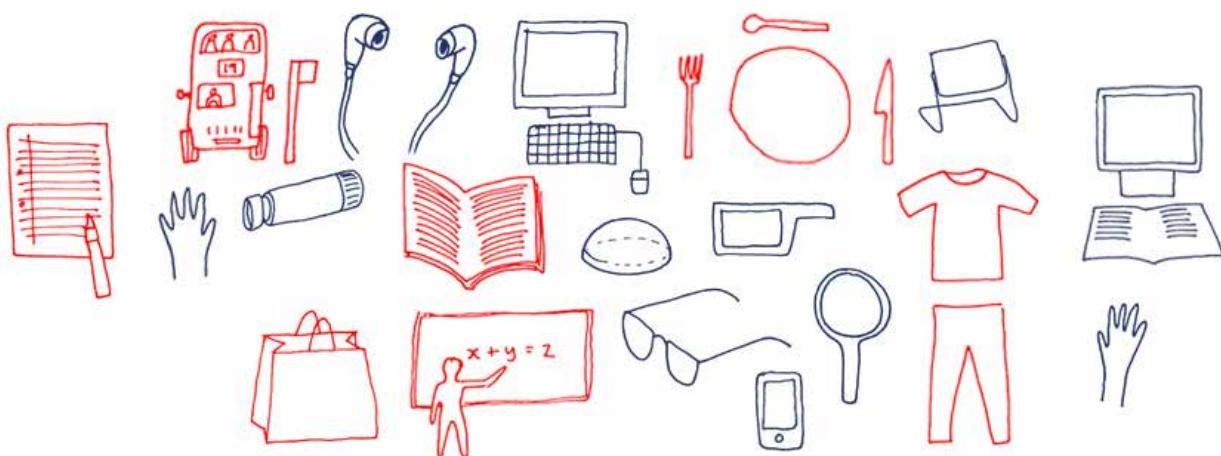


Design and Low Vision Aids – a Youth Perspective



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Foreword

Low Vision Aids (LVAs) have fantastic potential to impact positively on the daily experiences of children and young people; unfortunately, current offerings fall far short of the needs of most.

A wide range of devices already exist, but often fail to meet the needs of young people; those they are designed for are largely unaware of the options available to them, and the benefits that proficient use of a well-chosen device can add to daily living.

'Design and Low Vision Aids: A Youth Perspective' is a report drawing on findings from a six-month exploration that used design research methods to understand functional needs, perspectives and aspirations around LVAs, capturing and presenting the opinions of the young people these aids should support. The project assessed existing products including consumer digital devices, exploiting opportunities for new design thinking and outputs. It presents issues, themes, recommendations and design proposals towards the creation of suitable support for young people with reduced vision, suggesting ways to offer non-stigmatizing, desirable and functional LVAs.

Accessibility and pleasure in the use of such devices has much scope for improvement – the role of design within these developments cannot be highlighted enough.

Dr Chris McGinley
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Executive Summary

Aims of the project

This project aims to provide the reader with a better understanding of 12–18 year olds who have low vision; specifically their priorities and preferences in terms of being independent, and through reflecting on existing assistive devices, how design can be used to support this.

Research approach and methods

We have the unique opportunity to represent the voices of this age-group to an audience of Designers, the Low-Vision Community, Families and even relevant public and private institutions.

We carried out two-part phone-interviews or used mapping toolkits with 36 young individuals in person. Seven engaged in carrying out written and video diaries. We visited two schools, and ran a workshop with a group of seven Qualified Teachers of children and young people with Visual Impairment (QTVI) who also advised throughout the project.

Conversations identified early on that channelling design attention via this age group's social priorities would fast-track assistive benefit to other points in their daily-lives.

Key themes

This report found four key themes, which we prioritise as being most beneficial in terms of positive potential impact following design attention:

- *Understanding*: We found few Children and Young People (CYP) or their families were able to comprehend and communicate their condition effectively. Were this better supported this life stage offers an ideal opportunity for people to boost their confidence, understand and express themselves.
- *Reading*: Reading for periods of time is tiring and uncomfortable. Yet it is not only an essential part of learning, we found many people missed the sensorial activity of reading a novel for leisure. Reconnecting people to this activity at this age is important.

- *Out and About:* Sight Loss and the built environment are both highly variable subjects, we felt giving people a reliable tool to read close and far, that does not attract unwanted attention, will improve most concerns for people doing activities alone or with others in unfamiliar environments.
- *Inclusive Experience:* This theme addresses design for issues that require more societal and public cooperation to improve CYP independence. From factors to do with classes being received in parallel by each student; to how important the internet is now for both communication and information, yet is still so inconsistent and inaccessible; to one of our most surprising findings – what little awareness CYP and their families had of Low Vision Aids (LVAs) already on the market that can address their needs.

Research findings and insights

Design has a huge role in supporting young people towards feeling comfortable, confident and aspirational in daily life; socially and practically.

Whilst our participants highlighted the benefit of reliable and simple aids such as monoculars, they typically preferred using a digital aid. The handheld digital magnifier was identified as the product this age-group would most benefit from were it to receive appropriate design attention. As a digital product with the most popular functions – magnification, contrast and narration – it was appealing for its functional potential and flexibility.

There were no consistent differences between the preferences of a 12 year old to an 18 year old towards LVAs. Individual personality tended to inform whether they liked a product that had a ‘neutral’ style that blends in, or that was more apparent and reflected their ‘personal’ style, such as their favourite colour or fashion.

Conclusions

In conclusion the project packages together a portrait of capable and creative young people with aspirations similar to others of their age; how their development could be supported through products that reflect their personality; an online world that lives up to being a leveling platform; and societal and commercial understanding and practice that enables an inclusive experience.

Introduction

This project is based on the daily lives of Children and Young People (CYP) with low vision aged 12 – 18. In the transition from primary school to secondary school, it has been observed that around the age of 12, children begin to use Low Vision Aids (LVAs) less and less. (Keil, 2012, p.6). Traditionally LVAs have included glass dome lenses, hand-held back-lit magnifiers, and now include magnifying-software for computers, to smartphone cameras and apps.

Not only is sight a variable condition, individual personality and environment influence variations in development. The role of a LVA will vary for different people but what is consistent is that where it will assist independence, people should feel comfortable using it.

Initiated by VISION 2020 UK, supported by VICTA and Thomas Pocklington Trust, this design-research project, undertaken by The Helen Hamlyn Centre for Design, intends to provide better understanding and appropriate approaches to improve the design of LVAs for this age group.

The research involved interviews and visits with over thirty CYP and with other stakeholders, such as families, teachers, clinicians and experts. For best impact our central focus was on social perspectives, rather than formal education. The research findings and key insights are organised into four themes: '*Understanding and Communicating your Condition*'; '*Reading*'; '*Out and About*'; and '*Inclusive Experience*'. In selecting these themes, we are highlighting the crucial point that design understanding has several dimensions to it: practical, aesthetic, social and emotional. This wide context is particularly important where someone is concerned about using a type of device that may draw unwelcome attention or feel stigmatising.

Guidelines of priorities and proposals to product design become transferable lessons in design through empathic contextualisation. A base from which to make sure CYP with vision impairment feel self-sufficient, confident and happy in all daily activities.

'Being able to use my LVA intuitively means I do not have to rely on anyone to help me and this makes me more confident in myself.'

Zoe, 20



'Size and weight and style need to be designed to fit around social situations.' Emily, 13

'How often do we qualify, even excuse, design in this field because of the market for which it is intended?' (Pullin, 2009, p.xi). We spoke to people who were born with their condition and those for whom it has developed later. Similar to the *Sight Impairment at Age Eleven* report (Harris et al. 2014, p.54; Keil, 2014, Wellbeing 3.3) our research found this age group to be confident and capable, with full, active and interesting lifestyles. The majority of students with sight conditions are in mainstream schools (RNIB, 2013, p.6).

We hope by presenting the voices of this age-group from critique through to concept ideation, this research project will inspire ways one can deliver a parallel daily life for visually impaired CYP through design and practice.

Photo: Workshop with sports students at RNC

Glossary

AT	Assistive Technology
CYP	Children and Young People
LVA	Low Vision Aid
QTVI	Qualified Teacher of children and young people with Vision Impairment
TA	Teaching Assistant
UX	User Experience
VI	Visual Impairment / Visually Impaired
RNC	Royal National College for the Blind, Hereford

By Low Vision we mean people with a visual impairment that is so severe, it can not be corrected with regular eyeglasses, contact lenses or surgery. Most people registered with vision impairment or sight impairment do have some level of visual perception, so we are looking at building on this remaining vision.

Low Vision Aids are the devices and similar that help a person with low vision improve their visual performance. They can be sorted into optical aids, for example a hand held magnifying glass, to Assistive Technology such as a smartphone app.



Photo: A student at RNC reads her mobile

Chapter 1: A Day in the Life

CYP face many challenges whilst growing up. From going to a new school, making new friends, going through puberty to taking on new responsibilities. Growing up with a visual impairment (VI) can mean experiencing additional challenges, such as the need to carry more personal items; finding the toilet in a new place; or finding friends in unfamiliar spaces.

'I struggle with some day-to-day things. In school for example, everyone is wearing the same uniform and things. It's difficult to spot my friends. So I have created lots of techniques so I know what shoes they are wearing or bag or hair.' Olivia, 16

'I would put [my confidence] down to people I have surrounded myself with.' Olivia, 16

Life-transition experiences were identified as a key issue, especially for 12 year olds going from Primary to Secondary school. This chapter offers insights into the daily life of a 12–18 year old with sight loss; their personal priorities, routines and lifestyle choices, focusing on the effects caused by their sight condition.

As a teen going through a variety of changes, there tends to be an enhanced attention to what others think. The peer pressure and the fear of 'standing out' can lower a young person's self esteem, affecting the usage of LVAs. CYP desire LVAs that allow them to carry out a task just like everyone else.

'Although I really like to use Low Vision Aids, sometimes they have been the subject of people staring at me, which makes me feel very self-conscious.' Zoe, 20

'That's the reason why I don't use as many aids as I could be: because they're not that discreet or covert... I think there are a lot of opportunities for apps on the phone.' Mason, 16

'When you're younger, fellow pupils are more accepting.' Hannah, 15

Feeling comfortable using assistive equipment is important to a CYP's development, independence in life and preparation for life after studying. However, it is not easy to accept new devices and support, as it involves adapting the ways in which one carries out a task.

'I would rather do something in the same way as I used to and it take a little longer, rather than having to use something extra.'

Henry, 18

'My sight was good when I was younger. I wouldn't use a lot of things that someone who is blind would use. I am set in my ways and continuously trying to adapt and change the things I do to meet the needs of my eyes.' Specialist school student

Young people do not want to stand out as different because of their VI and while they may be at a perfect stage in life to adopt new assistive or inclusive technology, some may prefer to use simple adaptive behaviours.

'I'd rather a large print recipe book and be able to read labels, than use kitchen Assistive Tech.' Jordan, 15

In terms of managing yourself, being VI does require extra organisation, from packing your bag to the additional organisation of external support you may need. It is often not until the pressure of exams that CYP realise the benefit of LVAs and teaching support.

'With cut backs on services we're told we can't [receive AT] and that's all we have heard for the past 3-4 years. I was off for 9 weeks when I resat my Year 11 with no mobility or Braille input; my parents were expected to do it all.'

Funding criteria and budgetary reductions affect the availability of devices and equipment and CYP often have to develop their own techniques and to 'figure things out for oneself' (Lily, 24).

'Quite confident writing notes on my laptop because in primary school I used to use TouchType, I used to find it frustrating at the time but now I am seeing how useful it is in my life. If I am multi-tasking and need to look at something I can type so much faster.'

Olivia, 16

A number of participants spoke about the pros and cons of attending a mainstream or a specialist school. The comments revolved around feelings of social confidence and participation, building self-sufficiency, access to equipment and resources and understanding of their individual needs.

'You've got to let the bird go and learn to fly, otherwise you're not going to get anywhere.' Grace, 18

'It's difficult to include someone who is visually impaired and make it an inclusive environment for 30 other learners that are playing a non-VI sport. Often it's the case, "Well don't do P.E but do extra Braille lessons". Where it should be "How can we make the practical lessons more accessible?"' Sports teacher, Specialist school

Speaking to one author of Low Vision research we learned that many students rise up in confidence as they reach the end of their studies – being in an environment which has their interests in mind. However, if there is not a smooth transition into higher education they are faced with a lack of support towards employment and their confidence can take a knock.

Generally, one's priorities change in the transition between 12 and 18 years old, many participants expressed interest in developing confidence and independence. Navigating social norms and one's own interests from chatting with friends, trying new activities, going out more to taking responsibility for your own money and taking people out as opposed to being taken out.

Although a 12 year old's priorities are different to a 15 or 18 year old, a consistency was apparent in the development of self; the motivation to express an opinion on something that affects you, whereas before you were more likely to accept being told.

Beyond the emotional confidence, building life skills such as making a cup of tea or cooking are also surprisingly varied, again affected

by personality and that of those around you. For example one participant had not prepared their own meals before age 18.

'I was sighted until my teens and learnt basic life and cooking skills. From eight I was making my cup of tea or making my own packed lunches.' Sophia, 17

'Telling if bread is mouldy or safe is something I struggle with so I normally ask my mum. I also struggle telling colours apart.' Liam, 14

For some CYP, to participate in hobbies and daily activities such as going retail or food shopping; visiting a new place; going to a social event/pub, they are dependent on someone to help. Similarly daily tasks such as reading food labels, making sure make-up is not smudged, or getting money from a cash machine require assistance.

'There are some students that don't engage in certain things simply because they don't know what's out there to help them or they don't have the confidence to do that. Something as simple as going out and about and accessing shops, going out for a meal somewhere and having the confidence to track down a waiter and order food, or going to the local pub drinking, because it's quite an intimidating environment.' Teacher, Specialist school

For CYP who do not have access to this opportunity, it can create barriers to stepping out of their comfort zone and trying new things. If you cannot access your own money, then how can you get involved in hobbies and daily activities?

'Money. With money you can do a lot of things. If you don't have the option to access your own money or the chances of you going out and doing these social things, then your social life is very limited. Most students that don't have enough sight to see the [ATM] screen themselves, will be reliant on having someone with them to go get money out, whether a friend or someone else.'

Teacher, Specialist school

'My sight loss hasn't changed much, but I am going out more and wanting to do things with my friend, more importantly it's doing things independently instead of having someone read [my texts] to me because it's intrusive.' Lisa, 16

Whilst it varies with personality, if someone has not developed in confidence, they may avoid asking for help. So it is important to feel and be treated as any one else and develop practical ways to live independently.

CYP spoke of experiences of being ignored when needing support, or similarly feeling misunderstood by the public, teachers, bus drivers, shop assistants and other students. This highlighted a lack of awareness and struggle in communication from both sides. Being addressed slowly, or with extra care, can lead to negative sense of self, as if one's sight affects one's intelligence.

'As I need the lights on in class to use my monocular, it creates conflict with my peers who want the blinds down. There is tension that I am receiving special treatment... In previous years I struggled with people judging me or understanding my sight. Thinking I am being rude because I didn't see or hear them.' Olivia, 16

During this phase of self-development and exploring your personal interests, you are also strongly guided by your circle of friends, parenting and so on.

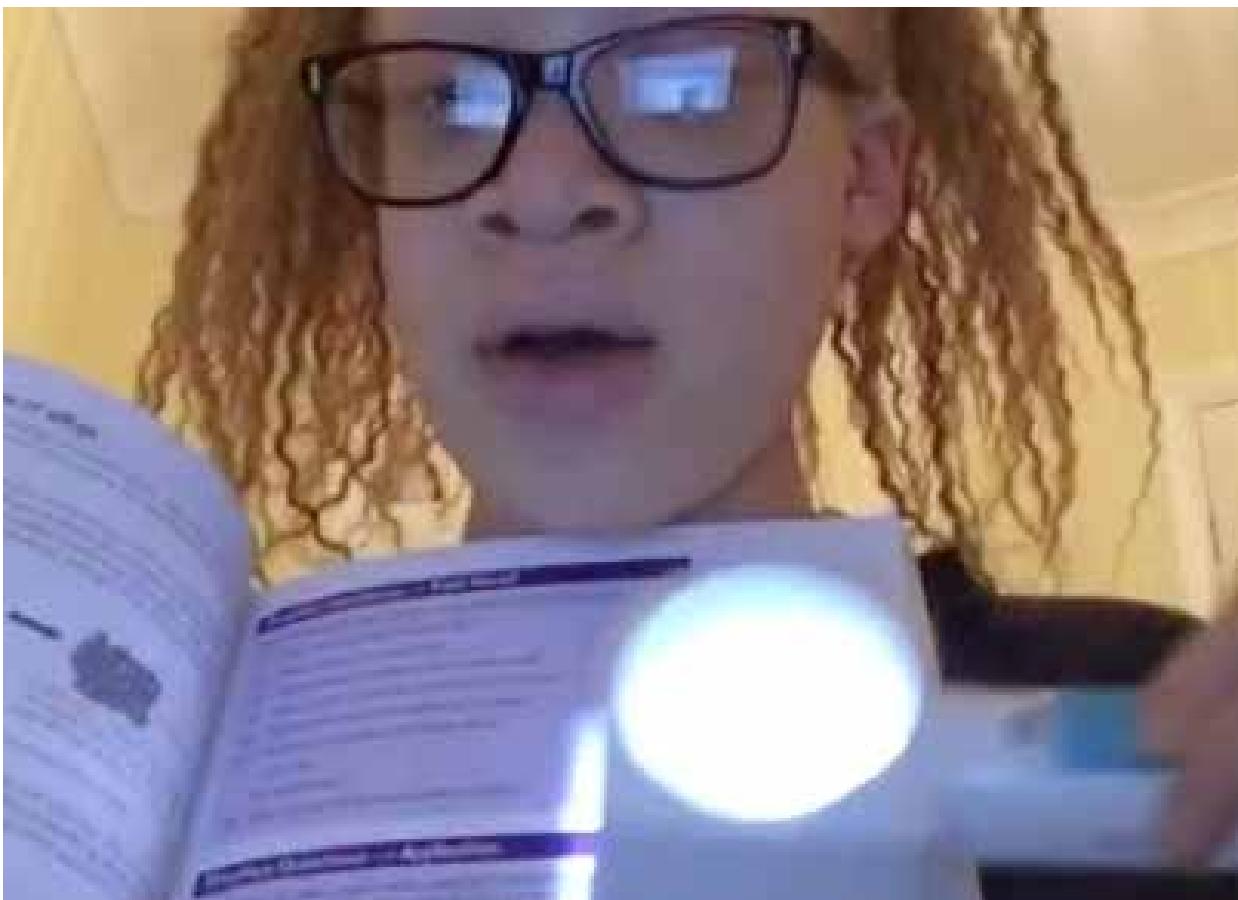
'I would put [my confidence] down to people I have surrounded myself with.' Olivia, 16

To communicate with friends and family, and keeping up with the latest trends, Social Media is now an integral part of many CYP's lives.

'I use Twitter a lot, and Facebook. There is no usability problem with them. In fact it is easier to talk and keep in contact with people here. I can't make eye contact – so it's quite awkward – I know people make eye contact, but I can't.' Hannah, 15



Video still: A participant shows his binoculars as an example of a Low Vision Aid that is quick and comfortable to use



Video still: A participant compares how her magnifying glasses are less complicated than her electronic magnifier

Chapter 2:

Current Products

This chapter aims to give a quick overview of the current products available to CYP, and their perspectives on these most commonly used LVAs and Assistive Technology (AT).



*Bar magnifier 2.5 ×
(16cm × 2.5cm)*



*Optima TruLUX
hand magnifier 10×*

Bar, dome magnifiers

Average price: £12
Popularity rating: 2/5
Portable rating: 5/5
Usability rating: 3/5
How discreet: 4/5

An alternative to hand-held magnifiers are bar and dome magnifiers which rest on the page. However, CYP shared their frustrations that the magnification is very low, and size impractical for long lengths of text.

'I used to use one of those bar magnifiers but stopped using them because they become impractical... I had a few but you can't get enough information in there, a little window lens, have to move it around too much.' Mason, 16

Hand held back lit magnifier

Average price: £40
Popularity rating: 3/5
Portable rating: 4/5
Usability rating: 3/5
How discreet: 1/5

Hand held magnifiers are portable, functional, affordable devices, that everyone uses: however they are the least discreet and not comfortable to hold whilst reading/writing. These devices have clear potential for design improvement.

'I take a selection of magnifiers into school in a bag, select one appropriate to the task and remove from its case. I'd switch on the light, and hold it at the appropriate angle to get the best view. Holding it can cause arm ache, headache and eye strain.' Emily, 13



Rehan Looky 5 HD



Close focusing Roof Prism Monocular

Hand held digital magnifier

Average price:	£700
Popularity rating:	4/5
Portable rating:	4/5
Usability rating:	4/5
How discreet:	4/5

Digital magnifiers with modes to improve legibility are now often matched by a smartphone camera and app, but have more immediate functionality and still offer better resolution. Formally a few designs are beginning to align with mobile-phones but all are prohibitively expensive for their comparative limited function. Some have fold-out stands for desk-based use.

'My magnifier doesn't have any grip so is easy to drop it. I've found getting the manual focus tricky, but I haven't used auto-focus yet.'

Nathan, 17

Monoculars

Average price:	£90
Popularity rating	5/5
Portable rating	5/5
Usability rating	4/5
How discreet	4/5

Many people we spoke with do use or have used a monocular. It is pocketable, has a straightforward operation and function and does not rely on batteries. Although not purposefully designed this way it can be turned back-to-front and act as a fish eye lens to 'minify' things. It can still make the user self conscious and can be tricky to use as requires accuracy to pinpoint the desired view (e.g. bus number).



Apple iPhone



Amazon Kindle

Smartphone: Camera and apps

Average price:	£460
Popularity rating	5/5
Portable rating	5/5
Usability rating	3/5
How discreet	5/5

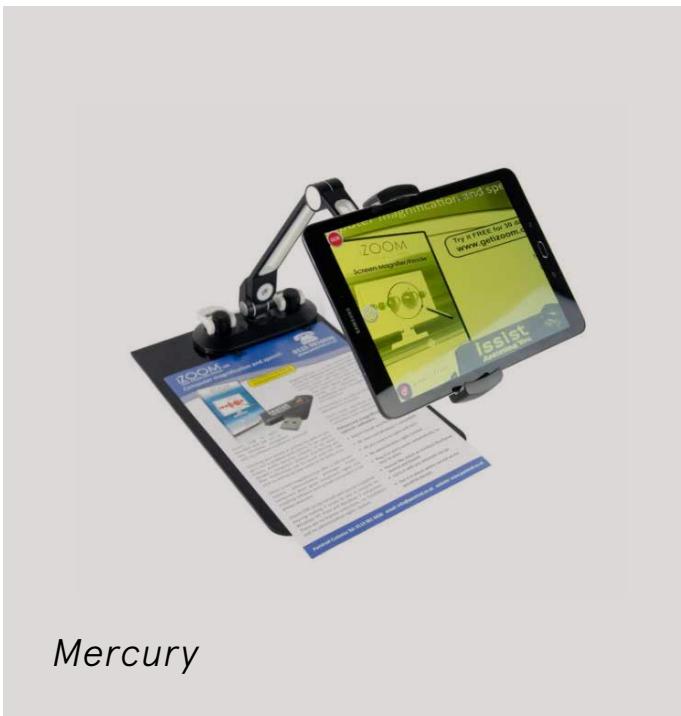
The smartphone has become a desirable assistive solution, mainly as it is discreet, people often have one in their hand, and the usability for other functions such as chatting with friends or playing games is well established. Despite the advantage of being mainstream and easily fitting into CYPs lifestyle, the quality of the camera on smartphones does not yet perform sufficiently to replace LVAs.

'I just want my LV gadgets to look like normal cool techy gadgets – kind of how I feel with my mobile phone – people use it for different things. LVAs are less up-to-date.' Noah, 11

Tablets and eReaders

Average price:	£110
Popularity rating	4/5
Portable rating	5/5
Usability rating	4/5
How discreet	5/5

Tablets and eReaders have been grouped in the same description because if you have one, you are unlikely to have the other. An eReader is a low power, straight-forward way to read for long periods of time in an accessible manner. A tablet is equivalent as a reading device, with added functionality; used just like a smartphone it is suitable for work or entertainment needing a larger screen. As these are mainstream market products these are competitively priced and discreet.



Mercury



JAWS

Desk based video magnifier / CCTV

Average price: £1,275
Popularity rating: 2/5
Portable rating: 1/5
Usability rating: 2/5
How discreet: 1/5

Although popular at primary schools not many people we spoke to still used CCTV, but following the development of tablets and web-cams they have become a lot more usable. There are now several products with degrees of functionality and scale specifically targeted at students. The advantage is they are hands-free and often have built-in compatibility to classroom or lecture-hall norms.

Screen readers

Average price: £845
Popularity rating 4/5
Portable rating N/A
Usability rating: 3/5
How discreet 2/5

Similar to picking between Mac or Windows, there is a monopoly in the expensive screen reader market with many people having to choose from one of three brands. CYP have their preferred screen reader based on their own experience but none of them seem to be overly satisfactory.

'The screen reader I use magnifies the computer screen and also has speech which I find very helpful if I don't want to use the magnification. Others I have experienced have a tendency of stopping half way through which results in the loss of work. It can take time as it seems to be a slower process than with the magnifier.' Zoe, 20

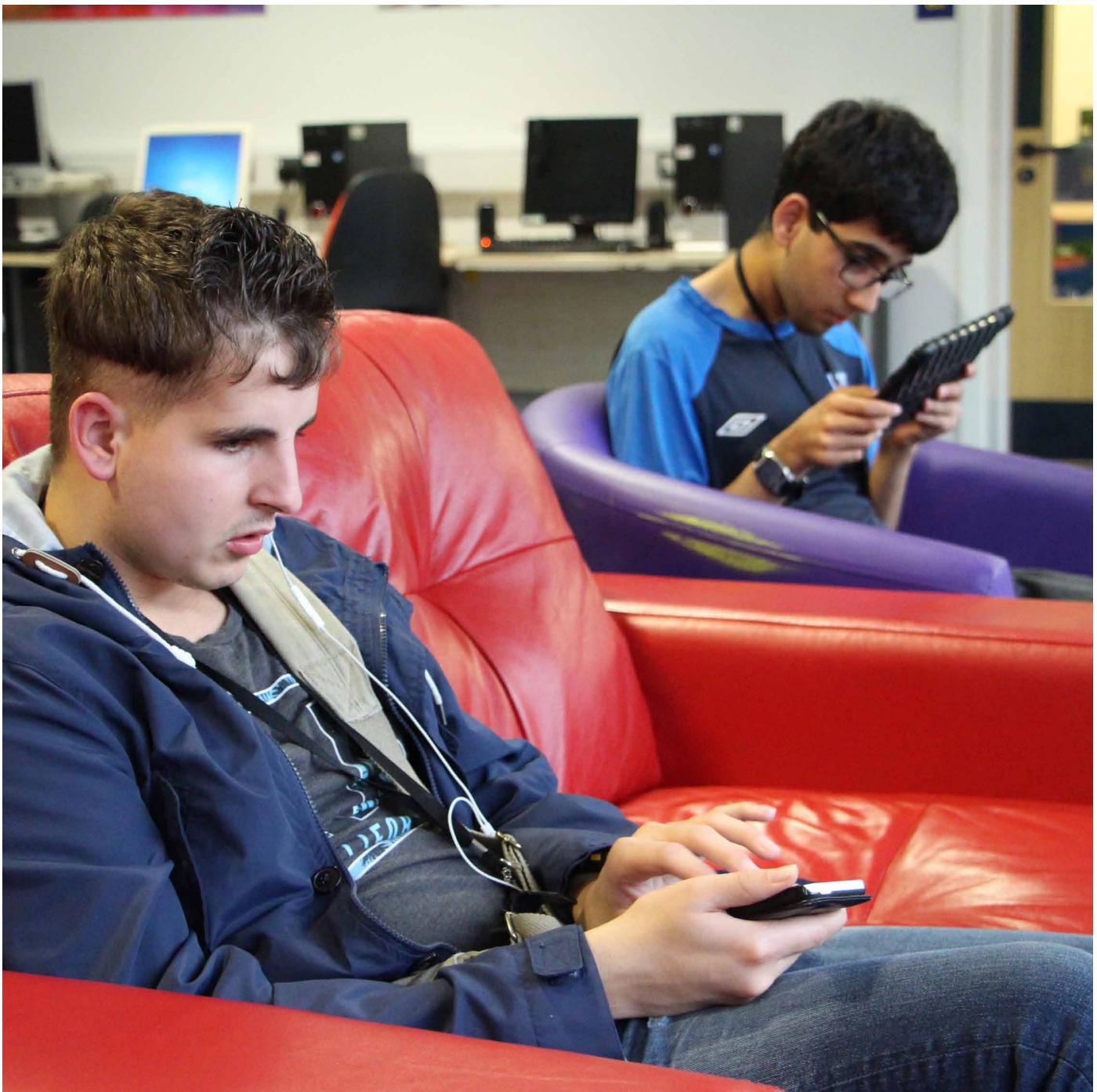


Photo: Two students sit on sofas at RNC using their smartphone and tablet

Chapter 3: **Key Themes and Insights**

Theme A: An Individual's Eye Condition

Insight 1: Understanding and Communicating Your Condition

Theme B: Reading

Insight 2: Studying and Fatigue

Insight 3: Reading as Leisure

Theme C: Out and About

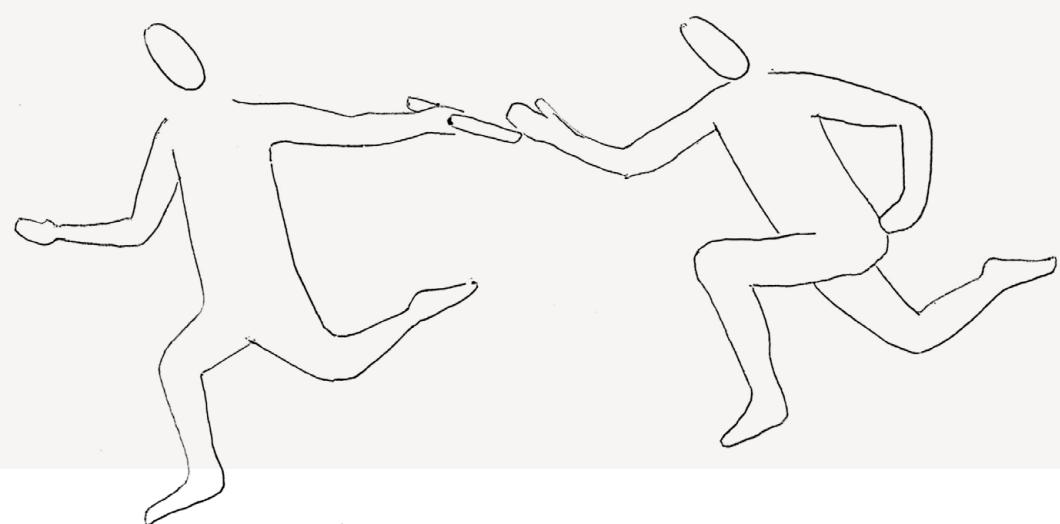
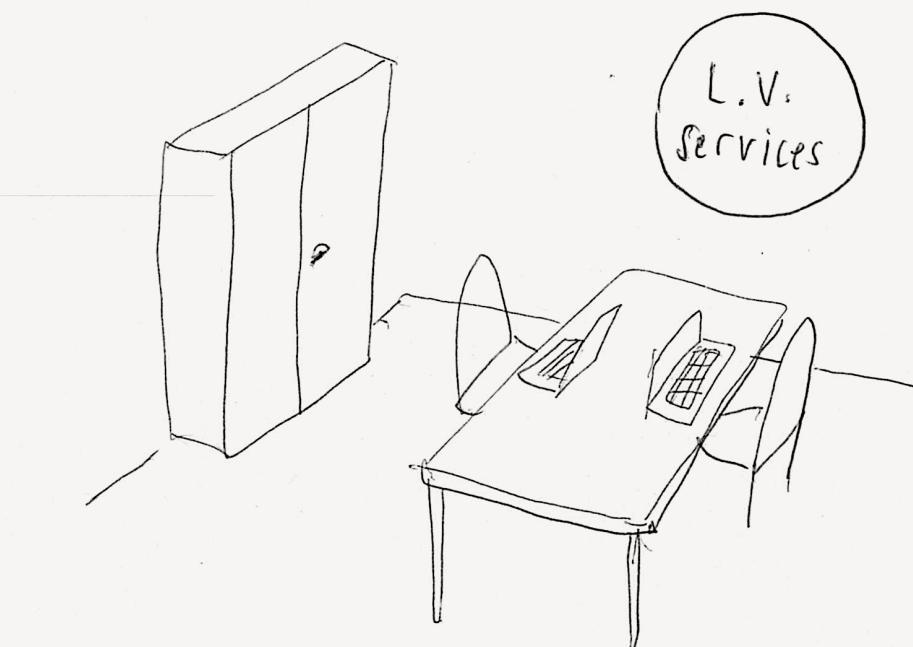
Insight 4: Reading Close and Far

Theme D: Inclusive Experience

Insight 5: In the Classroom

Insight 6: Access to Online Information and Digital Communication

Insight 7: Choosing a New LVA



Theme A: An Individual's Eye Condition

There are an estimated 29,000 (VISION 2020 UK) people under the age of 18 in the UK with low vision. Most CYP are born with their visual impairment, and these conditions can be progressive.

This theme highlights that sight conditions can create different experiences for everyone and focuses on the CYP's perspective of their own eye condition. It is important for an individual to have access to information if they wish to better understand their eye condition. In a visual society, this chapter also seeks to encourage better awareness of eye conditions, to include as many people as reasonably possible, toward an understanding and fluency in the appropriateness of environments.

Theme A: **An individual's eye condition**

Insight 1: **Understanding and communicating your condition**

It is important that an individual has access to information about their eye condition. So they feel confident in explaining to others, to allow a shared understanding, hence maximising the potential for correct support and equipment to be received. Yet many CYP can find it difficult to describe their condition and needs to others.

'Quite often we have students who ask us about their VI because they don't understand and haven't been told.' QTVI, Mainstream school

'It is difficult to explain to someone, when that is what you see and you know no different.' Billy, 17

- Understanding that sight is a variable condition**

Comprehending to what degree your sight compares to that of others with a similar condition, or to people with full sight is challenging. This project highlighted that there is a lack of relevant information, and support available to understand one's condition.

'When my vision began to deteriorate, I found it difficult to access the relevant information about my sight loss and what impact it might have.' Lily, 24

'Too much light affects my eye condition (a sunny lunch time). I slow down what I am doing, sometimes getting close to a wall helps.' Liam, 14

- Communicating to others**

The project highlighted that children and most young people found it difficult to explain their eye condition to others. This is not hard to understand with clinical names for conditions being the norm, such as 'retinitis pigmentosa'. Having the means to communicate effectively with others is invaluable. As you get older and confidence begins to grow, you become more comfortable in communicating your needs to others and finding techniques that best work.

- **Lack of social awareness**

A cane can communicate you are partially sighted, but like many, CYP do not want to be labelled as being different. Some CYP choose to not mention their VI for a variety of reasons, often wanting to blend in and work like fellow peers, carrying out tasks discreetly.

Additionally, a signal such as a cane can be perceived as a severity in VI, so actually the use of remaining vision can surprise those less knowledgeable about VI.

'In an unfamiliar surrounding I use my cane, but when I have my cane people look at me a lot differently than when I don't.' Zoe, 24

'I had the dilemma of not telling my employers (about my VI) in case they saw it as a weakness, but then [I was] faced with them thinking I am stupid if I made a mistake.' Lily, 24

CYP spoke about how they felt most comfortable and their confidence grew when working with people who are passionate about their job, or with someone that has or knows someone that has an eye condition.

'A lot of my friends have visual impairments and different health conditions. So are not just blind but also deaf. Tactile and audio are very important.' Chloe, 14

- **A shared understanding within education**

CYP also mentioned the importance of their teachers having a basic understanding of their condition and how to best support them during education.

'If you have no understanding of being a VI person, it is basically impossible to teach someone how to live... We have teachers that have the same visual problems. Which really really helps.' Grace, 18

During education students can often experience having new support staff and teachers. Through interviews and observation we learnt how easy it can be for information to get lost. The student is found repetitively reminding staff and communicating their needs to their Subject Teacher, Teaching Assistant (TA) or Qualified Teacher of children and young people with Vision Impairment (QTVI).

"There is lack of basic understanding, my Biology teacher used to talk to me like I was 3 years old." "Yeah they all do that."

Students at specialist school reflecting on previous experiences

Concept: An app 'Through My Eyes'

The insight of different descriptions used by students to explain their needs, inspired the concept to design an app to support CYP in situations when information needs to be shared with others. There should be a universal understanding, through descriptions or visual tools that are quick and easy to communicate. As part of an online platform, this would also include a digital Pupil Profile Sheet.

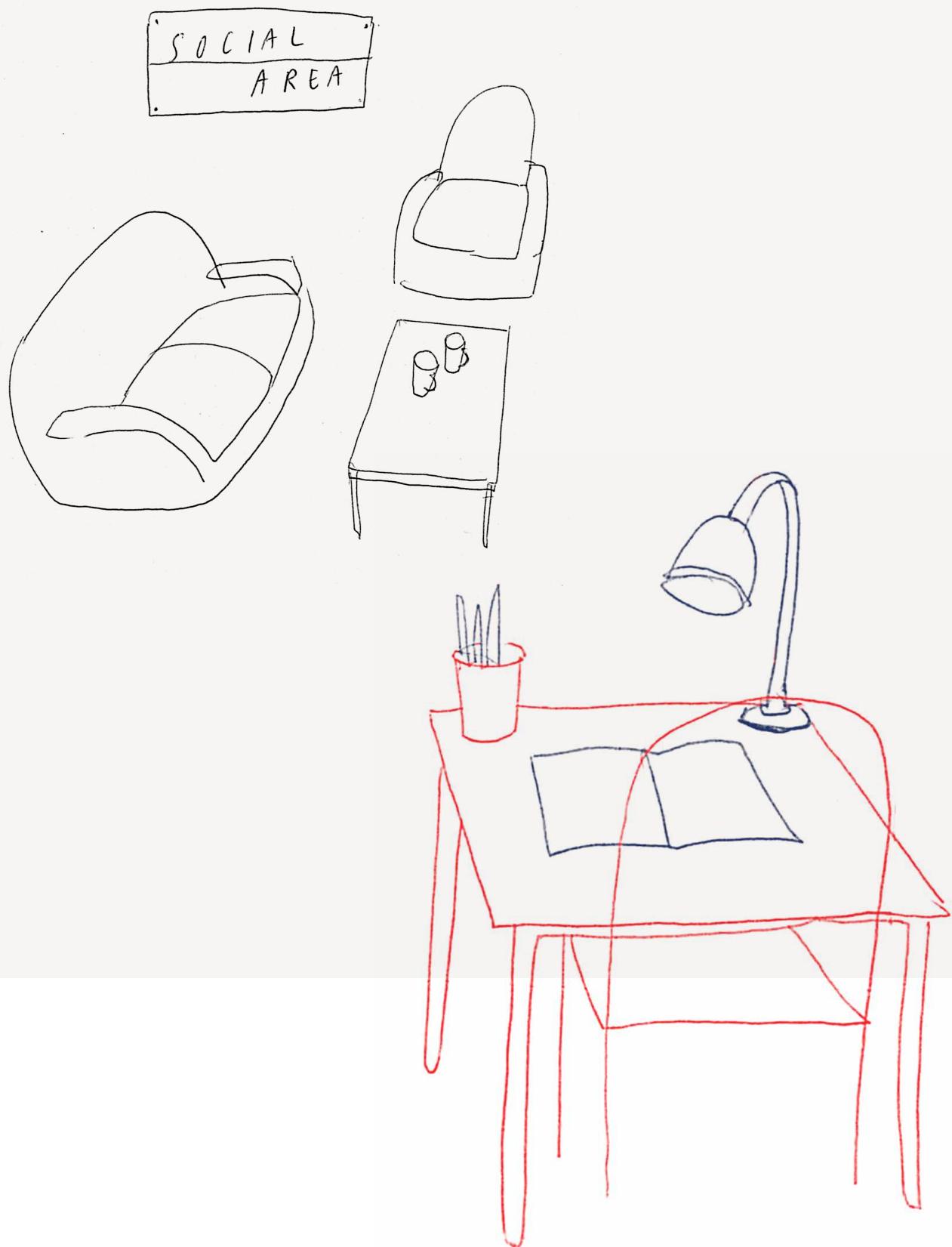


Image: A montage of two drawings; one of a relaxed scene of a pair of sofas and a low coffee table with two mugs on. The other featuring a one-person desk that could be at home or school, with an open book and a desk-lamp

Theme B: Reading

Reading comfortably and independently is an essential and enjoyable daily task. Current solutions help practically in the short term, however, they do not yet suitably address all issues in one portable size for long periods of reading.

'If you use a bar magnifier, you're going line by line, once you get to the end of the page you're already thinking I don't want to even read this story. You could stick it under the CCTV, but it's not the same because you want to kick back and read your book.' chloe, 14

Typical LVAs young people use to read range from dome magnifiers, to high-powered spectacles, hand-held-magnifiers with a light, to screen-reader software (See page 21). These all have side effects; such as fatigue through eye-strain or back-ache, to impeding on people's comfort when reading in a relaxed environment (e.g. on the train or in bed.)

The desire to read for leisure varies in line with a teenager's interests, regardless, if it is a difficult process it will be unenjoyable which in turn will reduce motivation. Being able to read in parallel with peers in class is often a compromise between table-space and technology, additional to the chore of homework; LVAs burden young learners with heavy rucksacks and complicated protocols regarding their use.

This theme has findings and insights we found most meaningful in addressing improving independent and enjoyable reading for this age group.

One sight-condition which particularly affects reading is Nystagmus where ones eyes move from side to side. Some people are able to find a 'null' point but this may only slightly reduce the degree of fatigue. Although more tiring than painful it is exacerbated by stress or tiredness.

Theme B:

Reading

Insight 2 :

Studying and fatigue

Reading long lengths of text is integral to studying, which creates an issue in terms of how to supply the material, but this chapter focuses on improving how the student actually reads it. Reading at length is tiring; be that physically, cognitively or through frustration. Individuals will have a preferred format of text, LVA and environmental conditions, that suit them for different contexts.

Being able to keep up, to get through long texts or sustain the extra time and concentration is not only relevant to the classroom, but also doing homework, revision, and in exams.

'Originally an 11 page test paper, it took me four and a half hours to type it up and was 96 pages because of how big you have to make everything. We would have to give it to her in stages. A test paper is bad enough but when you're putting 96 pages in front of them you can see their face drop.' Teaching assistant, Mainstream school

'I do have magnifiers and have a little one that I carry around but I have an app on my phone. I will chuck it in my bag but not bother to use it and it's just an extra thing to carry around. Where your phone has more of a purpose, it's a lot easier.' Lisa, 16

- **Importance of good lighting**

Lighting is an influential factor on ability, but individuals rarely consider it as something that could be addressed; as an environmental factor it may be perceived as uncontrollable. Support must be given to create the right environment for sustained work. Additionally, sight being a variable condition means what might be right for one person will not necessarily be right for another, or what is appropriate one day is not the next, so one may fear the risk of improving one person's experience to the detriment of another.

'In the last two years I have had to deal with situations where classmates wanted the lights off but I couldn't see. I am not being

'a drama queen, I can't work in the dark. There needs to be more awareness in schools.' Olivia, 16

- **Prospect of carrying bulky LVAs at school**

Preparing for the day ahead, CYP are often faced with a multitude of issues surrounding reading – a bulky bag with a range of devices no-one else seems to need to carry; receiving unwieldy A3 print-outs, imposing on your shared desk; holding the reading material whilst balancing the LVA and navigating around this sea of words, and so on.

Addressing how to lighten the load in using one's remaining vision, will satisfy numerous concerns of youngsters with low vision, and encourage use. Not having an appropriate tool to hand has a direct impact on academic performance and yet CYP can feel embarrassed by needing a TA to help carry their LVAs.

'Process: open bag, select LVA, take out of case.' Emily, 13

'I used to leave my LVA [at home] as I was fed up having to carry more than other students.' Olivia, 16

'At school I carry three bags. I want to look for something that is portable. One big bag would help me get around school' Olivia, 16

- **Getting eye strain from reading small areas**

Using a traditional bar magnifier, dome magnifier, or handheld digital magnifier device each have factors that affect being able to sustain reading long lengths of text. The dome has a consistent amount of magnification and stays the same distance from the page which helps, but the small amount you can read in one view requires extra concentration to maintain flow. Handheld digital magnifiers may offer greater magnification but the CYP in the study reported that the inconsistent level of magnification and focus can create nausea.

'I'd love a half-page sized magnifier that would actually magnify; you could read half a page, then another half. You can get A4 sheets, but they don't magnify enough.' Chloe, 14

'Reading by word shape: because of my eye condition, I don't see individual letters I see shapes. So I read along, connecting two sentences in my head.' Chloe, 14

- **Holding an LVA is tiring**

Magnifying print without the help of software will always be tied to navigating the layout of a page, moving your magnifier around the

page not only adds to the nausea mentioned above, it is physically tiring. Solutions are being developed which help existing mainstream technology assist in this context in a comfortable manner (e.g. the Giraffe Reader). Whilst CCTV may fit into a home scenario we have not spoken to anyone who considered it affordable.

- **Audio, digital content, text books, Braille**

Young people who have learned to read Braille will appreciate the autonomy it offers, but will be held back by the lack of access to material. The current digital alternative to a book is a reading tablet, such as the Kindle. Just larger than A5, at its best this allows magnification and audio output through headphones. It is an example of how with better access to content in its digital form, as 'live' text, there is almost seamless access and personal choice on how to read long texts. Publishers of educational material should be put under greater pressure to share their content digitally so that students have autonomy to read it in their preferred way.

(For 'Classroom Practice' see page 46)

"With an app if you can tell it what your condition is, and it changes to the settings that suit that type of impairment." Owen, 16

Concept: A portable digital magnifier for long periods of use

To improve reading for long periods of time we can inform several aspects of a design brief:

- People would like a portable device, to enable reading in different places, a flat surface being most common.
- Long texts result in eye-fatigue, so we must minimise any change in magnification whilst reading, and increase the amount of text visible at one time.
- In line with current functions: Allow the option to change the colour of text and background; utilise existing software capability to scan printed text and convert to 'live' text; which can then be read on-screen or through audio. Audio should be 'natural' (i.e. a human voice).

Theme B:

Reading

Insight 3 :

Reading as leisure

The simple, sensorial enjoyment connected to reading offers great potential to design. People we spoke to described how much they missed moments of comfort when reading since their condition had changed their reading habits. Highlighting the additional rewards reading offers beyond being an essential task.

Between 12 and 18 years of age, different distractions influence life and are markedly different from those in later life; it is an important phase in life to strengthen reading habits, and ensure reading is made as comfortable and natural as possible, which for many it is not (even in those without sight-loss).

- Reading is a rewarding sensorial experience**

How can you match the rich sensorial landscape that the back of a bookshop evokes?

'I miss the feel of a book, the smell, turning of a page.' Chloe, 14

Enlarged and Braille books provide access to literature; however, we did not hear any emotive language being used to describe the experience. Whilst some people are comfortable with using a magnifier and reading an enlarged book, others prefer to listen to books narrated by a human voice, it was apparent that sensorial elements still play an important role.

'I have a Tablet but I need the book; the feeling of the pages, every book has a different smell. So satisfying.' Chloe, 14

'The aesthetics of a book are really nice. A favourite thing to do is take a towel and food and read on the beach. Blend in. Dome and sheets are not strong enough and I would be quite embarrassed [as they are] not very discreet.' Sophia, 17

- **Wanting to “kick back and read”**

Posture when reading is another important part of the enjoyment; sitting on the sofa, in bed or on a train. How can we lift the performance of CCTV to a soft-environment? When reading for long periods again lighting is important and it seems that people prefer not to use a digital screen. People who use dome-magnifiers were most affected by the limitation of a flat surface being essential.

'I'd really like to be able to have something I could use when sitting in bed looking at magazines and graphic novels. When I am travelling on a bus or train there is no flat surface anyway, so I wouldn't be able to use it like I do when I am at school and it's on my desk... I would need the Low Vision tool to be portable yet stable and flat, and [it] would allow me to magnify things – but could also be small enough for me to then pop into my pocket or similar so that I could just put it away and travel with it without it being a hassle.' Noah, 11

- **Enlarged books**

Enlarged books are a solution to making novels more legible, but are not yet comfortable given the context they are intended for. If there is no way to reduce scale, could graphic design play a role in reducing any stigma around them?

'I used to read more than I do now. What put me off was [these] big thick books, I already have a lot to carry. Adding more to that would stress me out. I do have a Kindle and soon an iPad.' Olivia, 16

- **Reading through audio**

‘Reading’ through audio has made huge leaps in mainstream popularity in recent years; listening to articles, podcasts and audiobooks on a smart-phone are a common everyday activity. Audio boasts many positives in terms of access, control and convenience, yet one could argue the validity as a rich sensory experience?

A positive example of design from ‘margins to mainstream’, early developments for the world of accessibility have informed audio-book development (Pullin, 2009, p.95); however, often the voices used for narrating are digital and unnatural. A positive development is the increasingly popular audio-book narration by popular actors, giving the intonation and warmth story-telling deserves. Mainstream popularity may be the precursor to developments being made to achieve a better quality across the audio offerings.

- **Magnifiers should be adjustable to different tasks**

Trying to design one tool for numerous tasks can be detrimental, but several people mentioned the limitations of LVAs, which are good at one job, but lack flexibility. Under the theme of leisure we can draw upon other pastimes such as craft. Digital magnifiers are capable of different magnifications but are not yet used in this context, unlike hands-free non-digital devices such as clip-on lenses for glasses, or magnifying lamps like a dentist's, which are.

'I can remember recipes, so I'd rather a large print recipe book and be able to read labels, than kitchen Assistive Tech.' Jordan, 15

'My magnified glasses... I use these [the] most as they help me to read books, labels, papers, magazines and I can access everything on my phone much more easily than without them. They are a light-weight and they are small so [they] fit it in my bag or my pockets. I use them at home, at the library, in shops, in university...' Zoe, 20

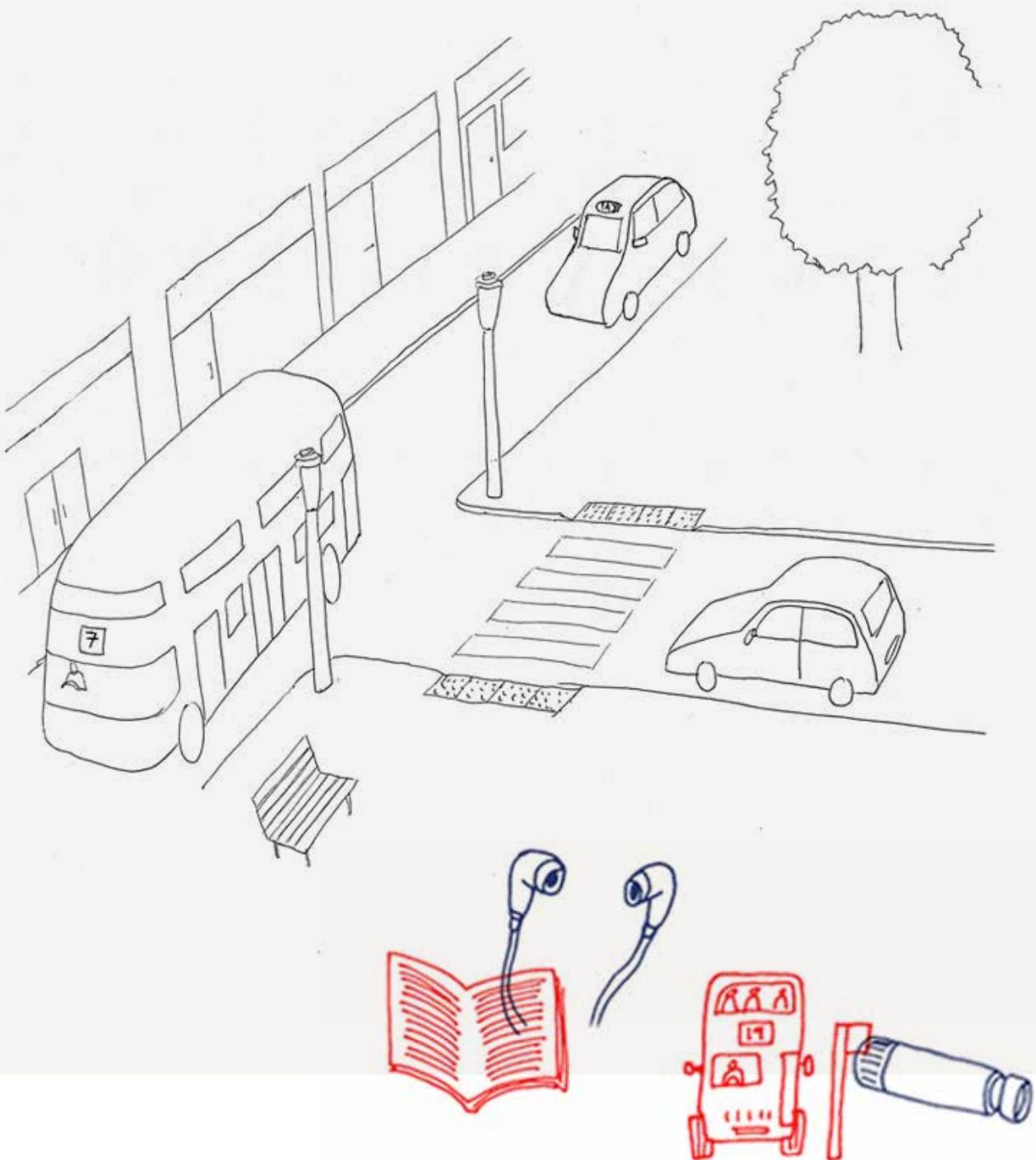


Image: Drawing of a street scene with local bus, taxi and car at a T-junction with a pedestrian crossing, shops, and inset are headphones and a monocular.

Theme C: Out and About

As highlighted, the desire from ages 12 to 18 tends to be increasing independence. This theme looks at maximising confidence and the enjoyment gained through getting out and about. Unfamiliar surroundings can be challenging for all, and often moreso for people with sight loss, so if we can support positive experiences at this age it should encourage confidence. LVAs carried most commonly when out and about are a monocular, a smartphone and a cane.

'A priority for me would be reading text you can't access; close and far; out and about.' Alice, 16

For some people there can be uncertainty around asking for help, it will be interesting to see the role of smartphones as they become more intelligent. Conversely one could ask will technology have a negative effect, decreasing people's confidence and self-reliance – encouraging dependence on smart-connected devices?

Mobility and navigation are both vital, and issues relating to them range from personal matters (e.g. inconsistent ATM displays interrupting access to your cash), to safety concerns (e.g. the pros and cons of using audio) and social issues (e.g. trying to locate the point where you agreed to meet friends). However, the focus here is specifically on the need to read text, whether close-up or far-away, as resolving this issue has the potential to improve many areas of daily life.

Theme C: Out and About

Insight 4: Reading Close and Far

Reading close and far is a fundamental task, however, everybody with less than perfect sight still aspires for a better solution in order to improve experiences outdoors (e.g. on the street or in the shops).

Young people should not be disadvantaged by their condition due to external factors – particularly those created by others; Product Design can distance people from their sense of identity – bad design disables, good design enables.

Monoculars do exist that can focus close (25cm) and far (several hundred metres) yet people are developing techniques with their camera-phones to read bus numbers, this is most likely due to the convenience of having one device at hand that can assist with a multitude of tasks.

- Treatment / perception of self by others**

We have found that when out and about CYP are comfortable around close friends but concerned by the perception of either peers or the general public and wish to carry out activities most take for granted, such as shopping or ordering from a menu independently. Currently the design of many LVAs do not 'fit' conventional environments and perceptions, hence are not used.

Expanded in *Chapter 4: Design Priorities for Future LVAs* (page 57) there is a distinction in preference as to whether a product should be personalised or fit stylistically alongside products such as mobile phones. This is compounded by a lack of mainstream product accessibility and mainstream understanding, which conflicts with notions of inclusivity.

'I like my binoculars... It makes it all the same and I'm exactly the same as everyone else.' Noah, 11

'I find it embarrassing when out and about, using my smartphone and looking like Gollum. I don't really dig that look. I've been

on the train before using my laptop with my magnification on and someone saw and said out loud that I should have gone to Specsavers, so I put my laptop away.' Sophia, 17

- **Using a smartphone, monocular, or audio?**

Monoculars are able to focus at around 25cm to read labels, but tend to be used for mobility; at 10x for reading bus numbers or street signs. Turning your monocular back to front acts as a field expander, it 'minifies' your surroundings. Although this sounds like a 'one-for-all' solution, apparently a slightly larger lens is preferable for labels. A lot of people use their smartphone and zoom in or photograph to read a label. Both of these are quite conspicuous 'mainstream' product solutions.

In getting around, audio (through headphones) is another new mainstream tool. There are many advantages in being able to receive a live information-feed about your surroundings; however, it also interferes with more responsive natural senses, such as attention to nearby traffic.

'In London you can wear your headphones and as you walk past a shop it tells you what shop it is. If that was everywhere, [it] would make it so easy. With earphones people just think you're listening to music.' Owen, 16

- **A streetwise solution**

The physical constraints from the cumbersome size of LVAs (page 33), also restricts use on the street. This is not only because it is problematic to fit in your bag or pocket, but also because people feel wary of damaging it, or exposing themselves to trouble (e.g. burglary or mistreatment).

'Carry like my phone – I don't want to break it. I am worried about being out and about with my low vision aids as I don't want to break them.' Noah, 11

Battery-life also impacted on people feeling comfortable using an LVA in public – having to decide whether or not the need was important enough to expend batteries. This dramatically reduces the feeling of independence.

'I had a LVA which I no longer use because I found the battery life tricky. It had limited use off charge, what seemed like twenty minutes, so I had to be careful to only use it when absolutely necessary.' Liam, 14

- **Effects of light levels**

Each individual's condition creates a different reaction to environmental light levels. Generally one would expect it to be harder for most people as it gets darker, but for a lot of people bright daylight is just as debilitating. This should inform the design of the built environment as well as LVAs which could be needed in bright sunlight.

'The darker it gets (dusk, night) the less easy it is for me in and out of doors.' Noah, 11

Concept: An analogue 'Close and Far' magnifier

To make it easier for CYP to feel comfortable going out we propose one pocket device that can be used for reading text of 2.2mm (10pt label) up to 350mm text (e.g. bus-numbers in the distance). This would potentially require two separate lenses. It should not be digital – removing the pressure to keep it charged or to use it tentatively (preserving battery power). Providing a sun-shade lens for any monocular lens would also help people when using it in daylight.

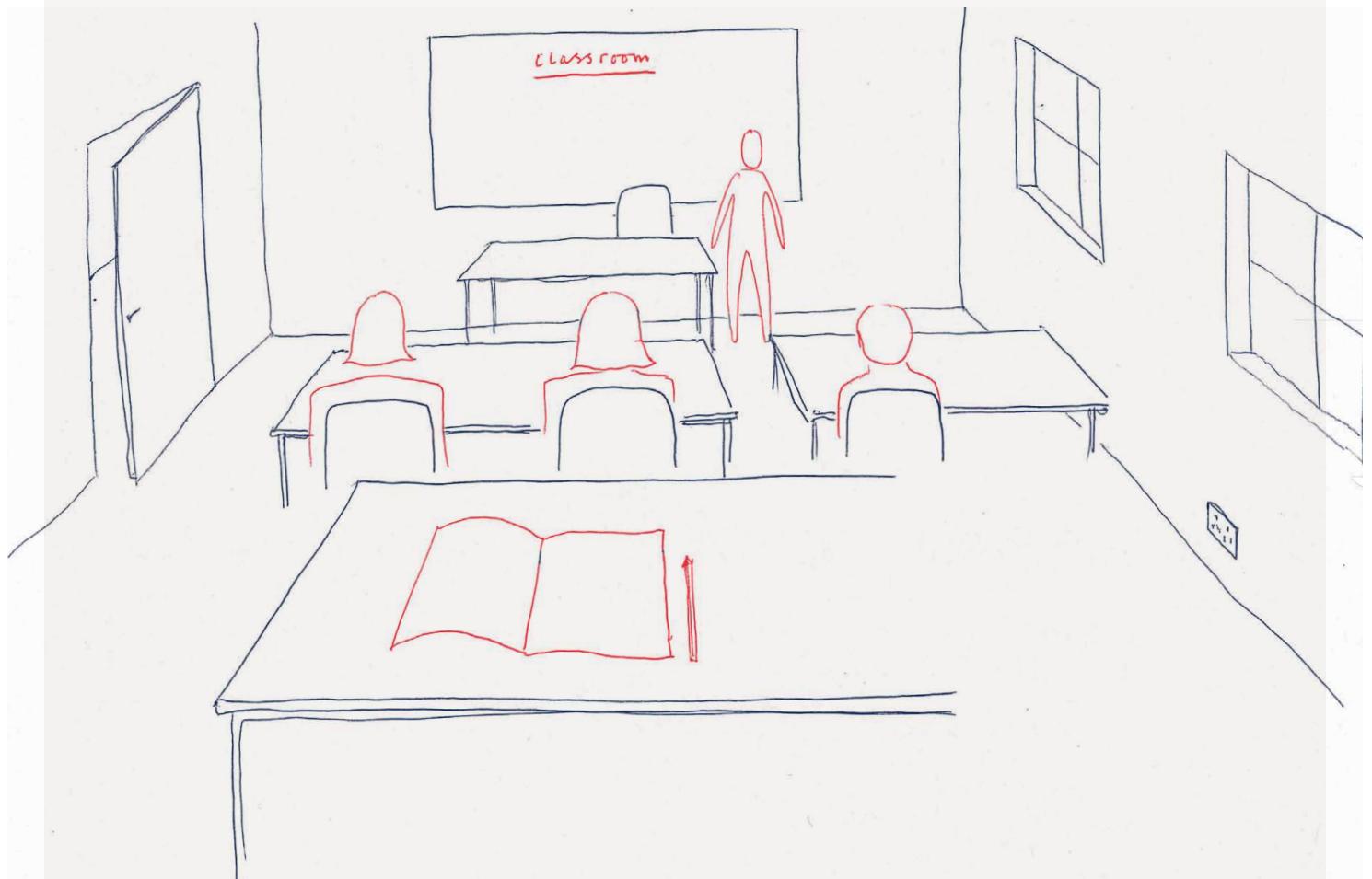


Image: Drawing of a view of a classroom with a teacher presenting, other pupils in the row ahead and an open book on the desk in front of you

Theme D : Inclusive Experience

The theme of inclusive experience extends from the classroom to the clinic to the online universe. The development of young people into confident individuals is significantly influenced by the approach of stakeholders connected to their education and independence – whether they are teachers, clinicians, web designers, those working in the sight loss sector or part of broader society.

Specialist understanding and experience may be necessary to ensure that your practice is inclusive – or ‘experienced in parallel by all’. Although it may sound daunting, with simple and engaging support, this should not be an overwhelming task.

This research, consulting people in mainstream as well as specialist schools, highlighted the need to achieve parallel learning in mainstream classes, to offer knowledge of the full range of LVAs available to offer to a young person, and to appreciate the importance of accessible digital platforms and information.

The impact is significant – creating an accessible, inclusive experience can help to build the confidence and independence of young people.

Theme D: **Inclusive Experience**

Insight 5 : **In the Classroom**

Whilst there are guidelines for teaching students with sight-conditions, and courses to become a *Qualified Teacher of children and young people with Vision Impairment* (QTVI), even when a qualified teacher is supporting a young person, it is not possible to remove all barriers to accessing the curriculum.

There is an opportunity for design to help lighten the load of already overworked teachers. We cannot expect every teacher to effectively deliver content in a parallel fashion when a consistent and well-communicated process is not in place.

Adapting to the requirements of visually impaired CYP is often a learning process. Hands on experience informs an understanding and facilitates the creation of packages of successful teaching material; however, whilst the teacher comes to terms with what is required, those students involved in this process may be more poorly resourced.

A designer for the classroom has to negotiate it being a social hot-spot as well as an essential learning environment. Whilst CCTV or A3 print outs help, they can create physical barriers to other classmates on the same table. This chapter looks primarily at the practical side to teaching a class.

- Providing accessible teaching material in parallel with classmates**

A key aim should be supporting teachers to ensure their teaching is received on an equal level by all students. Ideally teachers should be empowered to deliver the best experience with minimum extra work. Correct lighting and legible material are the traditional ‘must-haves’, this is made easier with teachers often preparing and presenting material digitally. Students are able to receive what is on the board via their laptop or tablet, but this is not a complete solution.

Considering the students' experience, there are still many moments in which they feel different to their peers, or have to work harder to access the teaching materials. Reading in class in parallel with classmates requires a legible size in an understandable layout on a manageable format.

'Enlarging an A4 sheet to A3 is not making it accessible: This pushes the work further from the student – reading across A3 is problematic especially for some eye conditions, for example, nystagmus. Page numbers will change when amending to A4 but this is easier for the student to work around than trying to access on A3 generally. When reformatting the text as an accessible A4, you can insert the page numbers relevant to the rest of the class.'

QTVI, Mainstream school

'If I haven't received their PowerPoint notes prior to the lesson I now make sure I tell my teacher straight away.' Olivia, 16

'You can only do so much, until you fall behind. If your teachers aren't bothering to put any effort into the preparation, then you get bored of your lessons and think what's the point of me being here.' Sam, 20

A long standing design opportunity exists in practical classes such as Maths, Science, Sports etc. that involve graphs or apparatus where guidelines may not always relate and more creative work-arounds are needed.

- Accommodating screen reader users**

Screen reader software is a big issue in education with a variety of common reasons still creating sticking points for students trying to keep-up. The user-experience (UX) – both the navigation system and having so few words visible at a time – makes it easy to lose your place. Audio is a positive feature for making reading less of a strain but in class it highlights you to others and distracts others, so inevitably people tend to mute it. Screen reader software regularly causes computers to crash and schools are unprepared in how to maintain it.

- Appropriate, timely lighting for learning**

Whilst the teacher has a class of many people with different demands, lighting in the classroom is critical, yet what that lighting is will vary according to how the individual's condition is during that lesson. Reflection and glare are very common problems, and

although it is according to activity; some students cannot work in the dark, whilst others' optimal scenario would include black-out blinds.

- **Communicating pupil profiles**

"No one bothered to tell the teachers about me. Used to walk into the classroom and be asked to take off my sunglasses and would have to tell the teacher that I was VI" Toby, 18

Successful employment of Pupil Profile Sheets, each with a description of condition and preferences, would improve understanding and reduce delays in getting the appropriate set-up in class. Not only giving the teacher immediate access to appropriate information and understanding, it would facilitate sharing information when there is a change in staffing.

- **Red Tape preventing use outside of school**

The funding source often dictates where an LVA can be used, which illustrates how complicated the system/infrastructure around supporting students self-sufficiency is. For example if the Local Council funded the LVA, you may not be allowed access to the school intranet. Or if the school has paid for it, insurance will require it is securely stored on school property when not in use. This lack of responsibility to the student exacerbates an unfair lack of autonomy.

- **Reliability of technology**

Once a student has received the appropriate equipment there are still inevitable issues around technology failing, which has an impact on the learner's flow. In addition we learned there is usually very little training and support provided by the manufacturer, so unless other people use that assistive technology or that user-interface, the CYP actually know more than others anyway. Whilst non-digital magnification would negate this, the advantages expressed regarding software underline its necessity.

Concept: Software to create accessible teaching material

The impact of not being able to read in line with the rest of the class has prompted the concept of software which reforms a Teachers' teaching material, through a series of filters, into a secondary, accessible, digital/printed format. It also exports a third version for the Teacher, which tracks differences in layout and correlates page numbers between the original and the accessible version.

Theme D: **Inclusive Experience**

Insight 6 : **Access to online information and digital communication**

For this group, having access to the internet does not necessarily mean an app or website is accessible. The focus demographic for this study are 'digital natives' – the majority are completely fluent in communicating, operating, even playing and relaxing in a digital environment. Without popular digital platforms being inclusive, visually impaired CYP are being left out.

Whilst 'app-stores' have minimum requirements and steps are being made to legislate web-accessibility of the public-sectors (as with the built environment), it is a substantial task to monitor the vast quantity of sites and apps made public.

A website may be useful for one essay or an app may be 'the' game for a week, but currently more education, awareness, and legislation is needed to ensure developers have an inherent attitude to digital content being accessible to all.

• European Union Web Accessibility Draft Directive

'On 3 May 2016, the Netherlands presidency reached an informal deal with the European Parliament on a new directive to make public sector websites and mobile applications more accessible, especially for people with disabilities... The scope of the directive has been extended to mobile applications, which are more popular than websites. The directive enables individuals to request specific information on demand if the content is inaccessible [and] must also include a link to a feedback mechanism, so that it is easy for any user to report compliance issues.' (European Council, Council of the European Union, 2016)

One participant mentioned how they were on a Local Authority website applying for disability assistance but that the drop-down menu on the page was not accessible. This initiative addresses

public-sector bodies to live up to standards providing an inclusive experience for all and highlights that includes apps.

- **Technical incompatibility**

This chapter addresses not just the awareness of the broader 'developer' or 'digital publishing' industry but also the surprising number of international computing cooperations who release operating systems or third-party software that do not behave cooperatively. The web legislation above is very late arriving to an internet broadly public now for 20 years, consumer electronics being bought today should work in parallel with accessible tools and not be adding further friction.

- **Access to digital educational information**

This research aspires for improvements suggested to filter through from its social focus to educational benefit. Whether researching on an amateur website, an established website or using a revision app, the benefits of researching digitally to complement edited, published books should not be ignored. Support to encourage free, exciting and interesting information that is accessible as standard, without expensive peripherals, is needed as the digital world continues to grow.

- **Access to digital communication platforms**

Whilst people do mainly use their phone for conventional spoken conversation, we have learnt how positive and popular messaging apps like Facebook, Twitter and WhatsApp are for people with partial sight. This facilitates a level platform where sensory loss has little to no effect to a seasoned user. In early 2016 Facebook made steps using artificial intelligence to describe what is in a picture (Wu and Pique, 2016), whilst Twitter has enabled alt-text allowing 420 characters to describe what is in an image (Kloots, 2016). Communication mediums as pervasive as these should be addressing parallel use as standard practice.

- **Access to social entertainment apps/sites**

Leisure time is increasingly spent on digital platforms (Ifould, 2016), CYP we spoke with complained that popular games or streaming sites were not accessible. The gaming industry creates many innovations that have transferable benefits to design for disability, (such as the Nintendo Wii for rewarding exercise at home); this is an exciting strand for further research to better align need and potential.

'All my friends do fantasy football. I can't because I can't access it. Very hard to navigate. These apps should be accessible for everyone.' Owen, 16

'The subtitles on Netflix stopped halfway through the series and it's very fiddly, whereas YouTube skips on to the next one for you.' Sophia, 17

Concept: Increase legislation that in-demand online platforms must be accessible

Whilst legislation exists, accessibility of mainstream digital media is far from optimal, yet many designers, developers, authors and publishers will have their own personal interests competing for their attention beyond ensuring accessibility. Legislation such as those addressing education, the environment, and physical access, should be examined to inform how to highlight digital access to the public conscience, making it harder to publish material that is not accessible.

Theme D: Inclusive Experience

Insight 7: Choosing a new LVA

Going through the process of choosing an LVA can be daunting and even overwhelming for CYP, their parents and the VI community. Being able to support a young person is about taking steps towards self-sufficiency and giving good advice. We have found there is a lack of awareness around what LVAs are available and where to look independently, even when in contact with a QTVI or a charity organisation. In this chapter we look at building on the awareness of LVA options, and CYP's ideas for how the process of choosing an LVA could be simplified and personalised to suit the needs of the individual.

'There should be more support for people like me, I didn't choose to have to buy all this expensive equipment.' Olivia, 16

'We never ask students that question "what do young people want?". We test them, give advice, tell them to use them and we hope that they do.' QTVI, Mainstream school

• Awareness of product options

'Awareness' was a key focus for this research project, as we often found CYP and their parents were not aware of an existing product that could help them. Researching for information on LVAs was therefore highlighted as a challenge for the VI community.

Popular routes for advice and access to LVAs are through family and friends, QTVI, local clinics, hospitals, specialist shops such as that at the RNIB and events like Sight Village. However parents still spoke about being unsure where to access information, there seems to either be too much information on which LVAs are available or not enough.

'Knowing it's easy to get – how available it is – buying it – understanding what's on the market – there's a lot of stuff out there that I don't know about.' Hannah, 15

If you are lucky enough to get support through your local clinic, your LVA options will be limited to what they have available. Additionally later you may find it does not work or 'fit' so well in certain contexts and environments.

'It was great using the products whilst I was at Sight Village, then once I came outside into the real world I began to feel different.'

Owen, 16

'They just showed the options that they had.' Mason, 16

- **Transition**

As a child you are given what you are advised, but as you grow older and your priorities change, so does the LVA you want to use. Through this transition of developing personal interests and finding your identity as a teen, you begin forming opinions and making decisions for yourself.

For example carrying three bags around, or a trolley for equipment may be considered untenable as a teen. This puts pressure on the parents, unsure where to seek advice for the latest and the best LVA available for their child.

'As a kid you are given and told "this will help you", as you get older you start to have more opinions and there are more options... [you] ask yourself "what do I actually need", "how does this fit in with my priorities"... you become more independent.' Lisa, 16

'Definitely seen a change in the Low Vision Aids I use, my eye sight has changed a lot since then.' William, 16

- **Creating a personal process**

Participants shared their individual experiences during the process of choosing a new LVA. The current system was considered to be too rushed, repetitive and of limited choice. CYP spoke about their interests in wanting to be a consumer during this process, rather than a patient being prescribed specialist equipment.

Some would prefer choosing LVAs in the comfort of their own home or school rather than a clinic, so they are able to test out the equipment in their own environment. Whereas, others would prefer an online database, so they have access to all information in one place.

'I wish I knew more about all different pieces of low vision aid equipment available; the side effects such as eye/neck/posture strain; the length of time an LVA should be used for. App advice. Recommendations and statistics on who and how it has benefitted people.' Emily, 16

'The aspect most important to me was that my opinion was valued.'
Olivia, 16

- Considerations beyond the clinic**

During the process of choosing an LVA there are factors of environment and circumstance one needs to consider. Sight is a variable condition: a person's eye condition can change depending on the environment, for example lighting. Some CYP will experience deterioration in their eye condition, which can affect their needs, for instance needing a stronger magnification, whilst for some an LVA may no longer fit with changes in their lifestyle.

'I use a variety [of LVAs]. It all depends on the weather, environment, lighting which one I pack in my bag.' Zoe, 20

Concept: Web Platform improving awareness of LVA options

Some people have the opportunity to seek advice or support from a family friend or have a close relationship with their TA, but what about those that do not? The issue is that there is not one universal place to access this shared information. We are proposing a web platform; particularly where the online shop will empower visually impaired CYP as consumers. Shared information all in one place would streamline awareness for the VI community in addition to providing a focal point for relevant organisations to work together.



Image: Photo of a student at RNC holding a palm-size fold-out magnifier

Chapter 4: **Design Priorities for Future LVAs**

When interviewing CYP we asked what their top five priorities are for any LVA, and what they felt designers should focus on improving. Style and portability with the main function of magnification were recurring priorities.

Key factors designers should focus on for any product:

'Size and weight and style need to be designed to fit around social situations.' Emily, 13

- Discreet product**

A defining factor is the dissatisfaction with aids people do not feel comfortable with. Being discreet can mean aligning with mainstream products in terms of size, style, and use. The challenge (albeit paradoxical) is successfully including the advantages of audio and a large screen, into a discreet device.

'That's the reason why I don't use as many aids as I could be, because they are not that discreet or covert.' Mason, 16

'To be honest the only question is 'How much is it going to stand out'? How noticeable is it?' Hannah, 15

- Portability**

A LVA serves a purpose which people should have to hand with the minimum of fuss. If a function you need is not integrated into something you feel natural carrying, portability should be addressed to combine what is often a choice: either functionality – or – convenience. Reducing bulk not only improves use but improving weight will reduce back and neck ache.

'Portable but not so much it compromises screen size.' Olivia, 16

- Digital or non-digital**

Our product audit suggested an even split between non-digital optical aids and digital types of LVAs available. This age group

preferred the option of digital products due to the range of features and ability to meet a diverse set of needs. Battery life and operational delay are the main concerns.

- **Affordability**

Children from socio-economically disadvantaged backgrounds make up one third of those most at risk of severe vision impairment or blindness, with 27% of all children with sight impairment living in households below the poverty line (RNIB, 2015, p.84). Many CYP are aware of the high cost of LVAs and this can affect how much people persevere exploring what is available on the market. When the high cost requires external funding this affects already stretched School and Local Authority budgets.

'I know an electronic magnifier would help, but is too expensive for me.' Grace, 18

- **Style: neutral / personal**

Current products are still described as looking clinical (with attempts to use colour often uninspiring). These are an essential part of daily life, so the option for more everyday appearance was desirable amongst this group. A neutral style suggests it looks good and fits in next to other popular or aspirational consumer electronics, even 'slick' and 'hi-tech', alternatively a more personal style would allow the choice of their favourite colour or it could be customisable and eye-catching (e.g. Disney/sports themed).

'Have a choice like glasses! Bling bling, choice of colours, bright colours; yellow/green not pink/purple. Not black and white!'

Emily, 13

No LVAs have been designed specifically for the lower end of the age-bracket being explored; where cessation of use first happens and who may lean towards a personalised design. For the older members who are beginning to look at and be influenced by what 18 year olds are doing; a style that appeals to under 25s may well be appropriate.

- **CYP with additional needs**

Having additional needs can make some LVA functions difficult to use, such as those with a hearing impairment, unable to use the audio feature. 'Swiping' might be difficult for those with limited dexterity and also interferes with your reading window.

'A lot of my friends have a visual impairments and different health conditions. So are not just blind but also deaf. Tactile and audio are very important.' Chloe, 14

Key products:

- Electronic digital magnifier
 - Monocular
 - Smartphone camera & apps
 - Screen readers on a computer
-

Priorities for a magnifier:

The key factors a portable magnifier must fulfill are:

- Portability
- Easily adjustable magnification
- Stylish and discreet
- Easy to use/control (straight-forward)

Design factors are expanded upon below, however, recurring functions highlighted were that a magnifier could be used for more than one type of task with different degrees of magnification.

'Focus button going too far, difficult to focus.' Zoe, 20

"I use hand held magnifiers and page magnifiers: they are bulky and hard to use while studying. Make magnifiers less bulky but equally as useful.' Olivia, 16

Key functions for a magnifier:

The most common functions used on a digital magnifier are:

- Magnification
- Changing screen colour and contrast
- Audio/mute; narration with a natural voice
- Light option (illumination)

'It's hard to say; everyone is so different; short sighted, long sighted. I should be able to do everything, things that other teenagers can do. You shouldn't have to worry – you know, like going into McDonalds and you can't see the menu.' Hannah, 15

CYP highlighted audio as reducing strain as they do not need to hunch close to the page.

Whilst some people used their phones mostly for calling, others used theirs for communicating via text, email, social networks; the internet, playing games, or as an alarm clock.

Other features for future magnifiers:

1. Battery life on electronic devices

Putting people in a situation where they have to be selective in their use of an LVA based on battery limitations is limiting independence. This argument prioritises carrying with you a mainstream or non-electronic products.

2. Being able to read something immediately without delay

If there is a delay through 'powering-up', searching for a function or similar will reduce trust and result in it being used less.

3. Out of the box operation, training and long-term support

Both QTVI and CYP have highlighted that there is very little training or support for many expensive LVAs. Whilst addressing accessibility part of the solution should be long term self-sufficiency, providing support to ensure an LVA fulfils intentions.

4. Magnification for different tasks so the person only has to carry one magnifier

Whilst digital magnifiers have zoom function, people still feel their magnifier only suits certain tasks or activities.

5. Compatibility

CYP have mentioned opportunities around the home, and when out and about, where a magnifier could be integrated with the existing products they use; such as a small peripheral that plugs into a phone. Instances where lack of power or data-compatibility inconveniencing people were also mentioned repeatedly.

6. Durability

Not only should these LVAs be as small as possible, they also need to withstand the routine and habits of a busy CYP. Robustness was another highlighted quality that CYP felt necessary to allow a product to be taken out and about, and carried around school.

7. Reduce screen glare

Glare is an issue which many people mentioned in different contexts; with a tablet screen, white board or the lens of a monocular.

8. Clearer resolution

As technology gets smaller the capabilities of cameras and screens will improve and will be a huge advantage for this market. At the moment pixelation when zooming in is an issue for tiny text or reading things far away.

9. Voice control and parallel user experience

Many people have been impressed by the accessibility of Apple products 'VoiceOver', a navigation mode that scrolls through the screen narrating where you are, requiring a double and triple tap. Whilst this is not easy for others to then navigate visually, it is encouraging and people are keen to build on the potential of voice control.

Conclusion

This project ultimately seeks to provide better means for young people with low vision to develop their confidence and independence. Through a social lens, understanding the needs and aspirations of Children and Young People, we have focussed on the role and potential of a design approach towards Low Vision Aids, software, and social and learning environments, pairing CYP's perspectives with design directions.

Recent literature about CYP with low vision paints a thorough picture covering perspectives and percentages around school and daily life. We hope to have built further on these in a format that brings meaningful insights for design consideration.

In investigating perspectives around LVA products – their function and design form – we also found taking an inclusive approach to more systemic parts of daily life important, in order to facilitate LVAs working to their full potential.

People's design preferences tend to shift from reflecting yourself to appearing more neutral, and between neutral and aspirational. Undeniably, a LVA should aspire to the qualities of a mobile phone in terms of appeal, portability, multi-function and compatibility. Whilst peripherals and software can make mainstream consumer-technology function more specifically to this audience's needs; our participants were not unanimous in preferring this, with a powerful, discreet magnification aid being just as desired.

A Service Design concept proposes a universal web platform to offer the low-vision-community one place to better understand their condition, communicate about their condition, and compare-and-choose the best-fitting LVAs from a broader range of suppliers.

Highlighting what elements of essential services should be focussed on to deliver an inclusive experience, will hopefully be transferable to practice in other areas of interaction with the public. Whilst product design directions are presented here, focussing on LVAs, combined with more empathic and contextual awareness, these too should be transferable to other design challenges.

Approaching this specific area alongside VISION 2020 UK, VICTA and Thomas Pocklington Trust has drawn attention to, defined and taken on, an important design opportunity. It has also been a great communication opportunity for highlighting the voices of young people. Looking forward we hope the perspectives of CYP presented can be disseminated openly to the design and low-vision communities, to inform improvements to design and practice and we hope further research, design and testing can be carried out to inform design solutions that engage and empower.

End Notes

Bibliography:

- BBC (2016). *Osborne under pressure from Tory MPs over disability benefit cuts*. [online]. Last updated 18 March 16. <http://www.bbc.co.uk/news/uk-politics-35843592>
- DYMENT, Sophie (2009). *Reading with confidence: A report on the provision of electronic pocket magnifiers for children with sight problems in Wales*. Cardiff, Wales Council for the Blind.
- DOUGLAS, G, et al. (2011). Access to print literacy for children and young people with visual impairment: findings from a review of literature. *European Journal of Special Needs Education*, 26 (1), 25-38.
- EUROPEAN COUNCIL, COUNCIL OF THE EUROPEAN UNION (2016). *More accessible websites across Europe: agreement with European Parliament*. [online]. Last updated 3 May 16. <http://www.consilium.europa.eu/en/press/press-releases/2016/05/03-more-accessible-website-across-europa/>
- HARRIS, John, et al. (2014). *Sight impairment at age eleven. Secondary analysis of the Millennium Cohort Survey*. RLSB, RNIB and NatCen Social Research.
- HEWETT, Rachel, DOUGLAS, Graham and KEIL, Sue (2015). *Support and Information received by Young People with Visual Impairments. Technical report of findings October 2014 to February 2015*.
- IFOULD, Rosie (2016). Can teenagers survive without social media? [online]. *The Guardian*, 18 June 16. <http://www.theguardian.com/media/2016/jun/18/can-teenagers-survive-without-social-media>
- KEIL, Sue (2012). *Access to print literacy for partially sighted pupils: research briefing*. London, RNIB.
- KEIL, Sue (2012). *Sight impairment at age eleven: Research Briefing 3: Happiness and Wellbeing*. London, RNIB. <http://www.rnib.org.uk/knowledge-and-research-hub/research-reports/education-research/sight-impaired-7>
- KLOOTS, Ted (2016). *Accessible images for everyone*. [online]. Last

updated 29 March 16. <https://blog.twitter.com/2016/accessible-images-for-everyone>

PULLIN, Graham (2009). *design meets disability*. Cambridge, MIT Press.

RNIB (2013). *Evidence based review of children and young people*. London, RNIB.

RNIB (2015). *Sight impairment at age eleven: secondary analysis of the Millennium Cohort Survey. Children's friendships and social lives*. London, RNIB.

RNIB (2015). *Sight impairment at age eleven: secondary analysis of the Millennium Cohort Survey. Happiness and wellbeing*. London, RNIB.

THOMAS, R, et al. (2015). Assistive technology for children and young people with low vision (Review). *The Cochrane Library*, (6).

THOMAS, R, et al. (2015). Optical reading aids for children and young people with low vision. *The Cochrane Library*, (6), 3.

VISION 2020 UK (2014). *Key facts about vision impairment in children and young people. CYP Sight Loss Statistics (Summary Version)*.

Last updated 10 June 16. <http://www.rnib.org.uk/knowledge-and-research-hub/key-information-and-statistics>

WU, Shaomei and PIQUE, Hermes (2016). *Using Artificial Intelligence to Help Blind People 'See' Facebook*. [online]. Last updated 4 April 16. <http://newsroom.fb.com/news/2016/04/using-artificial-intelligence-to-help-blind-people-see-facebook/>

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Partners:

- **The Helen Hamlyn Centre for Design, Royal College of Art**

The Helen Hamlyn Centre for Design provides a focus for people-centred design research and innovation at the Royal College of Art, London. Originally founded in 1991 to explore the design implications of an ageing society, the centre now works to advance a socially inclusive approach to design through practical research and projects with industry. Its Research Associates programme teams new RCA graduates with business and voluntary sector partners.

- **Thomas Pocklington Trust**

Thomas Pocklington Trust is a national charity dedicated to delivering positive change for people with sight loss. Research is central to Pocklington's work. The research we fund supports independent living and identifies barriers and opportunities in areas such as

employment, housing and technology. We work in partnership and share our knowledge widely to enable change. We provide evidence, key information and guidance for policymakers, service planners, professionals and people with sight loss.

- **VICTA**

VICTA provides support to children and young people who are blind or partially sighted and their families.

- **VISION 2020 UK**

VISION 2020 (UK) Ltd is the umbrella organisation which leads collaboration and co-operation between organisations within the UK, which focus on vision impairment and operate on a national, regional or international basis.

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Disclaimer:

Names have been changed for confidentiality.

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Low Vision Aids – a Youth Perspective

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