Final report for eSTEeM project (stage 1):
Remote sighted helper support for VI students: exploring good practice

Executive Summary

This project set out to explore how visually impaired (VI) students may be supported by a remote sighted (RS) helper to interact with visually complex teaching resources, as this support process was being evolved. We aimed to document student and helper reactions to this novel method of support, and to evaluate whether RS helper support is comparable with, or has advantages over physically-present sighted helper support for some VI students and whether such support may usefully be provided in future.

The context was the introductory programming block of TM111, based on the drag-and-drop visual programming environment OUBuild in which students create computer programs by manipulating coloured blocks representing code. Three VI students on TM111 20D were supported remotely by a RS helper, overseen by the TM111 Module Team Accessibility Lead Richard Walker (also project lead). This report documents how this support manifested for each student, describing the perspectives of the students, the sighed helper and the tutors involved.

Findings from Stage 1

As expected, the support varied according to individual student circumstances, abilities and preferences; however there were some common themes of good practice and the report below concludes with guidelines reflecting these, including:

- The need for structured and timely communication and information sharing amongst the main agencies and individuals involved in setting up and delivering support, and between the frontline support and the student
- The need to document good practice and share it between module teams, tutors and RS helpers
- How to make effective use of communications technology for supporting VI learners and what accessibility issues there may be
- What additions to or modifications of module materials can improve the experience of VI students.

Continuation to Stage 2

This action research project has already improved support for VI students in the 2020D and 2020J presentation of TM111, and other significant changes will be in place for 2021D. The project has also had an impact on related modules, such as TM112.

In early 2021 we plan to submit a proposal to extend the project into to a second stage; specifically, to investigate

- Whether the changes we have/will put in place for TM111 significantly improve the reported experience of VI students;
- How well RS help for VI students has worked on the allied Level 1 computing modules TM112 and TM129;
- How VI computing students fare when they progress to Level 2 and how it is affected by the support received at level 1;
- Whether there are cross-module issues to address.

We would collect information in the same way as the current project; by interviewing students, their tutors, and their non-medical helpers, using whatever communication technology participants feel most at ease with.

Aims and scope of the project

The overarching aim of this project was to increase accessibility of study for students with visual disabilities.

Although computer applications, including programming environments, are increasingly accessible to people with disabilities, or accessible in conjunction with assistive technologies (screen readers, for example), some including OUBuild remain very difficult or impossible for VI students to interact with directly because of their fundamentally visual nature (Siegfried, 2006).

Hence until now VI students have typically needed a sighted helper physically present alongside them to help navigate the TM111 OUBuild-based teaching materials, for almost all of their study of the programming teaching, across a study period spanning nearly two months. The sighted helper typically interacts with the programming environment as instructed by the student, describing the results to the student.

The processes involved in arranging physically-present support from an IT-literate specialist sighted helper can be complex and lengthy. In the Covid-19 lockdown this model of support was impossible so emergency measures were put into place for three VI students on TM111 20D, in which a helper would support these students remotely, using synchronous online communications technologies. This was new territory necessitated by an unprecedented situation but worth documenting and exploring since, even without lockdown restrictions, remote support may be considerably easier to facilitate than physically-present support.

The students involved would naturally all have different experiences, needs and expectations and we did not intend to extract specific guidelines from such a highly individual process. At the least, though, we hoped to be able to suggest how such differences may be incorporated into a successful support process.

We had in mind the following overarching questions:

- How does RS helper-VI student collaboration work?
- How can the particular requirements and study preferences of the VI individual be incorporated?
- What challenges are faced by each party?
- What strategies are used by each?
- What communications technologies are useful in facilitating communications, and how may they be well-used?
- Can good practice be identified for sighted helper support of VI students even where the support is not remote?

As an action research approach was adopted, the focus of this project was to reflect on specific interventions with the goal of improving practice if required. Action research projects tend to have practical benefits for users involved (McAteer, 2013), so particularly relevant for this project as we aimed to improve our understanding of remote support for VI students. As members of the TM111 module team we were insider researchers, and well positioned to study the programming experiences of the students. By interviewing the students, their sighted helper and their tutors we had the potential to reflect on these experiences and make relevant changes or recommendations.

We expected the outcomes of the project to help support future VI students on TM111 and perhaps also to be of interest to those involved in supporting VI students in other academic areas where sighted helper support is required to navigate visually complex teaching materials.

Related research

We found no research specifically documenting remote sighted helper support of VI students, though there is research concerning sighted helper support more generally. A recent paper (Lee, Reddie, et al, 2020) warns of the limitations of automated help systems for VI individuals, suggesting that the human aspect enables adaptation to changing conditions, and also when responding to specific preferences and needs. In particular, it notes the benefits of support relating to scene description, navigation, task performance, and social engagement.

The Open University has a body of scholarship around supporting VI students, for example the work in sonification of mathematical graphs, that is, representing the shapes of graphs in audio form (Vines, Hughes et al, 2018). There is also of course considerable research in the use of assistive technologies by VI students (screen readers such as JAWS, for example); and the Open University has led the way in the development of specific assistive techniques for students (Hughes, Colwell et al, 2020).

Hence we intended this project to complement the existing OU body of study, extending it into the novel area of remote sighted helper assistance for VI students.

Participants

Three VI students started on the 20D presentation of TM111, all needing sighted helper support, all allocated to different tutors. All agreed to feed back on their experience and hence contribute to this project, and expressed a wish to see the project report and any publication that might arise.

"Pen portraits" of these students follow, covering visual condition, technologies used for study, OU history, and what sighted support they receive from people other than the RS helper.

Student A

Student A was registered blind in 2008 although sight loss began a year or two earlier. Student A's vision has continued to deteriorate. All sight has been lost in one eye and is limited in the other. Student A uses a magnifier which allows reading of course books providing they are comb bound. The magnifier will also act as a screen reader but Student A finds the speech difficult to follow.

Student A first studied with the OU in 1982 and has subsequently taken a range of technology, maths and computing modules, including a Level 3 computing module.

Student A receives significant sighted help from family members, including remote support.

Student B

Student B has limited vision – about 20% – and has been that way since birth. Student B uses a screen reader and audio books.

Student B began with the OU in February 2020, studying an entry-level maths module at first, and then picking up TM111 from April of that year.

Members of Student B's family provided some sighted help with his maths module but not with TM111.

Student C

Student C has been blind since birth and has no useful sight. Student C uses screen readers: JAWS; NVDA; and also Apple's VoiceOver.

Student C is new to the OU and began with TM111 in April 2020.

Student C has worked with communications technologies a good deal and feels they have developed effective strategies for its use.

Sighted helper

The sighted helper was Steve Bishop who works for Cosmic People, a company specialising in supporting university students requiring non-medical help. Steve's work with TM111 was funded by the OU.

Steve previously worked selling T-shirts for rock bands but wanted to move away from this into a less noisy environment. Through a recruitment agency he found a job as a note taker and sighted guide, which normally involves attending university lectures and taking notes for students who have disabilities, and assisting with study tasks such as library searches. Although he has good practical computing skills acquired from everyday use he has no specialist knowledge of computing or computer science, and is not a programmer.

The project lead, Richard Walker, is the TM111 Module Team Accessibility Lead. He briefed the participants as described below, provided support for the sighted helper along the way, and at the end recorded feedback from participants.

Activities

Project briefings and feedback gathering

Initial briefings with participants were as follows:

- Students: Students were contacted by the OU's Auxiliary Aids Team and told that a RS helper was going to be put in place. The Student Support Team then contacted the students to make sure they were willing to have their details passed to the RS helper. Once they had agreed to that the RS helper was given their details and initiated contact (see 'How the Support Worked' below)
- Tutors: At the same time as the students were told what would be happening the TM111 Curriculum Manager informed the tutors involved. The tutors were subsequently contacted by the project lead via email, to inform them about the project, and what it hoped to achieve. They were also told that the project team was hoping to collect feedback from them at the end. They were not briefed in any special way, but they were told they could contact the Module Team if they had any questions or needed the Module Team to help them in any way.
- Sighted helper: Once the support was in place the RS helper was briefed extensively by the TM111 accessibility lead, particularly as regards OU systems generally, the TM111 module website and the resources available there, the structure of the TM111 programming teaching, the OUBuild programming environment, and the requirements of the associated assessment.

The RS helper support concluded as each student completed study of the TM111 programming materials. At this point feedback was sought from the students, tutors and sighted helper, either written or oral (according to participant preference). See Appendices for feedback questions.

The following accounts are based on this feedback and on the observations of the project lead, as he supported the sighted helper.

How the support worked

The RS helper initially contacted all three students via email and then followed up with telephone meetings. The mode and extent of subsequent support varied greatly between students, but in each case required a level of improvisation and inventiveness by both the student and the RS helper.

Student A

Student A, who has long experience of OU study, required only a minimal amount of help, amounting to about 2 hours of the RS helper's time in total. The main form the help took was the construction, at the student's request, of a spreadsheet describing all the visual code blocks available in OUBuild, and their organisation into groups.

TM111 provides an *OUBuild quick reference*, a brief overview of OUBuild supplied as part of the printed module materials but it is not accessible. The spreadsheet constructed by the RS helper is effectively an accessible version. It has been adopted by the TM111 Module Team (see TM111-specific recommendations below).

A challenge was that Student A felt that the support was less interactive then they would have liked, less successful than face to face support, and that

"The most effective way of helping would be with remote assistance where the helper could take control of the computer and see exactly what was happening."

This points to a serious gap in communication, because what the student suggests is exactly how the RS helper worked with Student B, but somehow the possibility did not emerge in Student A's case.

Student A also said it would be useful to them if they could change the size and colour of the font on the module website, and if with activities such as watching video a direct link was provided.

Student B

Student B needed extensive support throughout the programming block, amounting to some 90 hours in total, an average of 10-12 per week mostly delivered via Zoom sessions of 1-2 hours each. The student was already adept with Zoom and the RS helper had used it a certain amount. Working together they evolved ways of working that proved highly successful.

During the sessions the RS helper assisted in a variety of ways:

- Verbal descriptions of the content of pages on the module website and directions for locating items;
- Locating videos referenced by the talking books, but not linked to from there. The videos are hosted on the module web site but difficult to locate without sighted assistance. The RS helper found them and played them so Student B could hear them via Zoom.
- Descriptions of the OUBuild code blocks and their operation;
- Assistance with building programs, using the remote desktop facility provided by Zoom. This facility allowed the helper to manipulate OUBuild blocks on the student's computer screen. Under direction from the student the helper dragged and dropped blocks and assembled them as according to the student's instructions. The helper was then able to run the program and report the results to the student;
- Help with iCMAs. Although the student was able to attempt many of the questions independently, those that depend on being able to see an image of OUBuild code require sighted assistance. The RS helper gave verbal descriptions and assisted with the creation of code examples to illustrate various points.
- Acting as an amanuensis for written parts of TMA questions.

Student C

From the RS helper's perspective Student C only needed about 5 hours of assistance. The RS helper wrote textual descriptions of OUBuild programs, some produced by the student, some from the module materials, saying exactly what blocks were used and their order, so the student could check correctness.

Student C provided extensive feedback however, and from this it is apparent that writing in hindsight the RS helper underestimated the extent of the support provided. Initially support was 2 or 3 sessions of up to 3 hours a week but with the easing of lockdown sighted help was available from family members and the need for support from the RS helper reduced to about 3 hours a week. Student C reported that the sighted help from family and friends, was relatively effective compared with remote assistance.

At this stage the assistance Student C required from the RS helper could be carried out via email. It involved tasks such as the RS helper creating an OUBuild program from textual instructions provided by the student, and performing the reverse process – taking an OUBuild program Student C had created with sighted help from family, and writing a textual description the student could refer to when answering assignment questions.

Aspects Student C felt worked well were the ability of the RS helper to produce very detailed written descriptions; to carry out instructions provided by the student; to respond quickly; to use teleconferencing skills to screenshare and control OUBuild; to assemble and edit programs as directed by the student; to describe program output textually; and to assist with inaccessible iCMA questions requiring drag and drop responses.

The aspects Student C found problematical were the initial unfamiliarity of both student and helper with OUBuild and the need to learn about the environment; having to work out ways to give specific instructions without being able to see the controls; and the fact that the RS helper did not know technical terms used in the module materials. This made for a slow start and wasted time, until a way of working was found using screensharing software. Even when the student and the RS helper began using the screen sharing facilities there were issues caused by the time delay between action at one end and response at the other, which made fine manipulation of the OUBuild blocks difficult.

Student C noted that the RS helper did not have access to their personal profile and felt that this, taken with the factors outlined, meant they were somewhat disadvantaged.

Student C felt remote support was less familiar; had technical disadvantages and required more familiarity with systems, but worked well for tasks that were short and uncomplicated, whilst acknowledging the value of remote working when face to face support is not possible.

Student C felt remote support could be improved if students and helpers were briefed on the technologies available for remote support, including their accessibility, and if the RS helper were better briefed on OU systems.

Tutor perspective

As well as the assistance provided by the RS helper the students received extensive support from their respective tutors. Two tutors provided feedback and below we summarise the support they gave.

- **Previous experience of working with VI students:** One tutor reported having worked with VI students in the past but neither had experience of tutoring a student with severe visual impairment.
- **Initial contact:** Both tutors were fully aware of the need to make early contact and explore the student's needs. The first contact in each case was by email, proactively initiated by the student in one case. This student's tutor then followed up by telephone.
- **How the support was driven:** In both cases the student was knowledgeable and proactive in describing their needs and the support was predominantly student-led.
- **Module texts:** From the tutor's perspective neither student needed significant help with the module texts.
- **Support with iCMAs**: The iCMAs present considerable challenges for VI students because some questions have to be answered using drag and drop. Both tutors were aware of this

and one provided similar assistance to that given by the RS helper, performing the drag and drop remotely at the student's direction, but using Adobe Connect rather than Zoom.

- **TMA support:**
  - Both students asked for their tutor's TMA02 (programming TMA) feedback comments to be formatted in a particular way; one for it to be delimited by asterisks and the other for it to be supplied in a separate document laid out in a way that matched the students layout and numbering (students relying on screen readers need to be able to distinguish tutor comments from what they had written themselves).
  - OUBuild is not the only area where sighted support is needed; there a sound editing task earlier in the module that also relies on having a sighted helper. One tutor mentioned assisting with this task as well, again manipulating the software under the student's direction.
- **Tutorials:** One student attended all their tutor's online tutorials, and the other attended three near the start of the module. Both tutors applied generally recognised good practice, such as providing. materials in advance, adding textual descriptions where needed, and reading out what is on the screen. However because of the highly visual nature of OUBuild it is very hard to provide a fully equivalent experience.
- **Awareness of RS helper:** Neither tutor had any contact with the RS helper, although one felt strongly that it would have been beneficial and was surprised by the absence of a mechanism for liaison.

Conclusions and guidelines for future RS helper support

The students in this study not unexpectedly varied in their study preferences, personal situations and visual impairments, all of which impacted on the support required. Therefore, it isn't possible to draw up specific guidelines that would be applicable to all or even most RS helper support in future. However, there are some general points that, after analysis of the accounts above, the project team believe worth recording.

Remote sighted helper recommendations

- The RS helper should have experience of, or be willing and able quickly to assimilate skills in, a variety of forms of communication. Where a student is comfortable with using particular communication media (Zoom, WhatsApp, phone etc) that may facilitate appropriate support, the RS helper should be able to accommodate the student's preferences. If the support required demands a form of communication that the student is unfamiliar with (screensharing, for example) the RS helper should be capable of suggesting that to the student and guiding them through the basics of using it, modulo the student's technical capabilities. We will draw up a checklist that RS helpers can use to make sure students are aware of all the possibilities.
- It is apparent from Student A's feedback that the student was unaware that screensharing and remote control was an option, although the RS helper used it successfully with both the other students. It is easy to see how this could occur, but communication about possible support mechanisms needs to be more structured and we will draw up a checklist that RS helpers can use to make sure students are aware of all the possibilities.
- Where the subject matter requires the student to manipulate visual elements on screen, as with a visual programming environment, the RS helper should in particular explore with the student the potential for remote desktop control, to enable the RS helper to perform the manipulations under instruction from the student.
- Subject to student consent the RS helper should have access to the student's personal profile just as the tutor does (see feedback from Student C).
- It is apparent from Student A's feedback that the student was unaware that screensharing and remote control was an option, although the RS helper used it successfully with both the other students. It is easy to see how this could occur, but communication about possible support mechanisms needs to be more structured and we will draw up a checklist that RS helpers can use to make sure students are aware of all the possibilities.

Tutor recommendations

- Most tutors are very aware of their obligations towards disabled students but may lack prior experience of working with students who have severe visual disability. In addition they may not know of all the resources available, as was the case with at least one tutor in our study. A forum for sharing relevant information amongst tutors on a particular module would be an effective way of disseminating information and good practice. We have already created such a forum for TM111 in readiness for the 2021D presentation.
- One tutor expressed surprise that there was no contact with the RS helper. Tutor and the helper have different roles and will work independently most of the time, but subject to the consent of the student it would seem sensible for them to be in initial contact and liaise where appropriate.

Module team recommendations

- The RS helper should have independent access to the module website and associated materials (i.e. their own OU account), ideally in advance of the main period of support. This enables them to become familiar with the resources the student needs to study and hence to more readily guide the student through them.
- The briefing of an RS helper should be at the earliest possible stage and sufficient time needs allocating for this. OU systems are familiar territory to ALs and to Module Team but won't be to someone coming in from the outside, yet successfully helping students is difficult without a working knowledge of how the OU works. The helper also needs to be given an overview of the module structure and content.
- The process of arranging support for VI students is complex and involves cooperation between multiple agencies. It should be streamlined if possible, and should at a minimum be documented so the path is clear to everyone involved, particularly the Student Support Team and the Curriculum Manager, as the main points of contact.

> *To illustrate the complexity of the process, in the case of the students in our study the first step was a referral by the Student Support Team to the university Visual Impairment Adviser, who then contacted the Curriculum Manager. There is no central funding for sighted helper support, so the Curriculum Manager needed to approach the Faculty. At the same time the Curriculum Manager sought the help of Auxiliary Aids (a unit within the university whose responsibilities include arranging non-medical help) to find a suitable helper. Auxiliary Aids contacted an agency, Cosmic, who they have worked with before, asking for a helper with some computing skills, and at that point the RS helper Steve Bishop was instructed. Next, Auxiliary Aids contacted the students to let them know what was happening, and the Curriculum Manager contacted the tutors to let them know what was happening. The Student Support Team contacted the students to obtain permission to share their details with the RS helper. Once this was obtained the information was passed to the RS helper and an OU account was obtained to allow him to access the module web site. Finally the TM111 Module Team Accessibility Lead was brought in to brief and support the RS Helper.*

> *Given the multiple overlapping responsibilities and the fact that some aspects of the process are not clearly defined, support for VI students on the 2020D presentation was only just ready in time. For the 2020J presentation things have worked more smoothly, now that what needs to be done is more clearly established. The procedure should now be documented, so that in the future Curriculum Managers can have a clear understanding of how to proceed.*

TM111-specific recommendations

In conducting the above action research the project team became aware of TM111-specific issues for VI students:

- As mentioned previously one student requested a comprehensive list of the OUBuild code blocks, in textual form, which the sighted helper drew up. This may well be useful to VI students more widely. The project team will make a version of this available to all students via the module website.
- Questions in TMA02, the programming part of the module assessment, typically have "starter projects", partially constructed OUBuild programs which students are asked to

complete. Feedback from the RS helper indicates some VI students would benefit from textual descriptions of these starter projects.

- At various points the online module materials direct the student to video resources but without providing a direct link. Although the videos are hosted on the module website VI students are likely to have difficulty locating them. The module team should investigate adding embedded links.

Impact

A synopsis of the report and guidelines above will be made available to RS helpers and VI students on future TM111 presentations. They will also be disseminated as appropriate across module teams and support staff involved in advising students with disabilities (precise details to be determined in consultation with advisory staff).

The project team intends to apply to present this project at the 2021 eSTEeM conference.

Activities going forward

The three students involved in this study have now all successfully completed TM111 and progressed to their next modules. Students B and C are studying TM112 and Student A is studying M250. All three are currently doing well.

The two taking TM112 are receiving RS helper assistance from the same helper, Steve Bishop, and the TM112 Module Team Accessibility Lead (Richard Walker) has been helping set up a suitable environment for Student B to write programs in Python. Student A is programming in Java, using the BlueJ development environment provided for M250, which is a relatively accessible package, and has not required extra support.

Student C has also now started studying TM129. Steve Bishop has again been engaged to provide support and is being briefed about the module content.

There is one VI student on the 20J presentation of TM111, receiving RS helper assistance again from Steve Bishop. This student is making very good progress and has found the spreadsheet of OUBlocks originally developed for Student A to be very helpful.

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University approval processes

- HREC/SRPP – Approval from the Human Research Ethics Committee and Student Research Project Panel was obtained according to the Open University's code of practice and procedures before embarking on this project. SRPP Application number: 2020/068
- Data Protection Impact Assessment/Compliance Check – A Data Protection Impact Assessment/Compliance Check was obtained according to the Open University's code of practice and procedures before embarking on this project. Data Protection registration number:

Appendix 1

Student questionnaire

Research project Remote sighted helper support for VI students: exploring good practice

Thank you for agreeing to take part in the research, to help us better understand your experience on TM111 programming.

Questions 1 to 4 are general ones, relating to your visual impairment:

1. How long have you had visual problems?
2. How severe is your visual impairment?
3. What effect does the visual impairment have on your OU studies?
4. What assistive technologies do you use (for study purposes)?

Questions 5 to 18 are in the context of TM111 Block 2 only, considering just how the remote sighted help worked for you:

5. What parts of Block 2 did you need the most support with?
6. What parts of Block 2 did you need the least support with?
7. What form did the support take?
8. How frequently did you interact with the remote sighted helper
9. in planned sessions ?
10. How frequently did you interact with the remote sighted helper
11. in ad hoc sessions?
12. Can you give specific examples of what worked well regarding TM111 Block 2 support?
13. Can you give specific examples of what was least successful regarding TM111 Block 2 support?
14. How does remote sighted support compare with face-to-face sighted support?
15. Have you received remote sighted support before, not necessarily in a study context, but in any aspect of their life?
16. If so, can you add some detail regarding the context?
17. Can you suggest further ideas that would enhance this kind of remote support?

18. As well as the support received from the remote sighted helper did you receive other support with your studies, e.g. from friends/family members?

   - If so, how did this compare to the support received from the remote sighted helper?
   - Is there anything else you would like to ad

Thanks once again for taking the time and trouble to answer our questions, and good luck with your OU studies.

Please let me know if you would be interested in receiving any reports or publications resulting from the research.

Richard Walker

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Appendix 2

Tutor questionnaire

Was this the first time you have tutored a visually disabled student?

What challenges did it present? Were there things you would do differently another time?

What type and frequency of contact did you have with the student?

Did you need to adapt your TMA feedback to take account of your student's visual impairment?

Did they attend any online tutorials that you ran? If so, did you need to present the session differently in any way?

Was the information in the student's profile detailed enough or did you need to find out more details from the student?

We can't change OUBuild and it would be wrong to do so, because it is the most suitable for the majority of students. But there may be other ways in which the accessibility of the module could be improved for VI students. Are there any that come to mind?

Were you aware of the sighted helper and did you have any contact with them?

Appendix 3

Remote sighted helper questionnaire

1 Briefing and systems

1.1 How did you first get into this line of work? Have do done similar jobs before?

1.2 How were you briefed about this particular job helping TM111 students?

- initially
- subsequently

1.3 How easy (or not) were the OU website and systems to use?

2 Communication with the students

2.1 How did you initially contact the students involved?

- email
- telephone

2.2 How did you communicate with students subsequently?

2.3 How did you and the students come to an agreement about how you would work together, and what agreement do you reach

2.3 I know you had some sessions in Zoom. Had you used Zoom with students in the past?

2.4 How much time approximately did you spend with each student overall?

2.5 Roughly how often did you communicate with each and for how long?

3 The type of support provided

3.1 What types of support did you provide for

- navigating around the website?
- module materials?
- online quizzes?
- tutor-marked assignments?
- anything else?

3.2 What did you need to learn to provide this support?

3.3 What were the challenges and how were they overcome?

3.4 I know you created resources in some cases. What resources did you create, and can you share them with me?

3.5 Is there anything you would do differently another time?

3.6 Are there any important issues you feel it would be useful to note?

3.7 How rewarding did you find the work, professionally speaking.

4 Open question

4.1 The questions above probably won't have captured everything relevant. Please add anything important that we have missed.