local marketplace.

A clear example of this is the development of accessibility features in MOOCs. MOOCs are online units in higher education designed specifically for a large diverse and international student group and Australian universities are keen to expand into this new area. However, data show that the main group of students attracted to this type of offering are based in the US (Selingo, 2014) and, as such, these units need to be optimised for both this type of student (Bennett & Kent, 2017) and also to comply with accessibility regulation for the US market. In 2015, the National Association for the Deaf (NAD) filed a lawsuit against MIT and Harvard for violating the ADA by failing to provide closed captioning for their MOOC content (Lewin, 2015). A separate settlement reached by the Department of Justice last year confirmed that US institutions have a legal obligation to provide fully accessible educational materials (OPA, 2015). As a result of this ruling, all online lectures presented within a MOOC through the main MOOC developers – almost all of whom are based in the US such as Coursera and edX – are captioned by default. Any Australian universities hoping to reach the US market will have to compete with fully accessible US courses. Interestingly, even providers such as FutureLearn that are not based in the US have also adopted captions as a standard, perhaps with an eye to being compatible with the US' regulatory environment. In addition, for the domestic market, the expansion of online or distance education courses provides greater incentives to improve accessibility of lectures through the provision of captions – one set of lectures is often used for multiple iterations of a unit and captions do not necessarily have to be generated in real time (Bilowus, 2013; Burgstahler, 2015; Cavender, 2010).

This improved cost effectiveness and the increased expectation of fully accessible higher education in both Australian and US markets mean that basic accessibility requirements such as captioned and transcribed lecture content may soon become a mainstream expectation. In addition, from a legal perspective, while Australian universities are currently able to comply with national accessibility legislation by providing captions on demand on a case by case basis, the internationalisation of higher education, and the evolution of regulation in other jurisdictions, suggests mandatory captioning will be coming to the Australian higher education sector sooner rather than later.

## Methodology

Both this study and others have argued that captions benefit a wide range of students – those with and without hearing difficulties (Griffin, 2015), students from a NESB, those who have a learning disability as well as a wide range of others (Bowe & Kaufman, 2001). However, in the Curtin context, captions are typically only provided to students with the following disabilities – D/deaf or hard of hearing, complex physical disabilities, mental health conditions and/or dyslexia/dysgraphia, attention deficit hyperactivity disorder (ADHD) and students with autism spectrum disorder (ASD).

The research attempted to answer the following questions:

> *Do students as a diverse population benefit from personalised learning approaches, and accommodations designed to assist students with disabilities? Do these approaches benefit the entire student cohort, and how do all students utilise captioned lectures as part of a personalised approach to learning?*

The project sought to assess online captioning in teaching resources in order to determine its usefulness in enhancing inclusivity and learning outcomes for the disabled, international and broader student population. Data was collected from the current national and international literature and policies in this field as well as via surveys and interviews with a range of stakeholders including Curtin students, Open Universities Australia (OUA) students studying through Curtin, teaching staff and disability support officers. The breadth of information collected amongst these groups with different knowledge and expertise in teaching and learning was instrumental in understanding how the addition of captions can potentially enhance learning and teaching in a personalised learning environment.

This project was funded by Curtin's TEDF. The broad aim of the TEDF is to improve the quality of teaching, learning and assessment in alignment with the aspirations of the Learning for Tomorrow agenda at Curtin, as well as national priorities outlined by the National Office for Learning and Teaching (OLT).

The project adopted a multi-modal methodology across three parts:

Part 1: Literature review. An extensive literature review on the use of captions in higher education was conducted. We sought to identify how captions were being used in higher education, both in traditional lectures and classroom settings as well as online. Material was sourced through library and web searches using combinations of the search terms *caption, transcript, lecture* and *education*. Reference lists from relevant publications were also

reviewed for additional sources. Of approximately 250 sources relating to the use of accessible digital technology in education, 98 specifically related to the use of captioning in higher education, particularly in lectures. These included blog posts, news articles, academic journal articles, conference papers, dissertations and published reports. The majority of sources discussed or investigated captioning either as an assistive technology for people with disabilities or as an instructional technology for education. Speech-to-text or automatic speech recognition software was the most commonly featured captioning technology. An abridged version of this literature review is included in this report; the full review is available upon request.

Part 2: Policy review and discussion. A review of current regulations and policies relating to online and recorded lectures and the provision of captioning services relevant to Curtin was conducted to give context and background to the study and to help understand the current system. The review focused on three main aspects – Federal legislation, internal Curtin policies regarding disability access, and policies offered by partner organisations. As part of this review an online training module about how to make use of captions was developed for students (available as an Appendix in this report).

A selection of units then provided captions as a mainstream learning tool over the course of the unit.

Part 3: Online survey. A cohort of selected Curtin students enrolled in both on-campus and online study through OUA between November 2015 and November 2016 enrolled in these units were surveyed. Insights were gained into students' use of captioned video at the time of the survey and their anticipated future usage of these services.

The units surveyed include *Web Communications*, an introductory unit for the Internet Communications major, and its complementary first year unit, *Internet and Everyday Life*. Students of an additional second year unit, *Web Media*, were also surveyed at a later date.

At Curtin, a lecture that is given to a cohort of on-campus students is normally recorded through the Echo360 system automatically. This lecture is then made available online – this allows on-campus students to be able to review the lecture material and also allows access for students studying externally and for any internal students who were unable to attend the live lecture. Significantly, these recorded lectures are then also used as a resource for students studying externally though OUA throughout the year.

During the study, lecture captions were provided to all the cohorts surveyed using the existing captioning system available through the Echo360 lecture recording system. As well

as providing a written caption of what is being said during the lectures, this system also allows some sophisticated search functionality through the lectures for students, as well as access to a total transcript of the lecture. In the case of the two introductory units in the Internet Communications degree – *Web Communications* and *The Internet and Everyday Life* – these lectures are used in all four OUA study periods throughout the year, meaning that each recorded lecture series is used across up to five separate cohorts of students. However, these recorded lectures are normally only captioned through the request of a student with disabilities through their Curtin Access Plan (CAP). When this occurs, it is done primarily for the benefit of that one student, with little consideration for the potential benefits to the other students in the unit.

The survey was divided into four specific phases – the initial survey, the implementation of training modules and the subsequent follow-up survey, the final survey phase and, finally, follow-up interviews. The initial survey was carried out on online students completing the *Web Communications* unit during OUA study period three in 2015. This unit had already been captioned through a participating student's CAP and students in this cohort were surveyed to gauge their use of the captioning system. However, none were provided with any training in how to use the system or had its availability promoted to them. Students were sent an online survey that explored their use of the recorded lecture materials and the captioning system. Six of the 80 students in the unit responded to this survey.

In the second phase of the survey, captions were also made available to the second introductory unit in the Internet Communications program, The *Internet and Everyday Life*, so that both units offered captioned content in OUA study period four for 2015/16. To raise awareness of the existence of the captions, and to help students make the best use of them, a training module for the use of the captions system in Echo360 was developed. This consisted of a step by step tip sheet (see Appendix) and an explanatory video presentation being added to the units' online learning materials. Staff teaching the units also tried to make students aware of the captioning system being used and directed students towards this additional instructional material. These captions and training modules were then available for both these units throughout 2016 for OUA units, and for on-campus Curtin students from semester two of 2016. A subsequent follow-up survey mirroring the questions in the first one was then conducted for all students enrolled in these two units – for OUA students this was completed at the end of study period four of 2015/16; for Curtin students at the end of semester two 2016.

The same survey was repeated a third time, with the addition of students from the second year unit, *Web Media*. This unit had also had its lecture series captioned in study period two

of 2016 through a student's CAP and students in the unit were also given access to the training material. These students were surveyed at the completion of the study period. A total of 539 students participated in these three units across OUA study period four and two 2015/16, and Curtin semester 2, 2016. The survey sample size in this latter survey phase, where students had access to the tip sheet and training video, was 50 students, representing approximately 10% of the participating student population. Comparing cohorts with a training manual to one without has provided results that have allowed for a greater point of comparison.

The final phase of the study, five follow-up interviews, were conducted once the surveys had been completed. Interviews assessed the awareness, use and perceived validity of the captions system in the context of both learning and teaching, with reactions sought from teaching staff, students, and disability support staff. Staff interviewed included tutors and unit coordinators who taught and supervised units in which lecture captions were provided. Curtin Disability Services were also approached, and a disability support officer was interviewed in order to provide wider context. Students who participated in the survey were also invited to provide further input; however, only one responded. These interview responses are incorporated in the survey results.

It should be noted that there were some limitations which were encountered. The first cohort of students in study period three could not be surveyed until after the unit was completed, possibly reducing the rate of responses. Further, the training module was not ready for the start of study period four 2015 – this would have reduced its effectiveness for the students in the two cohorts over that study period.

# Part 1: Literature Review

The literature review identified two key areas of prior research. Firstly, the benefits of captioned online lectures for at risk students such as students with disabilities (including hearing, cognitive and learning disabilities), NESB students and mature aged students was considered. Secondly, the notion that captions have mainstream benefits for the entire student cohort due to diverse learning styles and access to technology was also evaluated. This section provides a summary of the full literature review which is available on request.

Figure 3 (adapted from Paez, Leitch, & MacMillan, n.d., p. 9) summarises the enhanced model of learning that captions and transcripts enable, using a two-step process of speech-to-text technology followed by edited transcripts. Captioned and transcribed media enable all students to access content that could otherwise have been missed or misunderstood, to enhance information processing and concentration, and to enable sophisticated study techniques through searchable transcripts.
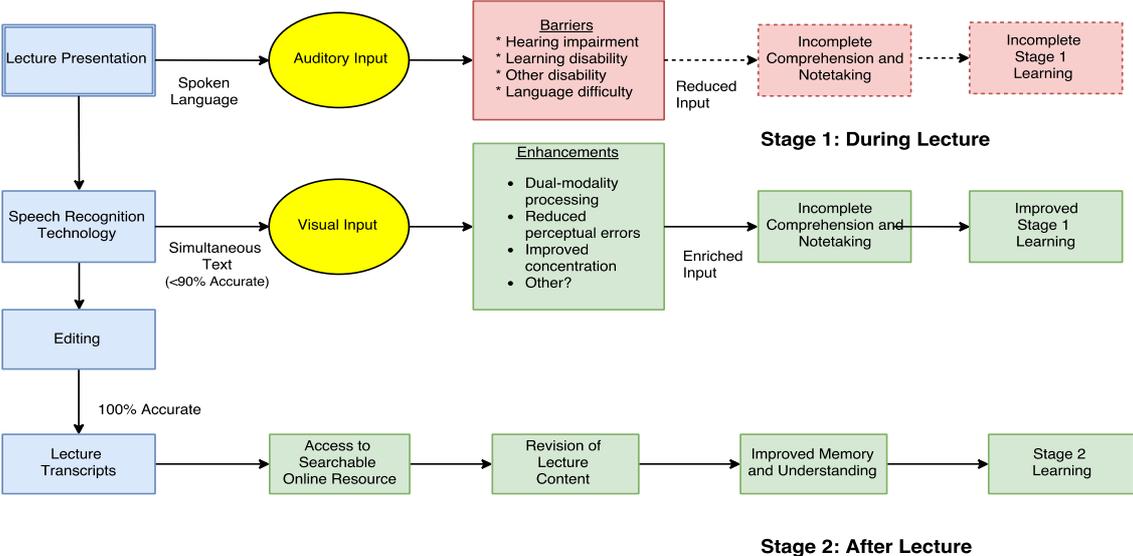


*Figure 3: Model of learning support enhanced by captions and transcripts (adapted from Paez et al., n.d., p. 9)*

## Benefits of Captions for At Risk Students

Captions benefit a range of students, particularly those considered to be at risk – the D/deaf or hard of hearing, those with other learning difficulties, or those from a NESB. For students who are D/deaf or hard of hearing captions are vital in order to engage with audio content that would otherwise be inaccessible. Indeed, it has been observed that captioning and transcripts are superior to sign language interpreters, note takers or lip reading methods of content delivery for many of these students due to the difficulty of taking notes while

watching a speaker or interpreter and the lack of experienced note takers in higher education (Stinson, Elliot, Kelly, & Liu, 2009; Wald, 2006). Other studies concur, indicating that students who are D/deaf or hard of hearing learn significantly less than their hearing peers even when relying on sign language interpreters, and that many such students prefer non-mediated instruction (such as transcripts or captions) over content that is filtered through a sign language interpreter or professional note taker (Maiorana-Basas & Pagliaro, 2014; Marschark et al., 2006). The provision of content in this way does not level the playing field entirely, but guidance on the effective use of captions and transcripts for note taking and studying can enhance its effect (Elliot, Foster, & Stinson, 2002).

Research into the use of captions for post-secondary students with a wide range of cognitive disabilities also demonstrates a significant improvement in comprehension of video information in this group (Evmenova, 2008; Evmenova & Behrmann, 2014). For example, students with autism spectrum disorder (ASD) often experience auditory processing difficulties that make speech sounds difficult to separate from background noise, making lecture content particularly challenging. While there is limited academic research on the effect of presenting information in different media combinations for students with ASD in higher education, it has been noted that children with ASD benefit from text being added to audio visual media, and this may also be the case in adulthood (Knight, McKissick, & Saunders, 2013; Reagon, Higbee, & Endicott, 2007). There is also a wealth of anecdotal evidence that individuals with ASD find captions useful (for example Garman, 2011). Researchers in the UK and Australia are therefore investigating the use of captions for people with ASD using a form of simplified captions called Simple Text (Media Access Australia, 2014). Ai-Media explain that Simple Text captions are modified to ensure they communicate a single idea in a single sentence, removing metaphorical and figurative language (Ai-Media, 2014). This helps minimise the amount of information that needs to be processed simultaneously, and is likely to also assist students from a NESB.

In addition, other anecdotal evidence suggests students with ADHD also benefit from captions. Students with ADHD sometimes receive note taking assistance due to difficulties managing attention and distractibility, as well as less obvious difficulties with audio discrimination. Yet ADHD students, like many students who are D/deaf or hard of hearing, may prefer to autonomously access direct content through transcripts rather than through a note taker (Stinson et al., 2009). However, to date, we found no successful studies of the effect of lecture captions on students from this group. Lewis and Brown (2012) investigated caption use for students with ADHD to discern whether captions were beneficial to maintaining attention to audio content or detrimental due to split attention effects, but the

results were inconclusive. Clearly more research is needed into the effectiveness of captions or transcripts for students with ADHD and how students can best harness these benefits.

Students with dyslexia can also find it difficult to take lecture notes due to the cognitive load of switching between listening and writing and sometimes have to rely on note takers. Captions or transcripts could assist students who face this challenge to create their own notes directly from the unfiltered lecture content. Interestingly, two recent studies show that many students with dyslexia perform better with text-only media such as lecture transcripts, when compared to media combinations such as sound and diagrams or diagrams and text (Alty et al., 2006; Beacham & Alty, 2006). By contrast, non-dyslexic students performed significantly better with the sound and diagram presentation. On the basis of this limited existing research, it therefore appears that students with dyslexia would benefit from having access to full lecture transcripts. Significantly, Beacham and Alty (2006) also observed that despite performing best with text-only media, students with dyslexia in their study actually preferred the worst-performing media combination, diagram and text. Further, they found the diagram and sound combination the easiest to follow. This suggests that it is particularly important to provide evidence-based information and training about effective learning techniques to students and to undertake further research into broader student preferences for the presentation of educational materials and how well those preferences correspond with learning performance.

A third group of at risk students were also considered to potentially benefit from captioning – those from a NESB. Captions have long been recognised as an effective aid for individuals of all ages who are learning to read, be they first or second language learners, beginning with studies on the literacy effects of television captions (Bean & Wilson, 1989; Block & Okrand, 1983; Koskinen, Wilson, & Jensema, 1985). Further, as Gernsbacher notes, the benefit of captioned videos for primary school students learning to read is well established in the literature (2015, p. 196). Results of a 2010 study by Linebarger, Piotrowski and Greenwood show that captioning increases comprehension of television content amongst such primary school aged students (2010). This effect carries across to adult literacy, with numerous studies identifying the benefit of captions for adults learning to read or improving their reading, whether in their first or second language (Bean & Wilson, 1989; Silver-Pacuilla, 2006; Steinfeld, 1998). The literature also demonstrates that captioning specifically increases vocabulary learning amongst second language learners (Montero Perez et al., 2014, 2013). Part of this benefit overlaps with the demonstrated literacy benefits for students, captions can also aid with comprehension of accents or rapid speech. Indeed, one study found that

international students "may be more likely to not drop a class if they know they could get captions of what the professor says" (Borgaonkar, 2013, p. 59).

In addition to these three main groups, a smaller cohort potentially benefitting from captioning has been identified. Older students are more likely to suffer from age-related hearing loss (Schmidt & Haydu, 1992), making the provision of captions or transcripts a necessary but often unidentified assistive technology. A recent study into the cognitive demands of learning has also shown that presenting information in multiple ways can result in better learning outcomes for older students in particular (Pachman & Ke, 2012).

## Benefits of Captions for the Broader Student Population

While the discussion so far has shown a clear benefit of captioned lectures to students with disabilities and other at risk groups, trends in online learning and personalised approaches to learning suggest a significant portion of the student population would also benefit from the delivery of captioned online lectures. As the authors of 'Universal Design for Learning in Postsecondary Education' argue, students learn in diverse ways, and comprehend information in different ways depending on how accessible they find the delivery (Rose, Harbour, Johnston, Daley, & Abarbanell, 2006, p. 3):

> *At the extreme are students with disabilities (e.g., those who are blind or deaf), for whom some forms of presentation are completely inaccessible. More prevalent are students who, because of their particular profile of perceptual or cognitive strengths and deficits, find information in some formats much more accessible than others (e.g., students with dyslexia, aphasia, mental retardation). Even more common are students with atypical backgrounds in the dominant language, cognitive strategies, culture, or history of the average classroom who, therefore, face barriers in accessing information when presented in a manner that assumes a common background among all students. There is no common optimal means of representing information to address these diverse learners' needs.*

Clearly, some benefits of captions for at risk students are also mainstream educational benefits for all students (Shadiev, Wu-Yuin Hwang, Nian-Shing Chen, & Yueh-Min Huang, 2014) as many students encounter similar barriers to learning. That is, students without a recognised disability can experience similar issues with lectures as students with a disability – both groups of students report difficulties hearing lectures, for example (Fuller, Bradley, & Healey, 2004; Fuller, Healey, Bradley, & Hall, 2004; Healey, Bradley, Fuller, & Hall, 2006; Madriaga et al., 2010). Captions may also be an important tool to help tackle the

underrepresentation of at risk groups in particular subject areas such as science, technology, engineering and maths courses (Wheatly, Flach, Shingledecker, & Golshani, 2010) and captions have also demonstrated a positive effect on vocabulary acquisition, which may help students to learn the subject-specific language and vocabulary of these and other academic disciplines.

In addition, overall retention of course content has been seen to significantly improve for students both with and without disabilities when using captions (Steinfeld, 1998). Captions offer accessibility to all, and the ability to adapt content to different context, constraints and audiences. Many students better comprehend content when it is presented in particular media combinations such as auditory and visually (Moreno & Mayer, 2002). Alty et al. (2006) build on this earlier research, confirming that particular media combinations can impact on learner motivation, comprehension (particularly of complex information or large data sets), cognitive load, as well as improving accessibility for those with different needs, such as students who are D/deaf or hard of hearing. Representing content in multiple ways such as through captioned and transcribed lectures can therefore enable more students to learn in their preferred way (Schweppe & Rummer, 2016).

There are also proven benefits purely regarding the technology that captions offer. Captions and transcripts can enable more consistent access to content even when it is not possible or suitable to listen to a lecture (Elliot et al., 2002; Stinson et al., 2009) – students can therefore access the content in public spaces or noisy environments, and can avoid having to replay video content whenever background noise interferes with their ability to hear clearly. In addition, provision of captions can also be an advantage in a purely online learning environment. A much more diverse group of students enrol in online learning as it can be more accessible for many students. However, students will not always have access to the ideal technology environment through which to do so – slow or intermittent internet connections, poor quality speakers or headphones, and computers that struggle to stream large files can all negatively impact a student's ability to make use of recorded lectures. Provision of a lecture transcript, or captions, may help to bridge this often invisible technology gap between students with diverse learning styles and in diverse learning environments.

Further, creating captions or transcripts for video media can revolutionise the way students index, search and retrieve information (Tuna et al., 2011; Wactlar, Kanade, Smith, & Stevens, 1996). Captions uploaded with YouTube videos can be indexed for increased

discoverability through search engines (Bond, 2014; Griffin, 2016). Students can more easily search for particular terms to find relevant lecture content when revising (Gernsbacher, 2015).

## Problems with Accessibility

While technologies, such as captions, can be valuable to students, both with and without disabilities, research by academics such as Jane Seale caution that there is a lack of awareness and understanding as to how accessibility for students with disabilities can be incorporated into the provision of online courses (Seale & Cooper, 2010):

> *Many accessibility specific tools exist, but they do not seem to be having much impact on teachers and teaching practice in further and higher education. This is evidenced by the fact that the accessibility of e-learning in colleges and universities is still very variable.*

They suggest that both technological and pedagogical changes need to occur in order for accessibility to be incorporated in the educational context.

Koshy (2014) and Kilpatrick et. al. (2016) further argue that there remains, despite clear 'guidelines' for accessibility in education, significant variation in what support is offered for students with disability. For example, Matthew Brett (2010, 2016) has looked specifically at the inclusion of people with a hearing disability in higher education, finding that, despite the existence of DDA legislation, "in exploring support considerations for deaf and hard of hearing students, who form around 10% of disability disclosures, it is evident that existing support models have been ineffective at facilitating learning for many students" (Brett, 2010, p. 7). This is further evidenced in Kent's (2016) exploration of OUA courses and the experience of students who are D/deaf or hard of hearing, arguing "problems that deaf and hearing impaired students face are often magnified in the context of eLearning".

Brett (2016, p. 111) also adds:

> *There has been a great disconnect in the current accessibility field in that legislation is aimed at changing practice at an institutional level, whilst guidelines and standards appear to be aimed at changing practice at an individual level.*

In reviewing the accessibility of online content in particular, Brett found that inaccessibility occurred at multiple levels, from university websites to the use of online materials in lectures, for example YouTube. He argued (Brett, 2016, p. 100):

*effective access to online materials requires web information to be structured accessibly. Studies into the accessibility of Australian university websites found that 100% of sites and 92% of pages failed to meet the basic standards (Alexander 2007). Further, the more frequently used online video resources like YouTube are generally inaccessible to people with hearing impairments as captions on these resources are rare.*

# Part 2: Policy Review and Discussion

A review of current regulations and policies relating to online and recorded lectures and the provision of captioning services relevant to Curtin was conducted to give context and background to the study and to help understand the current system.

This section summarises relevant policies relating to online and recorded lectures and the use of captioning services relevant to Curtin to give context for the mainstream provision of captions in contemporary higher education. It focuses on three main aspects – Australian and international legislation in relation to industry standards and best practice guidelines, internal Curtin policies regarding disability access, and policies offered by external partners such as OUA.

The review found a strong commitment to the inclusion of students with disabilities in higher education, particularly with reference to mainstreaming support. Legislation dating back to the 1990s protects people with disability against discrimination and disadvantage on the basis of their disability, including in the education sector. Education and training service providers must make "reasonable adjustments" (Australian Government, 1992, 2005) in order to ensure access to all prospective students, ensuring that no student is discriminated against. With regards to websites, and online captioned video content specifically, both national and international legislation increasingly recognises their importance in enabling disabled students to access information as readily as non-disabled students.

However, while Curtin also has a strong commitment to the provision of alternative formats, there were at times significant disparities between the commitment to access and the realisation of that goal. These disparities were sometimes due to issues the students had themselves, for example access relies on students being proactive in establishing their own CAP with the Disability Office. Further, some disparities were due to issues within Curtin, for example the timeliness of access of alternative formatting for those students who did request it and, perhaps more pertinently, a lack of policy on a more mainstream approach to captioned recorded lectures.

## Australian and International Legislation

### Australian Legislation

Two main policies apply to the provision of captioned lectures in Australian universities – the DDA 1992 and the Disability Standards for Education 2005.

*Disability Discrimination Act 1992*

The DDA 1992 makes it unlawful for education providers to discriminate against a student on the basis of disability in relation to admission, access and harassment. The Act addresses disability and education to ensure people with disability have equal access to education (Australian Government, 1992, sec. 2.2):

> *Division 2: Discrimination in other areas.*
>
> <u>*Education*</u>
>
> *(1) It is unlawful for an educational authority to discriminate against a person on the ground of the person's disability:*
>
> > *(a) by refusing or failing to accept the person's application for admission as a student; or*
> >
> > *(b) in the terms or conditions on which it is prepared to admit the person as a student.*
>
> *(2) It is unlawful for an educational authority to discriminate against a student on the ground of the student's disability:*
>
> > *(a) by denying the student access, or limiting the student's access, to any benefit provided by the educational authority; or*
> >
> > *(b) by expelling the student; or*
> >
> > *(c) by subjecting the student to any other detriment.*
>
> *(2A) It is unlawful for an education provider to discriminate against a person on the ground of the person's disability:*
>
> > *(a) by developing curricula or training courses having a content that will either exclude the person from participation, or subject the person to any other detriment; or*
> >
> > *(b) by accrediting curricula or training courses having such a content.*
>
> *(3) This section does not render it unlawful to discriminate against a person on the ground of the person's disability in respect of admission to an educational institution established wholly or primarily for students who have a particular disability where the person does not have that particular disability.*

*Disability Standards for Education 2005*

The DDA is further elaborated on in an accompanying document, titled Disability Standards for Education 2005. The primary purpose of this second text is to clarify the obligations of education and training service providers under the DDA and the rights of people with disabilities in relation to education and training. This legislation is most relevant to provision of university education for students with disabilities. This document explains that education and training service providers must make "reasonable adjustments" in order to ensure access to all prospective students, ensuring that no student is discriminated against. Adjustments and "reasonable" adjustments are both outlined below (Australian Government, 2005, sec. 3.3):

> *3.3 Adjustments*
>
> *For these Standards, each of the following is an adjustment:*
>
> > *(a) a measure or action (or a group of measures or actions) taken by an education provider that has the effect of assisting a student with a disability:*
> >
> > > *(i) in relation to an admission or enrolment — to apply for the admission or enrolment; and*
> > >
> > > *(ii) in relation to a course or program — to participate in the course or program; and*
> > >
> > > *(iii) in relation to facilities or services — to use the facilities or services; on the same basis as a student without a disability, and includes an aid, a facility, or a service that the student requires because of his or her disability;*
>
> *3.4 'Reasonable' adjustments*
>
> *(1) For these Standards, an adjustment is reasonable in relation to a student with a disability if it balances the interests of all parties affected.*
>
> *(2) In assessing whether a particular adjustment for a student is reasonable, regard should be had to all the relevant circumstances and interests, including the following:*
>
> > *(a) the student's disability;*
> >
> > *(b) the views of the student or the student's associate, given under section 3.5*
> >
> > *(c) the effect of the adjustment on the student, including the effect on the student's:*
> >
> > > *(i) ability to achieve learning outcomes; and*
> > >
> > > *(ii) ability to participate in courses or programs; and*

*(iii) independence;*

*(d) the effect of the proposed adjustment on anyone else affected, including the education provider, staff and other students;*

*(e) the costs and benefits of making the adjustment.*

Significantly, these Standards acknowledge that what is considered a reasonable adjustment "may change over time" (Australian Government, 2005, sec. 3.4). Nevertheless, it should be noted that when the Standards were reviewed in 2015, it was acknowledged that educational providers and students with disabilities and their associates often approach the concept of "reasonable accommodation" from divergent points of view. Universities were also criticised in this review for an often rigid approach to the ways courses were offered and for not always making content accessible.

While these Acts work to ensure students with disability receive the same standard of education as those without, they have been criticised for having a problematic framework. For example, they offer a minimum standard for accessibility "and do not articulate broader aspirations of social inclusion, achievement of individual potential or inclusive education" (Department of Education and Training, 2015, p. v). They have also been criticised for their reliance on a complaints-based mechanism, that is the onus falls on the person with a disability to make an individual complaint of discrimination.

The terminology used in both Acts has also been criticised for its use of broad terms – such as "on the same basis", "reasonable adjustment", "unjustifiable hardship" and "consultation" (Department of Education, Employment and Workplace Relations, 2012, p. 56) – and the consequence of this ambiguity when institutions aim to meet the Standards of Education. For example, when Elizabeth Dickson explored the way in which "reasonable adjustment" was defined and applied by examining legal cases in which it was used, she found that (Dickson, 2007, p. 38):

*… [with] the approaches of courts and tribunals to consideration of what is reasonable in the treatment of students with disabilities deconstructed, it is clear that the Education Standards may not deliver much, if anything, extra by way of "substantive equality". The moderating factor of "reasonableness" on the duty of adjustment will allow courts and tribunals to balance a range of competing considerations and the balance may or may not favour the inclusion of students with disabilities.*

The 2015 Review of the Standards (Department of Education and Training, 2015, p. ii) also found that:

… there is a clear divergence in perspective between people with disability and their associates, and education providers around exercise of discretion – particularly in relation to interpretation of the terms "reasonable adjustment" and "unjustifiable hardship". Resolving these disputes was therefore a complex process (Department of Education and Training, 2015, p. 11):

> *The differences in knowledge, perspective and decision-making power mean that effective conversations between the person with a disability (or associate) and the education provider are complex, and require a high level of skill on the part of the provider to reach the best possible outcome.*

**Australian Legislation in an International Context**

Four further documents can be seen to be particularly relevant to the Australian educational context for students with disabilities – The United Nations Convention on the Rights of People With Disabilities (UNCRPD), the National Disability Strategy, Web Content Accessibility Guidelines 2.0 (WCAG 2.0) and the Digital Transformation Agency (DTA) (previously the National Transition Strategy). While two are non-enforceable international Standards, the other two are Australian governmental policies which were introduced in an attempt to achieve their international counterpart standards.

*The United Nations Convention on the Rights of Persons with Disabilities*

The United Nations Convention on the Rights of Persons with Disabilities sets out the fundamental human rights of people with disabilities. It seeks to outlaw disability discrimination in key areas of social life including for example education. Australia became a signatory to this convention in 2008. The preamble highlights several points of inclusion relevant to this study (UNCPRD 2006):

> *Recognizing the importance of accessibility to the physical, social, economic and cultural environment, to health and education and to information and communication, in enabling persons with disabilities to fully enjoy all human rights and fundamental freedoms…*

According to the UNCRPD, people with disabilities should be guaranteed the right to an inclusive education at all levels on the basis of equal opportunity (2006 art. 24 para. 2):

> *In realizing this right, States Parties shall ensure that:*

*(a) Persons with disabilities are not excluded from the general education system on the basis of disability, and that children with disabilities are not excluded from free and compulsory primary education, or from secondary education, on the basis of disability;*

*(b) Persons with disabilities can access an inclusive, quality and free primary education and secondary education on an equal basis with others in the communities in which they live;*

*(c) Reasonable accommodation of the individual's requirements is provided;*

*(d) Persons with disabilities receive the support required, within the general education system, to facilitate their effective education;*

*(e) Effective individualized support measures are provided in environments that maximize academic and social development, consistent with the goal of full inclusion.*

With specific reference to university education, the Convention sets out to (UNCPRD 2006 art. 24 para. 5):

*… ensure that persons with disabilities are able to access general tertiary education, vocational training, adult education and lifelong learning without discrimination and on an equal basis with others. To this end, States Parties shall ensure that reasonable accommodation is provided to persons with disabilities.*

State parties are also tasked with ensuring students with disabilities have access to the alternative formats and different methods of communication they require (UNCPRD 2006 art. 24 para. 3):

*State Parties shall enable persons with disabilities to learn life and social development skills to facilitate their full and equal participation in education and as members of the community. To this end, States Parties shall take appropriate measures, including:*

*(a) Facilitating the learning of Braille, alternative script, augmentative and alternative modes, means and formats of communication and orientation and mobility skills, and facilitating peer support and mentoring;*

*(b) Facilitating the learning of sign language and the promotion of the linguistic identity of the deaf community;*

*(c) Ensuring that the education of persons, and in particular children, who are blind, deaf or deafblind, is delivered in the most appropriate languages and modes and*

*means of communication for the individual, and in environments which maximize academic and social development.*

*National Disability Strategy*

Following their ratification of the UNCRPD, the Australian government began developing a National Disability Strategy. The Strategy brought together Commonwealth, State and Territory governments for the first time in a unified approach to disability. The Strategy was devised with a view to "achieving a society that is inclusive and enabling, providing equality and the opportunity for each person to fulfil their potential" (Department of Families, Housing, Community Services and Indigenous Affairs [DFHCSIA], 2011, p. 3). The Strategy focused on improving services in a number of areas so that people with disability could become equal citizens. Education was identified as a key policy area (DFHCSIA, 2011, p. 10):

*5. Learning and skills – early childhood education and care, schools, further education, vocational education; transitions from education to employment; life-long learning.*

The Strategy recognised a significant gap between students with disabilities and those without participating in university studies. While targeted support was required, a universal design approach to mainstream education was encouraged as a way to "assist students of all abilities" (DFHCSIA, 2011, p. 54). Four key policy directions were identified (DFHSCIA, 2011, pp. 54–56), to:

- *Strengthen the capability of all education providers to deliver inclusive high quality educational programs for people with all abilities from early childhood through adulthood.*
- *Focus on reducing the disparity in educational outcomes for people with a disability and others.*
- *Ensure that government reforms and initiatives for early childhood, education, training and skill development are responsive to the needs of people with disability.*
- *Improve pathways for students with disability from school to further education, employment and lifelong learning.*

The Strategy also recommended areas for future action including (DFHCSIA, 2011, p. 58):

*Reduce barriers and simplify access for people with disability to a high quality inclusive education system including early learning, child care, school and further education.*

*Web Content Accessibility Guidelines 2.0*

With increasing moves towards online education, standards around web accessibility hold particular significance for disabled students**.** The World Wide Web Consortium (W3C) has produced the WCAG 2.0 to ensure that creators of web and app content include accessibility features such as captions, audio description and an accessible interface for assistive technology users. A simplified version of WCAG 2.0 is reproduced below (W3C, 2008).

> *WCAG should be:*
>
> - *Perceivable*
>   - *Provide **text alternatives** for non-text content.*
>   - *Provide **captions and other alternatives** for multimedia.*
>   - *Create content that can be **presented in different ways**, including by assistive technologies, without losing meaning.*
>   - *Make it easier for users to **see and hear content**.*
> - *Operable*
>   - *Make all functionality available from a **keyboard**.*
>   - *Give users **enough time** to read and use content.*
>   - *Do not use content that causes **seizures**.*
>   - *Help users **navigate and find content**.*
> - *Understandable*
>   - *Make text **readable and understandable**.*
>   - *Make content appear and operate in **predictable** ways.*
>   - *Help users **avoid and correct mistakes**.*
> - *Robust*
>   - *Maximize **compatibility** with current and future user tools.*

Captions are specifically mentioned in WCAG 2.0 as a way to make content "perceivable". Legislation in the US, discussed in a later section, is also prompting more online content to adopt WCAG 2.0 and introduce captions in particular.

*Digital Transformation Agency*

Following the release of WCAG 2.0, the Australian government issued a National Transition Strategy (later to become the DTA) to improve the accessibility of Australian government websites to mandate them to become WCAG 2.0 compliant by 2014. Under the Strategy, a

government website was defined as either fully or partly owned and/or operated by a government agency; registered on a domain name, sub-domain or sub-directory; and having a distinct look and feel (design), audience and purpose. The Strategy was applicable to all departments that received government funding meaning universities were potentially subject to these requirements. The plan was to introduce WCAG 2.0 over three stages – the preparation phase (July 2010 to December 2010), the transition phase (January 2011 to December 2011) and the implementation phase (completed by December 2012 (Single A) and December 2014 (Double A)). A flow chart about WCAG 2.0's implementation (Figure 4) was circulated as an easy reference guide.
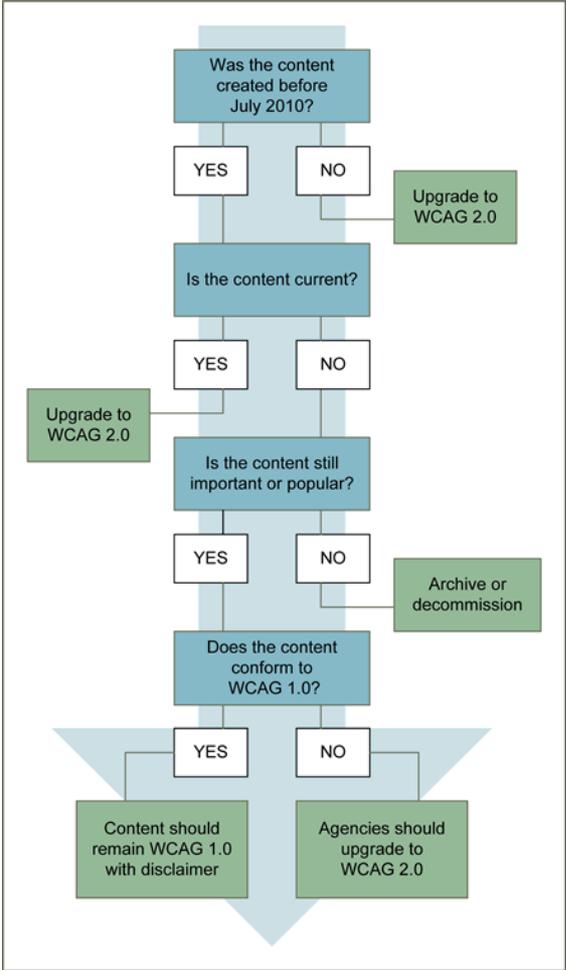


*Figure 4: WCAG 2.0 – implementation*

However, at the Strategy's midpoint, compliance had only increased from 0.5% in 2010 to 26% in 2012. When the 2014 target went by similarly unmet, the government moved on from the original Strategy and implemented the DTA. Their digital services standard features accessibility requirements are outlined as point number 9 (Digital Transformation Agency, 2017).

*9. Make it accessible – Ensure the service is accessible to all users regardless of their ability and environment.*

The DTA explain that accessibility is important in ensuring everyone who needs to can use the service, including people with disability, older people, and people who can't use, or struggle with, digital services. Poor digital literacy and users in remote locations were also highlighted as key reasons for accessibility compliance (Digital Transformation Agency, 2017). However, while the DTA applies to anything developed by government, including education, it is difficult to find anything specifically mentioning academia within the new policy.

## US Legislation

Relevant legislation in the USA includes the ADA (1990) and the CVAA (2010). The ADA's objectives are to provide "a clear and comprehensive national mandate for the elimination of discrimination" and "clear, strong, consistent, enforceable standards addressing discrimination" by reinstating a broad scope of protection to be available under the ADA. It has four titles which pertain to employment, public services, public accommodations and services provided by private entities, and finally miscellaneous (United States Code, 1990). The disabilities covered by the ADA are wide ranging, including both physical and mental, and were expanded in 2008 to include psychological and emotional disabilities. The CVAA, by comparison, addresses the specific issue of access to modern communications for people with disabilities. The CVAA seeks to ensure that "accessibility laws enacted in the 1980s and 1990s are brought up to date with 21st century technologies, including new digital, broadband, and mobile innovations" (FCC, 2010).

*The Americans with Disabilities Act 1990*

The *ADA* does not refer directly to captions; however, with the increasing transition of goods and services to online platforms, the jurisdiction of title III 'public accommodations and services provided by private entities' is being reinterpreted to include online spaces (Ellis, 2015). According to title III:

*Public accommodations must –*

- *Provide goods and services in an integrated setting, unless separate or different measures are necessary to ensure equal opportunity.*

- *Eliminate unnecessary eligibility standards or rules that deny individuals with disabilities an equal opportunity to enjoy the goods and services of a place of public accommodation.*

- *Make reasonable modifications in policies, practices, and procedures that deny equal access to individuals with disabilities, unless a fundamental alteration would result in the nature of the goods and services provided.*

- *Furnish auxiliary aids when necessary to ensure effective communication, unless an undue burden or fundamental alteration would result.*

- *Remove architectural and structural communication barriers in existing facilities where readily achievable.*

- *Provide readily achievable alternative measures when removal of barriers is not readily achievable.*

- *Provide equivalent transportation services and purchase accessible vehicles in certain circumstances.*

- *Maintain accessible features of facilities and equipment.*

- *Design and construct new facilities and, when undertaking alterations, alter existing facilities in accordance with the Americans with Disabilities Act Accessibility Guidelines issued by the Architectural and Transportation Barriers Compliance Board and incorporated in the final Department of Justice title III regulation (Department of Justice, n.d.).*

As such, disability advocates seeking more accessible video on demand services have attempted prosecution under this Act with varying levels of success. In 2010 a case was brought against Netflix by the NAD who argued that the company discriminated against the D/deaf or hard of hearing by not providing closed captions for all content. It was argued that though the company was not a "physical" place of public accommodation, that online businesses should be considered within this definition. Netflix settled out of court in 2012, agreeing to caption 100% of its content by 2014 (Mullin, 2012; Wolford, 2012). However, a Federal appeals court later ruled that Netflix was not a "place of public accommodation" and therefore did not have to comply with the ruling (Hattem, 2015). To that end, via the ADA, legal cases have also been brought against educational institutions who do not provide accessible lectures. In February 2015, the NAD filed a discrimination case against MIT and Harvard for not providing captioning for online content, including for MOOCs. As with cases brought against video on demand providers by the NAD, the argument being made is that

"electronic spaces" are now akin to "bricks and mortar spaces", and thus the exclusion of people with disabilities from such services and accommodations goes against antidiscrimination laws.

*The Communications and Video Accessibility Act*

Although the ADA was intended to evolve with changing technology, there has been disagreement as to how the law should apply to online spaces (see Ellis, 2015; Goren, 2012; McCullagh, 2002; Wooten, 2012). Like the ADA, the CVAA is designed to be "forward thinking" and evolve with changing technologies (Varley, 2013). The CVAA mandates the provision of captions on video material; this includes captioning across multiple formats, including online video. It does not, however, cover online lectures (unless the content airs on television) as it only applies to online content that was previously aired on television.

However, in the US, while the CVAA may not directly impact on the way in which education institutions implement captioning for online lectures, it has established important pretexts as to the responsibility of accessibility by online media creators, platforms for distribution and distributors. It is also a global 'bench mark' (albeit, not a flawless one) for accessibility regulation in "blended environment, with technologies converging and demonstrating the obsolescence of the definitions established in the first wave of accessibility policy-making" (Ellcessor, 2015). Lastly, the Federal Communications Commission regulations also impact on how accessibility is addressed by all video hardware and software manufacturers, which are now required to be capable of providing closed captions in a standardised way.

> *all digital apparatus designed to receive or play back video programming transmitted simultaneously with sound, if such apparatus is manufactured in the United States or imported for use in the United States and uses a picture `screen of any size must be equipped with built-in closed caption decoder circuitry or capability designed to display closed-captioned video programming pursuant to the provisions of this section, if technically feasible, except that apparatus that use a picture screen less than 13 inches in size must comply with the provisions of this section only if doing so is achievable as defined in this section.* (FCC, 2014, e-CFR sec. 79.103).

## Internal Curtin Policies

In addition to mandated national and aspirational international legislation, other Acts govern disability access policies at Curtin; the Disability Action Inclusion Plan (DAIP), the Accessible Information policy and the Digital Learning@Curtin Strategy.

*Disability Action and Inclusion Plan*

Under the Western Australian Government's Disability Services Act 1993, Curtin is required to develop an internal DAIP and submit implementation progress reports annually to the Disability Services Commission. Curtin's DAIP outlines the strategies that it will undertake to provide an accessible and inclusive environment for students, staff and visitors with disabilities.

With regards to this particular project, of the seven major outcomes listed in the DAIP, Outcome 3 is particularly significant (Curtin University, 2016b, p. 8):

> *3. People with disabilities receive information from Curtin in a format that will enable them to access the information as readily as other people are able to access it.*

Further, both Curtin's DAIP and disability legislation state clearly that information – print, audio and electronic – must be provided in alternative formats "on request" from a person with disability who is unable to access the information in its original format. As discussed in the literature review, this might include D/deaf or hard of hearing students, students with ASD, students with dyslexia, and students with ADHD. To achieve this outcome, Curtin commits to the following aims in their DAIP:

- *Implement an accessible information policy.*
- *Ensure information is available in alternative formats.*
- *Distribute media releases to disability organisations and community radio.*
- *Implement accessible corporate IT applications.*
- *Ensure compliance with W3C requirements for online material.*
- *Implement high quality and accessible iLectures and audio visual material.*
- *Make learning resources available in accessible formats and in a timely manner.*
- *Ensure inclusive language in Curtin communications.*

In addition, Curtin is required to provide a dedicated Disability Office staffed by advisors who provide assistance with specific learning needs such as the provision of learning materials in these accessible formats such as electronic, Braille, audio, large print, transcripts or captions. However, lecture captions are only made available if requested. At present, students wishing to access such services are required to work with Disability Services staff to create a CAP, an individualised document that outlines the support recommended for a specific student with a disability at Curtin.

While providing such alternative formats is mandated by the DAIP, and should be done so in a "reasonable time frame" (Curtin University, 2016c, sec. 2.2.7); in reality, these may take several weeks to produce, potentially leaving students unable to access lecture content for a significant portion of the semester. Therefore, any request (especially for course material) is required to be made well in advance, particularly some formats such as audio, captioning or specialised text conversion. If advance notice is not possible or practicable, staff must act promptly once the request is made and provide interim information where possible. Curtin's disability website therefore urges students to be proactive in establishing their CAP (Curtin University, 2012):

> *Please provide us with as much notice as possible if you require any of these services, particularly alternative format materials. It may take up to 8 weeks to provide the required formats depending on availability.*

*Accessible Information Policy*

In addition to the DAIP, Curtin Teaching and Learning also have an accessible information policy (Curtin University, 2016a):

> *[Curtin is] committed to ensuring that there is equitable and inclusive access to [its] facilities, services, events and academic programs on all [its] campuses and education centres for people with disabilities.*

Accessible information is defined as information, including course materials, that is presented in a format that is easily used and understood by an audience with diverse needs, including people with a range of disabilities who may also use assistive technology (for example a screen reader) to access information. This policy supports the Curtin DAIP and in particular Outcome 3. Its focus is also on the accessible provision of information for all students, including printed information (letters, brochures, course handbooks, advertisements), electronic information (online learning environments, emails), and auditory information (lectures/presentations, both face-to-face and recorded, meetings, telephone communication, audio and video recordings). The accessible information policy also incorporates the principles of universal design.

*Digital Learning@Curtin*

In 2015 Curtin devised and released a Digital Learning@Curtin Strategy for 2016-2020 in recognition that this sector was in the "midst of great change" (Curtin University, 2015, p. 2). The Strategy focuses on innovation in Curtin's teaching and learning, providing a

personalised and interactive learning environment and equipping all students with the skills necessary to become lifelong learners. The Strategy seeks to "re imagine the provision of digitally delivered learning" (Curtin University, 2015, p. 4) by identifying where Curtin is currently and where it hopes to be by 2020. A focus on flexibility is evident throughout the Strategy, as is the notion that Curtin must provide a timely response to learners' additional expectations.

The Strategy identified the following factors as contributing to this change:

- *Convergence of new technologies that allow for various learning modalities and scaling of content delivery and learning.*
- *Emergence of global competition.*
- *Changes to learner profiles and their expectations of their university experience and the option of choosing online offerings.*
- *Changing demands from employers and graduates with respect to credentials as they translate university education into the professional environment.*

Although captions are not explicitly mentioned in the Strategy, students with disability are. According to the Strategy, Curtin's current approach to supporting students with disability requires that they:

> *Access assistance and support for study needs from Disability Services.* (Curtin University, 2015, p. 15)

For students with disability captions may represent an alternative format but for the entire student population they can potentially become part of an enhanced individualised approach to learning. With the increased market and competition of the global educational environment, particularly from the US, online units that do not offer captions at best miss out on a competitive edge and at worst contravene international accessibility requirements. By 2020 Curtin therefore hopes to adopt a more universal design approach to issues such as online captioning, with an aim to "conform to or exceed accessibility guidelines and standards". Further, the Strategy considers that (Curtin University, 2015, p. 16):

> *Emerging trends are regularly identified and platforms, tools and learning technologies reviewed to ensure that Curtin remains at the forefront of emerging technologies.*

## External Partner Policies

Further to these internal policies, Curtin-based courses offered by external partners Open Universities Australia and edX are also bound by supplementary policies regarding disability access.

*Open Universities Australia*

OUA students do not have the same processes and deadlines as regular Curtin students. However, as for internal students, OUA students with hearing difficulties are required to organise their own adjustments for each unit they enrol in. The universities that provide courses through OUA offer alternative format study materials to support students with a disability including Braille, E-text, DAISY format, large print and lecture transcripts. To benefit from these lecture transcripts and captions, an OUA student must (Open Universities Australia, n.d.):

- Enrol in at least one study period (13 weeks) well in advance.
- Complete the disability support questions when they're enrolling, and nominate that they need assistance.
- Contact the university that provides their course or unit directly to organise the alternative format study materials they need.
- Allow plenty of time to have the alternative format study materials organised.

As with the Curtin internal DAIP policy, assistance is offered on a case-by-case basis, with the individual student responsible for organising accessible course materials.

*edX*

edX is the organisation that is partnered with Curtin to offer MOOCs. MOOCs are free short courses offered online on a variety of topics; their underlying philosophy is that they are courses open to all. Curtin has worked with edX since June 2015 to provide MOOCs. However, the same year, edX were sued for not being accessible enough and, as a result, created a website accessibility policy (edX Inc., 2015)

> *We value every learner, and are committed to being a leader in expanding access to all, including learners with disabilities. It is thus edX's commitment to ensure that our website, mobile applications, and platform are accessible to individuals with disabilities and that they permit content providers to develop and post accessible content.*

The edX MOOC guidelines also address the provision of video captions and transcripts directly and consider both the essential nature of such formats, and the fact that these features are beneficial for all students, not just disabled students (edX Inc., 2017):

*4.3. Accessibility Best Practices for Developing Course Content*

*4.3.7. Create Accessible Media*

*Media-based course materials help to convey concepts and can bring course information to life. <u>We require all videos in edX courses to include text captions</u> in SubRip (SRT) format. The edX media player displays caption files in an interactive sidebar that benefits a variety of learners, including learners who are hard of hearing or whose native language differs from the primary language of the media. This built-in universal design mechanism enhances your course's accessibility. When you create your course, you need to factor in time and resources for creating text captions.*

*4.3.7.1. Audio Captions*

*Audio captions are essential for presenting the readable equivalent of audio content to learners who cannot hear. They can also be helpful for learners whose native languages are languages other than the primary language of the media. Synchronized text captions allow learners who cannot hear to follow along with the video. The edX media player displays text captions as links in an interactive area adjacent to the video, which allows all learners to navigate to a specific section of the video by selecting some location within the caption text.*

*Text caption files start with the text version of a video's spoken content and any non-spoken audio that is important to understanding the context of the video, such as [BUZZER], [LAUGHTER], or [THUNDER]. If you created your video using a script, you have a great start on creating the text caption file. Simply review the recorded video and update the script as needed. Text captions can be uploaded to YouTube along with the video to create a timed text file in SubRip (SRT) format.*

*Otherwise, you will need to transcribe the video yourself or engage someone to do it. There are many companies that will create timed text captions (captions that synchronize the text with the video using time codes) for a fee. SRT files should be associated with video components in Studio. See Working with Video Components for details on how to associate text captions with videos.*

*4.3.7.3. Downloadable Transcripts*

*For both audio and video transcripts, consider including a text file that learners can download and review using tools such as word processing, screen reader, or literacy*

*software. All learners can use transcripts of media-based learning materials for study and review.*

Where Curtin typically takes a reactive approach to the provision of captions, in the context of MOOCs and edX, the approach is more proactive and recognises the potential wide ranging benefits of captions to the broader student population. Findings of our study suggest internal Curtin students would also appreciate and benefit from such a proactive approach.

# Part 3: Study Results and Discussion

This section reports on the students' views on lecture captions using data from the survey and interview stage of the study. It offers a discussion of how students are currently using captioned video and considers areas of anticipated usage and future significance emerging from the results. It covers the demographics of the cohort, the participants' degree of engagement with recorded lectures and online learning tools, their awareness of accessibility of captions using the Echo360 system and its additional features, and their perceived efficacy or value of both captioning and of the training module provided.

An initial survey was conducted on students in the OUA study period three instance of the introductory *Web Communications* unit in the Internet Communications degree program. This instance of the unit had its lecture series captioned in response to a request through a student's CAP. At this stage the tips sheet and training video had not been created. Six of the 80 students in the unit responded to the survey. None of these students identified as a person with a disability. Only one student indicated that they were aware of the captions and made use of them. This student did, however, make use of both the search facilities and the transcripts provided through the system and found the system helped in their use of the recorded lecture material.

Subsequently when the tip sheet and training video were developed these were made available to students from study period four of that year and for the reset of 2016. The cations were also made available for the second Internet Communications introductory unit *Internet and Everyday Life*. Students were surveyed from OUA at the end of study period four 2015/16 and form Curtin at the end of semester 2, 2016. An additional cohort of students were surveyed in the second year unit *Web Media* at OUA in study period two of 2016 when this instance was also captioned in response to a student's CAP and the training video and tip sheet made available. A total of 539 students participated in the units across the timespan of this part of the study. The final survey sample size was 50 students, representing approximately 10% of the sample student population.

## Results

**Demographics**

Respondents ranged in age from 18 to 65 with a relatively even spread across the age brackets therein. While the students surveyed were enrolled in first and second year units, only 48% were under 30 and 52% were aged between 31 and 65, reflecting a significant

portion of mature age students participating in the study. A total of 64% of respondents were female and 36% were male.

Of 50 participants in the survey, only six identified themselves as a person with a disability – almost 90% did not identify as disabled (Figure 5). Additionally, 45 of the 50 participants identified English as their primary language (Figure 6). Only one student identified as a person with both a disability and coming from a NESB.
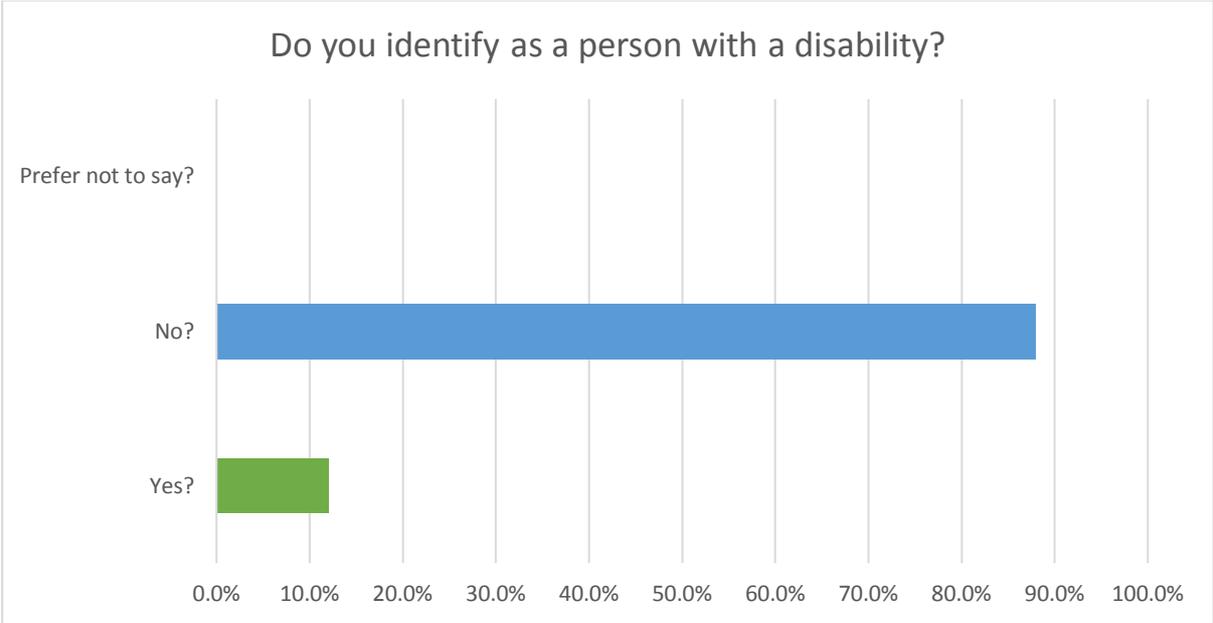


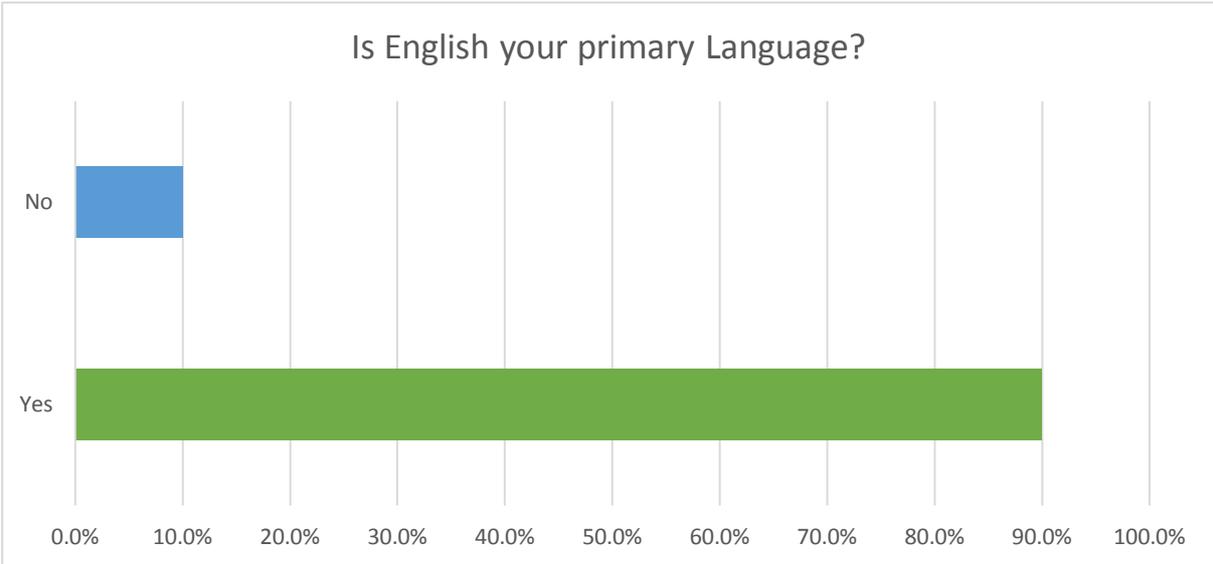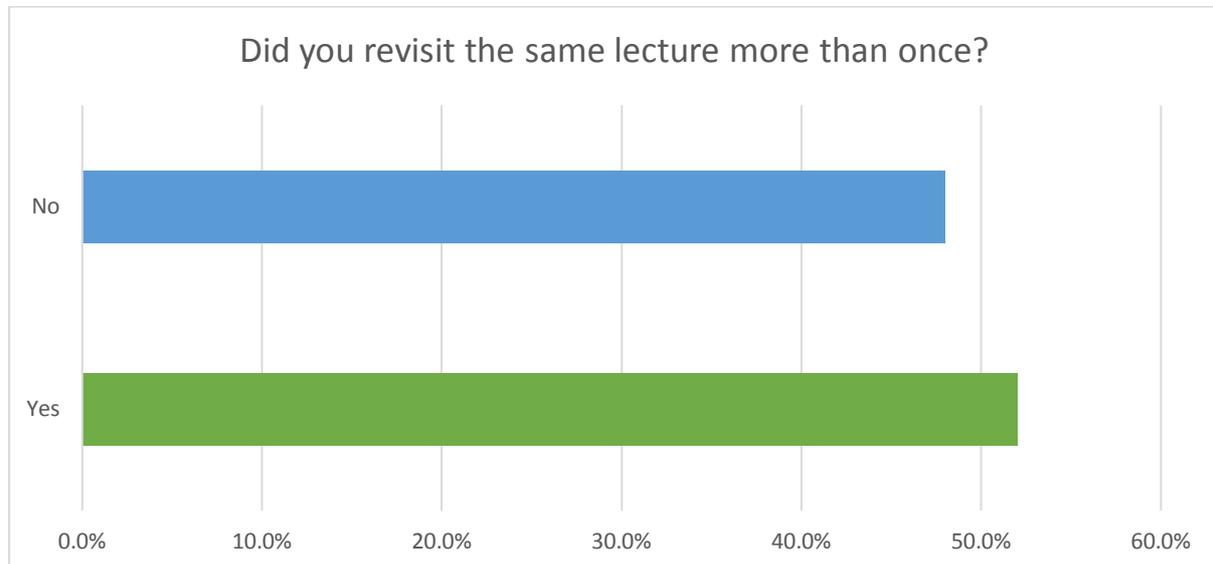*Figure 5: Proportion of students who identified as having a disability*



*Figure 6: Proportion of students who had English as a primary language*

**Engagement with Recorded Lectures and Online Unit Materials**

The survey results provide insight into the ways in which participants interact with both online study materials and the Echo360 lecture system. Overall, a very high level of engagement with unit content was reported, with all of the sample group accessing the relevant unit online study package on a weekly basis. Ninety per cent had posted on the unit online discussion board at least once, while 54% said that they visited their unit discussion board "most days" of the week, or more frequently.

Over 90% of students had also accessed the recorded lectures via the Echo360 system. While this might not seem notable at first, given such materials are essential elements of the units surveyed, the level of *repeated* engagement seen in these results is important because it indicates the extent to which students are revising the same materials multiple times – a practice that captions are designed to facilitate and assist. For instance, one lecture was recorded per week for each unit surveyed, and the majority of respondents (70%) were viewing these lectures at least once or twice a week, while 10% were viewing lectures multiple times a week. Over half the students surveyed reported viewing the same lecture more than once (Figure 7). This illustrates that frequent revision is taking place, as students watch the same lecture repeatedly to absorb and clarify its contents.



*Figure 7: Proportion of students who viewed online lectures multiple times*

Out of the participants who indicated that they had watched the same lecture more than once, 19 (or 73%) had viewed a lecture twice and 23% had viewed a lecture three times or more (Figure 8).
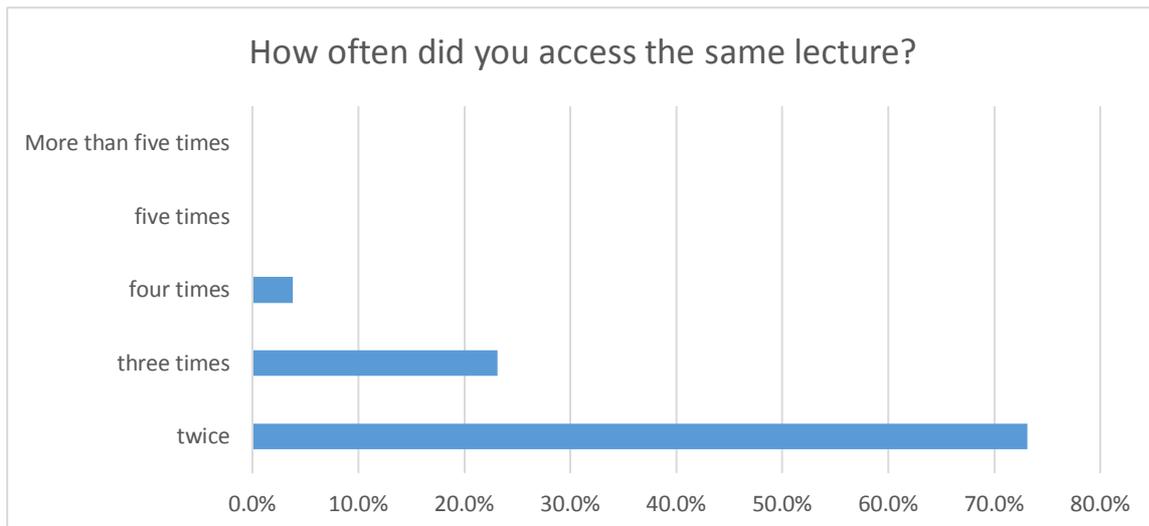
Figure 8: Proportion of students who viewed the lecture more than once

The frequency of repeated engagement with unit materials – lectures in particular – indicates that students were making online engagement and revision a key element of their learning process.

**Awareness of the Echo360 Lecture Captions and Additional Features**

While students were highly engaged with both the online learning material and the recorded lectures, there was less awareness of the availability of the captioning system. Overall, in the main survey group, slightly more than one in three students indicated they were aware of having access to captions (Figure 9). While this is double the rate of awareness from the initial survey, less than 20% of students reported that they were aware of the availability of the training module (Figure 10).
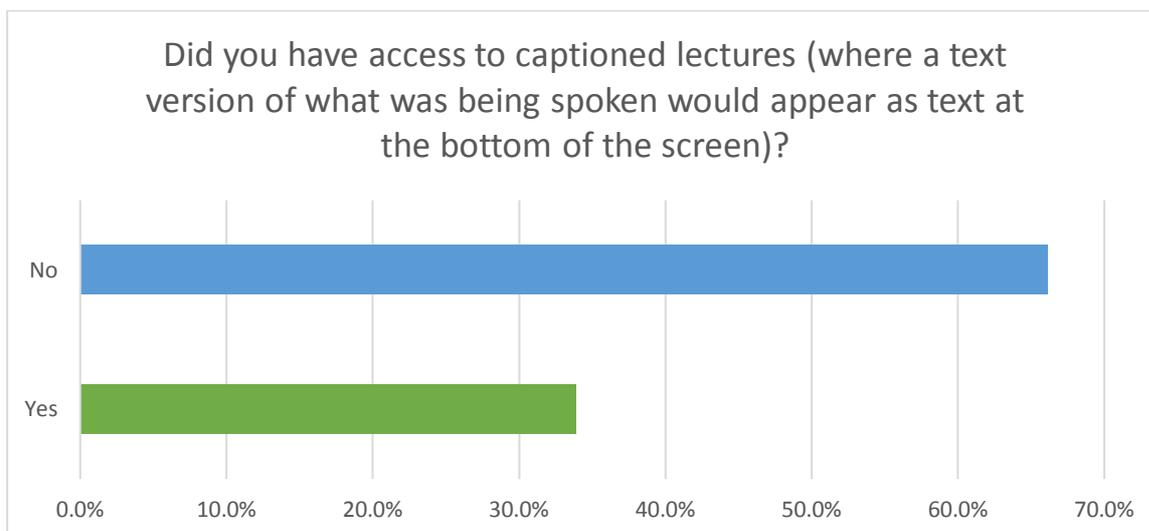


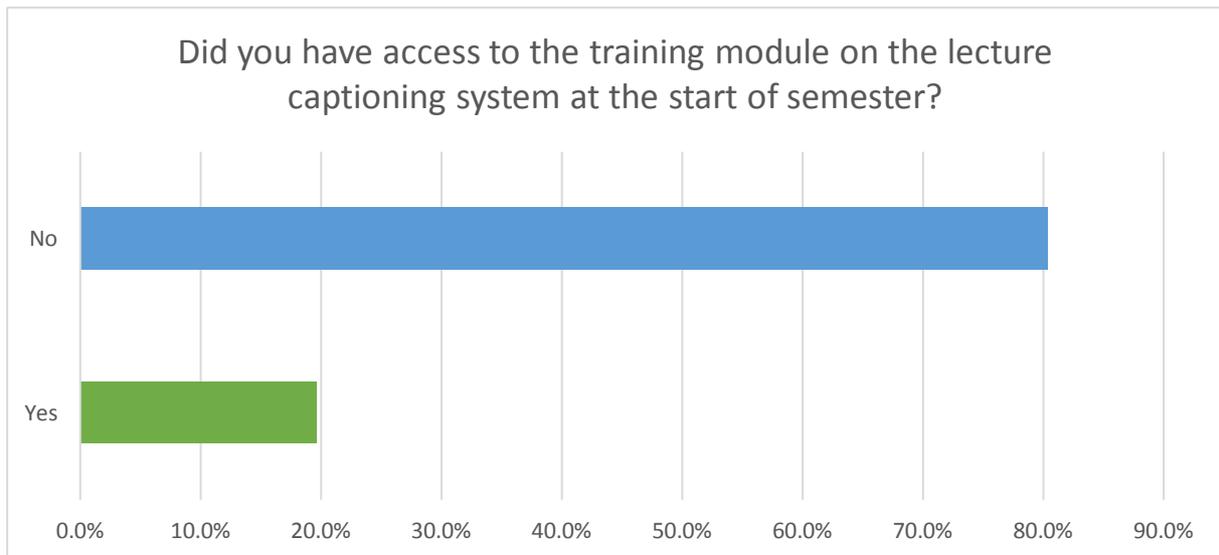Figure 9: Proportion of students who were aware of captions

*Figure 10: Proportion of students who were aware of the training module*

Only three students responded that they had completed the training module. The reasons for this are open to speculation. For example, the student interviewed affirmed that active contact from staff would have been important:

> *Many students may not realise the availability of the captions unless they are reminded about them and how easy they are to use. Even if it's a quick mention at the start of the lecture to turn the captions on.*

Based on this comment, a demonstration during lectures might be more useful than a written document, for example a live demonstration by tutors in class. This is another area worth future study to identify how best to facilitate captions awareness and competency throughout the general student population.

The survey also asked students whether or not they had used additional features of the Echo360 captioning system such as the search function and downloadable lecture transcripts. Survey results confirm that these features were being used (Figure 11); however, responses indicated that only a minority of students using the captions system used these features, with 28% using the search function and 33% making use of the transcripts.
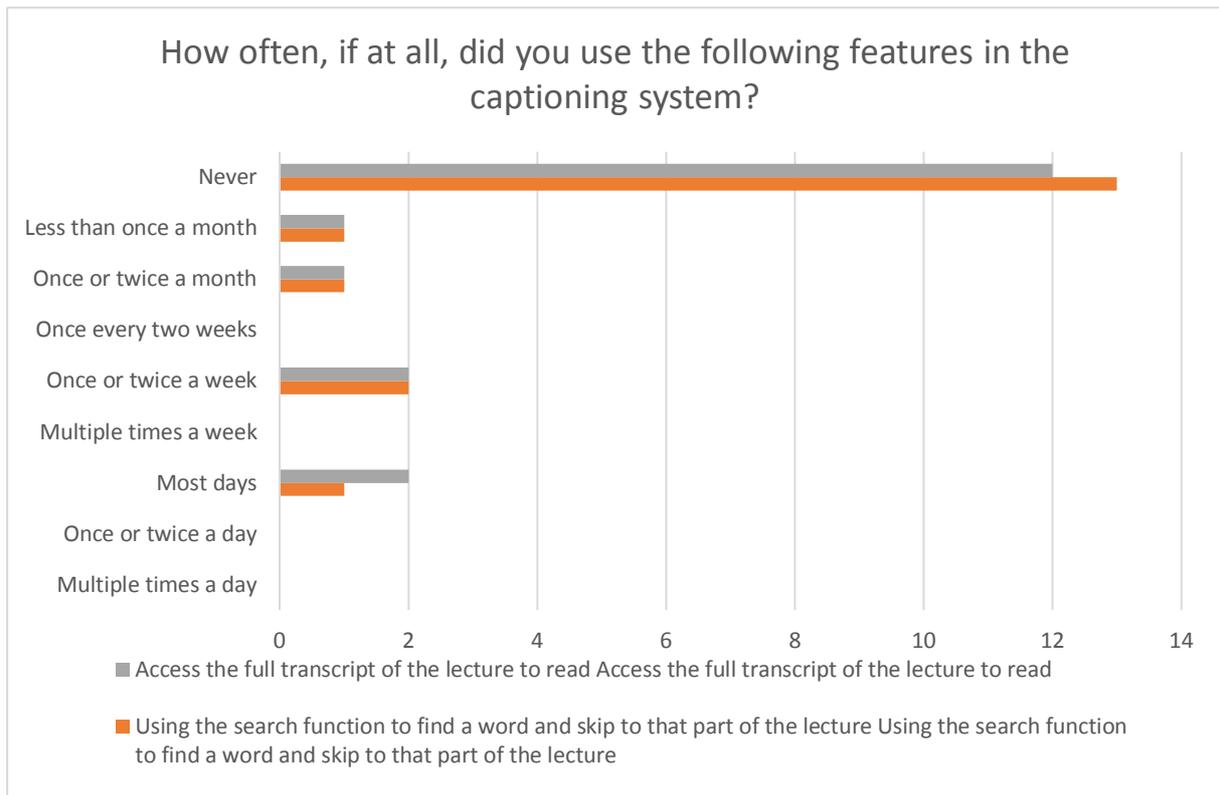
**How often, if at all, did you use the following features in the captioning system?**

| Frequency | Value |
|---|---|
| Never | 12 / 13 |
| Less than once a month | 1 |
| Once or twice a month | 1 |
| Once every two weeks | |
| Once or twice a week | 2 / 2 |
| Multiple times a week | |
| Most days | 2 / 1 |
| Once or twice a day | |
| Multiple times a day | |

■ Access the full transcript of the lecture to read Access the full transcript of the lecture to read

■ Using the search function to find a word and skip to that part of the lecture Using the search function to find a word and skip to that part of the lecture

*Figure 11: Proportion of students who used captioning features*

These results can be seen as an indication that additional features were useful for revision, albeit for the minority of students who used them. A Curtin disability advisor noted in their interview that:

*Transcripts are particularly useful in addition to captions as they allow the user to quickly skim the material rather than sit through a whole lecture. Transcripts also allow translation into other languages, highlighting text and other features that make the content more accessible.*

Teaching staff were positive about these features and suggested that providing transcripts saved time for tutors who are often approached to provide these to individual students:

*I typically receive requests for lecture transcripts at the commencement of each study period. In SP3 [during this study] I did not receive any requests.*

*I feel that lecture transcripts would be particularly useful as this is the most common request I receive from students, especially those with disabilities.*

*I think transcripts and keyword searching would likely be useful to many students who access lectures through recordings (or who access recordings even after attending the lecture in person).*

However, the one student who was interviewed preferred the keyword search feature, although they expressed interest in transcripts as well:

> *I used the captions keyword search. I think I would like to use the lecture transcript as well but I did not use that in this unit.*

In summary, while not all students made use of Echo360's additional features for captions, those who did access them did so frequently, indicating that these are potentially useful learning tools.

**Value of Captions**

Of the students who were aware of the captions, 63.2% found them useful for engaging with the lecture material (Figure 12).



Overall did you find that the captions helped in your use of the recorded lecture material?
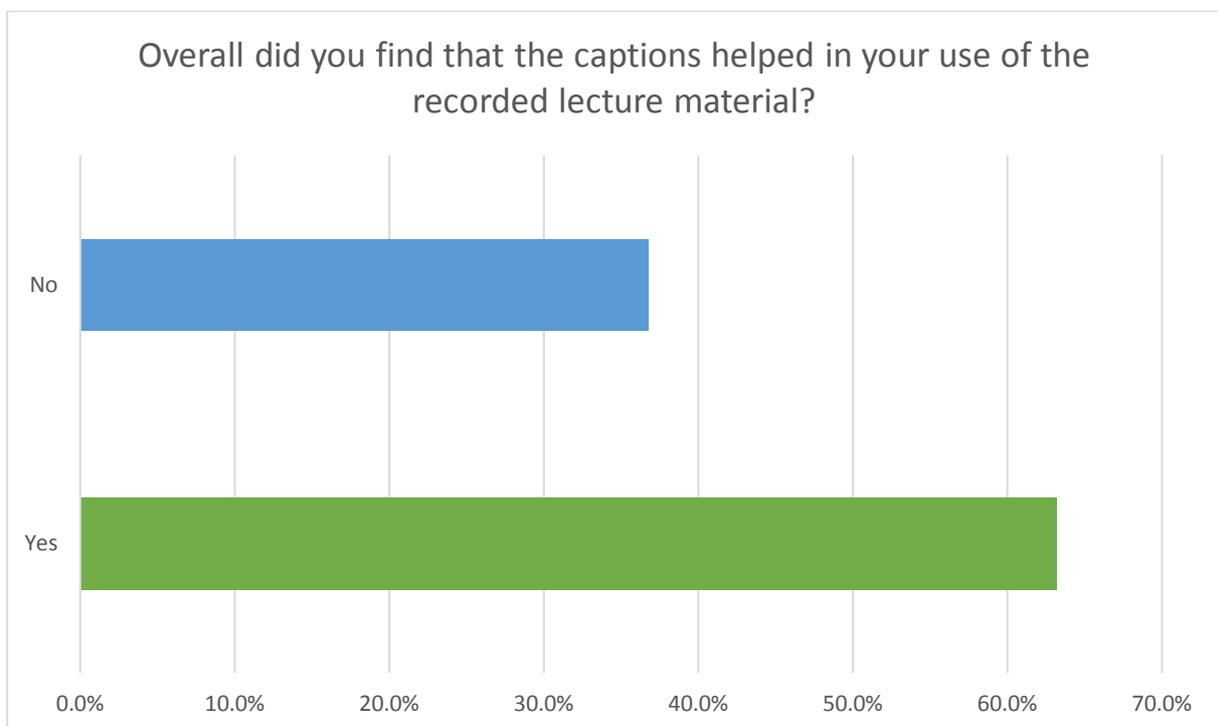
*Figure 12: Proportion of students who found captions useful*

According to one of the students:

> *[Captions] made a big difference to me in terms on understanding and retaining what was said in the lectures. I am not sure that many students would realise this unless they actually used the captions.*
>
> *I found it much easier to follow what was being said in the recorded lectures and I also found that they helped stay focussed and not become distracted from the lecture.*

It is notable that the improvements described above do not involve assistance with hearing or language issues, but the extent to which captions improve a more general learning experience. This participant identified themselves as a native English speaker with no disabilities, but the captions still made a "big difference" in their ability to follow, understand, focus on and retain information drawn from the lectures.

However, while over 60% of students who used the captions reported they found them useful, it was difficult to get more detailed feedback on precisely how and why. Only 52.6% reported actually using them when accessing the lectures, and a relatively small number reported taking advantage of the search and transcripts features available through the Echo360 system. Exactly how they were being used and what role they play in student learning is therefore an area to pursue in future research, as it will assist in breaking down the benefits of captions for all learners.

Teaching staff also reported the difficulty in assessing the full value of captions – one teacher interviewed explained that the impact of captions was hard to monitor quantitatively during regular teaching:

> *It is difficult enough to track who listens to lectures at all, let alone who might be using the captions, or have found these helpful. I would like to think that not only those with hearing impairments, but also ESL students and even people who find listening to and taking in the recording difficult for other reasons, might have benefitted.*

Some teaching staff, however, did note positive feedback from students:

> *One student has given me positive feedback via comments on the [discussion board].*

> *One has reported that it helps with retention and with times when speech is soft or garbled. I suspect it helps mediate my accent and pitch!*

While 60% claiming captions were useful is a solid majority, it is notable that some participants skipped this question. Survey answers indicate that this was because these 37 students did not think they had access to captions in their units (Figure 9). This is an important result because it indicates the need for a more concerted effort in raising student awareness of the learning tools available. Similarly, a tutor interviewed also confessed they were not aware of the captions or training module:

> *I was not aware of the implementation of closed captioning.*

> *As I was unaware that CC was being implemented, I cannot comment on this.*

This is despite captions being mentioned by lecturers during recorded lectures and information on captions and training being shared on the discussion board. We can only speculate regarding the reasons for this. However, it is possible that students – and even staff – who are already familiar with specific types of online video (through sites such as YouTube) expect an intuitive interface that resembles the format they are used to. Confronted by an unfamiliar interface with a new arrangement of buttons and symbols, users might simply assume there are no captions available.

Indeed, difficulty with the user interface and time delays were both cited as issues that could put students off using captions:

> There have been some glitches within the iLecture system with identifying the correct lecture and some issues with audio quality. There is also a time delay as it takes up to a week for the captions to become available.

> I find the location of Transcripts in the iLecture system is not user friendly and many students have difficulty finding where they are.

> I'm aware that the EchoCenter is not necessarily the most intuitive of interfaces to use.

## Future Significance

Overall, these results indicate that while captions can provide a benefit to students' engagement with learning material presented through lectures online, there is a need for more direct and ongoing information sharing to ensure both students and teaching staff are fully aware of captions and how to use them. Technical issues such as the time delay potentially dissuade students from using captions, so improving the speed and reliability of this tool could increase the number of learners keen to use it. All staff interviewed agreed that captions are useful for all students, and that implementing captions for all lectures would be beneficial for everyone:

> Any technology that can assist in making lectures more accessible is useful, particularly in OUA [online] courses.

> It would be a good example of Universal Design as it would make the lecture content more accessible for students with disabilities as well as students with other equity needs.

> YES – it benefits all students. I personally find that I understand and my attention is held more by captioned content.

*It certainly makes my role easier as it allows effective access to recorded lectures. Captioning allows full access as every word is accessible as opposed to note taking which is not verbatim.*

## Discussion

The results of this research indicate that captions and the functionality available through the Echo360 captions system are an aid to student learning. However, there are significant challenges to be addressed to make students aware of these features and their potential benefits.

This study has shown that in a cohort of primarily English speaking students without disabilities, over 60% found captions a useful addition to recorded lectures. This suggests that the implementation of captions for all recorded lectures would have widespread benefits for all learners, not only those with hearing or language difficulties.

Yet, while there are clear benefits for the majority of students, the study also indicated that these benefits – and challenges – should also extend to groups that are traditionally seen to benefit from the use of captions. However, none of the students who identified as having a disability or coming from a NESB indicated that they had access to the training module. Five of the six students with disabilities reported that they did not have access to the captions system and, similarly, only two of the five NESB students. Despite these low numbers, all the students who were part of these two groups and who did access the captions system did find it useful.

Challenges for teaching staff include ensuring all students are aware of captions and can access them easily. One option for reducing the need for training or further instructions might be having captions always ON by default. This means students can incorporate them into the study experience without having to take direct action, or simply choose to switch them off.

There are also a few potential teething issues with implementing captions universally, as staff express some concerns regarding how this might alter the teaching and learning experience. For example:

*Because the captioning is once-off, it means I can't re-record the lectures where there was a failure in technology as the new versions would not be captioned.*

*A bit cautious about the transcript as there may be problems with students copying that content and also with not viewing the lectures thinking the transcripts are sufficient.*

Despite these concerns, the survey results and interviews indicate that lecture captions have the potential to benefit all learners, enhancing each student's existing capabilities. As one staff member put it:

> *In the main I just feel [captions are] important for accessibility and equity in general. Why should people have to request captions? Recorded lecture content should be available to all students, in whatever way they find it most easy (or possible) to engage.*

Follow-up from students at the end of the study further supported this. As one student noted in an email at the start of 2017:

> *Hi All, In one of my units last semester we were lucky enough to have captions on the recorded lectures. They were immensely helpful for a number of reasons. I really hope they might become available to us in this unit. I think Mike Kent was the name of the Curtin person who organised them. If Carol or Paul think we might get them I'd be a super happy camper!*

# Conclusions

When this project set out to investigate the ways diverse groups of students could utilise captioned lectures if they were offered as a mainstream learning tool rather than a feature only disabled students could request, existing research suggested that accommodations designed to assist students with disabilities actually benefit the entire cohort. The results not only confirmed this, they underlined that captions could operate as an important learning tool for the majority of the student population, particularly within Curtin's move to embrace a digital learning strategy.

The literature review confirmed the broad educational benefits of captions and transcripts. Captions and transcripts are important assistive tools for the diverse needs of at risk students, including students with a range of disabilities, students from NESB and older students. Captions and transcripts are also excellent instructional tools for diverse learning styles. Further, with appropriate guidance, students can use these tools to improve their note taking, revision and general study habits.

Currently, lecture captions are typically utilised in Australian higher education settings – including Curtin – only as an assistive technology for students with disabilities, particularly students who are D/deaf or hard of hearing. In these circumstances, the student must undertake a lengthy process months in advance to ensure timely access to essential captioned material. Mainstreaming the provision of captions and transcripts for online lectures would greatly increase the accessibility of online learning – removing these barriers allows education providers to harness the broad potential of captioning technology. Indeed, ensuring that captions were available 'by default' would benefit the educational outcomes and self-determination of the wide range of students who could benefit from this technology.

Lecture captioning and transcription is increasingly cost effective, given technological developments in speech-to-text or automatic speech recognition software and the increasing re-use of content across different iterations of a unit in online higher education courses. At the same time, international trends in online education – not least the rapidly evolving interpretations of international legislation – provide new incentives for educational providers to begin addressing accessibility shortcomings by incorporating captions and transcripts into the basic materials of a course.

Finally, an understanding of the diverse benefits of lecture captions and transcripts needs to be shared widely amongst higher education providers, researchers, teaching staff and

students to ensure the potential of this technology is accessed and used effectively. Understanding who can benefit from captions and how they benefit is a necessary step in encouraging greater use of the technology.

# Recommendations

The university sector in Australia today is in a unique position to capitalise on the broad potential of captions and transcripts to enhance learning and teaching. There is an opportunity to be world leaders on this issue, differentiating Curtin on the global stage. Captions must be addressed within Curtin's Digital Learning Strategy and the next DAIP. As can be seen from the evidence in this report, the benefits of captioned material are significantly widespread across the student population that we propose the following recommendations

- Lecture videos should display captions by default rather than requiring students to identify the availability and switch it on themselves. Where material is captioned, a transcript should also be provided to accommodate the needs of those students who benefit most from transcribed material.
- Allow any student – regardless of perceived need – to request lecture captioning. This would be a major step towards recognising the needs of diverse learners. Further, both students and staff would benefit from being better informed about the benefits of captions and transcripts in university learning and teaching.
- We recommend a three stage process for adopting captions.
  - First, within the current system any lecture suite captioned under a CAP should be made available to each student cohort of that unit along with supporting instructional and promotional material for the system. This would increase knowledge about the availability and functionality of captions within Curtin teaching and learning. It would have a further benefit of de-stigmatising disability support requested by students with disabilities. We recommend Curtin implement this strategy immediately.
  - Following this, we recommend Curtin provide captions by default to lectures that are shown to more than 100 students. As part of this process, Curtin might consider other means of captioning provision, for example in-house captioning. This could significantly reduce the timeframe for turnaround of captioned material for students with disabilities.
  - The final stage of this recommendation is captions by default available on every recorded lecture. This is an excellent opportunity to push forward with Curtin's determination to incorporate universal design into course structures by 2020.
- Curtin should continue to support and fund further research into the mainstream benefits of captions and transcripts. Building on our research in this project, it would

be beneficial to offer captions from the beginning of a unit, and require students to complete a short training module about how captions work and how they can augment their learning as part of their university induction.

- We also recommend the creation of a working group consisting of members from the Curtin Learning and Teaching, Curtin International and Curtin Disability Services to raise the profile of the benefits of captions and transcripts with Curtin teaching and learning to inform staff of their benefits and make students more aware of how to use captions in their learning.

# Authors

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Dr Mike Kent is Head of Department and Senior Lecturer at the Department of Internet Studies at Curtin University. His research focuses on eLearning and also people with disabilities and access to communication technologies. His recent books include *Disability and New Media* (Routledge 2011), and *Disability and Social Media: Global Perspective* (Routledge 2017), both with Katie Ellis, as well as *An Education in Facebook: Higher Education and the World's Largest Social Network* (Routledge 2014) with Tama Leaver, and *Massive Open Online Courses and Higher Education: What Went Right, What Went Wrong and Where to Next?* (Routledge 2017) with Rebecca Bennett.

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Associate Professor Katie Ellis is Senior Research Fellow in the Department of Internet Studies at Curtin University and the convener of the Curtin University Critical Disability Research Network. She has worked with people with disabilities in government, academia and the community and has convened disability research advisory panels. She has authored and edited seven books and numerous articles on the topic, including an award winning paper on accessible learning platforms for students with disabilities and how these can be effectively used by mainstream students. She began a highly competitive Discovery Early Career Researcher Award (DECRA) in 2013 to investigate the impacts of the changing television environment on the social inclusion and exclusion of people with disabilities.

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Dr Gwyneth Peaty is a Lecturer in the Department of Internet Studies at Curtin University. Her research focuses on new media, popular culture and digital technologies, and she has published a range of book chapters on these topics. She has extensive experience with teaching and disability, and has taught in the Department of Internet Studies since 2009. She received her PhD in English from the University of Western Australia in 2013 with no corrections.

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Natalie Latter is a Research Assistant in the Department of Internet Studies at Curtin University where she has participated in research projects investigating a variety of ways people with disabilities use digital technology, including digital television, video on demand, and captioned lectures in higher education. Natalie's research focuses on complex ethical challenges within a human rights framework. Her PhD argues for action on climate change which balances intergenerational and global needs, and she has extensive experience teaching in global governance, the politics of the European Union, environmental politics and public policy.

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# Appendix



## Captioned Lectures – A guide for students

### 1.0 How to access and use lecture captions

These instructions are for viewing lectures via the Echo360 interface. Please note that if you download the lecture you will not be able to view the captions on the video itself.

1.1 Lecture captions can be accessed and viewed in two ways. The first way is via the Closed Caption icon located at the bottom of the screen, near the buttons that toggle the viewing screens.
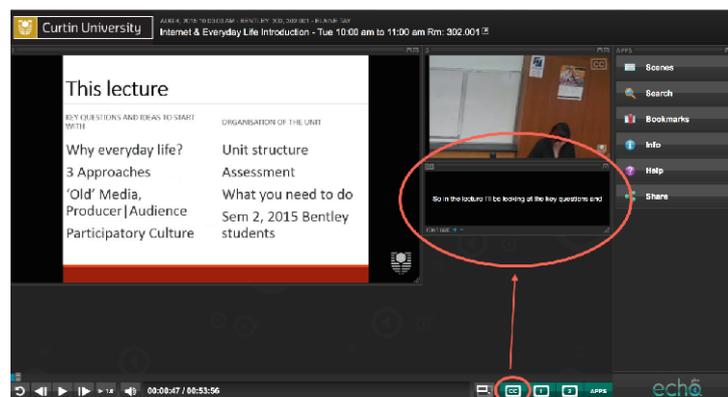


Clicking this button will bring up a small window with the captions visible in it. This window is movable and can be repositioned in a location you find most convenient when viewing the lecture.

1.2 The second method of accessing captions is via the Closed Caption icon located in the top right-hand corner of the second screen.
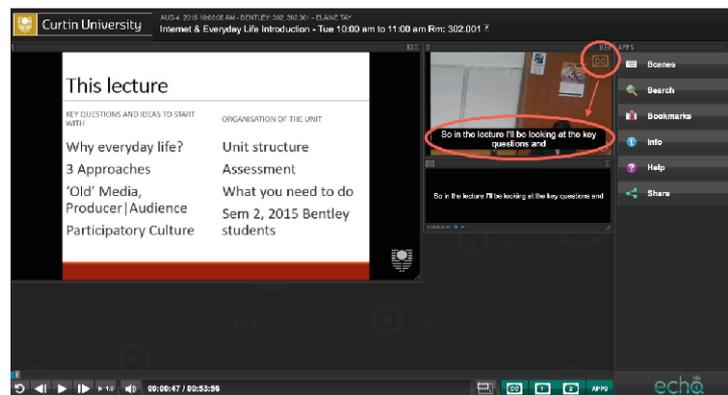


Clicking this icon will toggle the captions on the screen itself. This is useful for when you may wish to focus on what the lecturer is doing, e.g. if they are conducting a demonstration, or using the whiteboard.

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*Alternative approaches to engaging with video content • page 75*

## 2.0 Useful features

A number of useful features can be accessed via the Apps menu on the right.



## 2.1 Keyword search

Captions provide greater search functionality for lectures, allowing users to search not only the text on the lecture slides, but also the captions, potentially offering more accurate and relevant results. This can be accessed via the Search option in the Apps menu. This brings up a search field for you to enter your search terms.
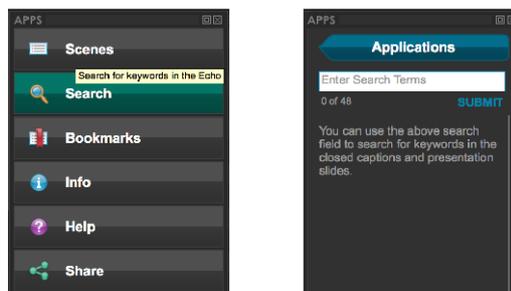


## 2.2 Bookmarking

Bookmarks can be placed at various points in a lecture recording to enable users to return to key points in a lecture. This is useful for revising key definitions or concepts. Captions assist with pinpointing these moments. This can be accessed via the Bookmarks option in the Apps menu. Clicking this will allow you to create a bookmark at the point of the lecture you are currently at. It also displays any current bookmarks you have active in the lecture.
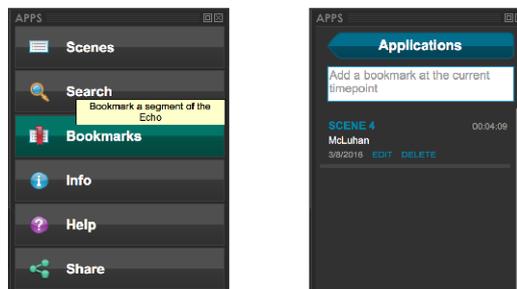
### 2.3 Transcripts

You are able to print out or save copies of captioned lecture transcripts. These can be used to supplement lecture notes or to act as study aids through the unit.
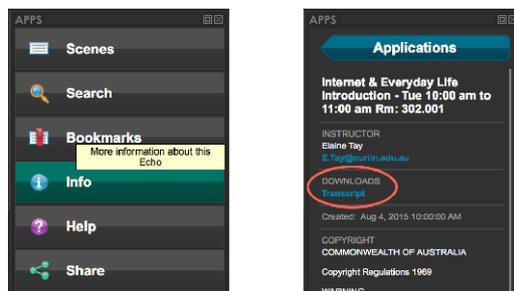


## 3.0 Benefits of captioned lectures

Captioned lectures are not only useful for students who are hearing impared. They offer a wide range of benefits and flexible learning options for all students.

### 3.1 They are particularly helpful for (but not limited to):
- Students with hearing impairments
- Students who know English as a second language
- Students who have attention difficulties or trouble focusing

### 3.2 Captioned lectures can also be used by all students:
- To follow lectures in a noise sensitive environments (e.g. in a noisy café, in a quiet space such as a library, or when headphones can't be used)
- To provide greater clarity, particularly when the lecturer is speaking quickly or is hard to follow, or some of the recording is obscured by background noise.

### 3.3 The combination of audio and text delivery offer a number of benefits for study, such as:
- Helping maintain concentration when viewing lectures
- Assisting with improving comprehension and literacy
- Appealing to a broader range of learning needs
- Identifying technical terms or discipline-specific terminology
- Facilitating revision and review
- Boosting knowledge retention

### 3.4 Some suggestions on how to use captioned lectures as part of your study process:
- Save or print out transcripts to use as study guides, or use the transcripts to supplement your own notes
- Perform keyword searches within lectures to focus in on when a specific concept or idea was discussed, and bookmark these events for later reference
- Customise the pace at which you follow the lecture, e.g. pause to take better notes from the captions, or speed up to skip to key points in the lecture

## 4.0 Further resources

General instructions on accessing and using iLectures are available here:
http://elearn.curtin.edu.au/tools-guides/ilectures-echocenter/

Learning Support offers a range of helpful tips and advice regarding study, including tips on making the most of your lectures: http://life.curtin.edu.au/local/docs/CL_D-lectures-and-seminars-08-2015.pdf

For further information about iLectures please visit:
http://ctl.curtin.edu.au/teaching_learning_services/iLecture/iLecture.cfm