

Integrated framework

This framework and the accompanying recommendations and areas for consideration in the next section integrate the four group frameworks and draw on the discussions of those groups. The framework is presented as a table to highlight the structure of the information; however, we acknowledge that this may be difficult to read due to the length of the cells. The same information is presented, by row (and so phase) in the section Appendix: Integrated framework in linear format by rows at the end of this document.

Table 1: Integrated framework

	Student's actions	Skills development	Teaching and learning	Support
Pre-application	<p>Do:</p> <ul style="list-style-type: none"> ▪ Identify interests and plan route through correct choice of subjects at school ▪ Gain input from teachers, SENCOs, disability staff and other advisors on route, modes of study, likely required preparation etc. ▪ Start pre-application process earlier than UCAS process including approaching universities for access to STEM information. ▪ Compile a potential 	<p>Skills to develop:</p> <p><i>It is noted that specialist and subject skills are best developed gradually, likely starting in a school environment during A-level and continuing through pre-entry and transition.</i></p> <ul style="list-style-type: none"> ▪ Subject specific knowledge and specialist skills appropriate to STEM study including IT skills, use of technology and study skills. ▪ Specialist skills should include acquisition of an effective reading and writing method for 	<p>Barriers to progression and methods of resolution:</p> <ul style="list-style-type: none"> ▪ Staff and parents may inaccurately discourage interest in STEM due to negative stereotypes or insufficient information. ▪ Experience in specialist areas including skills development for STEM study not necessarily available in all schools. ▪ Teachers may have limited training in how to meet the diverse needs of students, how to take a flexible approach and to communicate 	<p>Identification, access to and resourcing of appropriate support and equipment:</p> <ul style="list-style-type: none"> ▪ Students may require access to specific technology and training e.g. in use of IT, Braille. Their access to and use of technology and training may need to be reviewed in light of a decision to focus on STEM subjects at A-level. ▪ Specialist transcription services may be required for STEM resources.

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	<p>short list of universities and open dialogue regarding their approach and support which they could offer.</p> <p>Information needs and advisors:</p> <ul style="list-style-type: none"> ▪ Advice on the appropriate time to start planning for studying a STEM subject. ▪ Positive, realistic information and early advice (pre-GCSE and A-level choices) to students, teachers and parents to prevent barriers including assumptions about what can be studied. This should include careers advice. ▪ Access to role models including successful students, graduates and employees in STEM subject areas. ▪ Evidence that 'someone has done this before' at individual institutions. 	<p>equations whether in Braille, large print or audio. This is likely to include introduction of some quantity of LaTeX and decisions regarding appropriate text editing environments (e.g. MathType and Word, Emacs etc.).</p> <ul style="list-style-type: none"> ▪ Specialist skills should include acquisition of an effective method for working with diagrams. This might include use of tactile diagrams. ▪ Specialist skills should include acquisition of higher level IT skills; learning to make good use of digital media; research skills for searching, sifting and prioritising and study skills including a self-aware approach to for instance, planning an approach to study, monitoring speed of working etc. 	<p>information in different ways. This may have a disproportionate effect on experience of STEM subjects due to the modes of communication generally used.</p> <ul style="list-style-type: none"> ▪ Schools may have limited access to information required by the student to prepare specifically for STEM study and so may find it challenging to provide information in a timely manner. <p>Information needs of and advisors for teaching staff:</p> <ul style="list-style-type: none"> ▪ Communication between institutions, organisations and agencies involved in transition is required to support staff in information provision and skills development. ▪ A collaborative approach between 	<ul style="list-style-type: none"> ▪ Students may require support in accessing transition information, making choices and planning. ▪ Universities are best placed to communicate how STEM subjects are taught at HE level, the skills required and the approaches which work. Widening participation taster days/courses should be offered early to pupils with VI and summer schools should be offered for both pupils and subject teachers at A level. These events should include a 'taste' of how support would work, what technology might be used and how teaching and learning can be accessed in STEM. Role models or evidence that 'someone has done this before' can also be provided.

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	<ul style="list-style-type: none"> ▪ Clear course descriptions which specify access approaches and required skills. ▪ Access to a central pool of information (currently disparate, individuals hold information in isolation) regarding studying STEM subjects for students with VI. This should include resources, practical information and advice. 	<ul style="list-style-type: none"> ▪ Soft skills are particularly important including: being able to self-advocate; being able to identify needs and clearly communicate them; decision making skills; ability to respond flexibly to a range of situations. ▪ Students also need to develop independent living skills, mobility and travel skills and knowledge of adjustment at university. <p>Supporting and advising on development:</p> <ul style="list-style-type: none"> ▪ It is acknowledged that the school's focus may be on students gaining grades to secure a place and that specialist STEM skills may be challenging to deliver. Students and teachers require access to central resources for 	<p>subject and VI specialists is required to ensure that specialist skill development can be delivered.</p> <ul style="list-style-type: none"> ▪ Staff may need to engage in further reflection on practice with access to specialist advisors (including those with experience of preparation for HE) to adapt teaching to meet skills need by VI students e.g. learning Braille, typing skills, tactile diagrams, specialist skills for STEM. 	<p>Information needs of and advisors for support staff:</p> <ul style="list-style-type: none"> ▪ A central pool of information, suitable to role and institution level (i.e. School/FE/HE) should be available advising on availability of assistive technology, software, transcription, training etc. specifically for access to STEM subjects.

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		<p>specialist skill acquisition and may benefit from partnership with a HEI.</p> <ul style="list-style-type: none"> A student's family is likely to play an important role in development of soft skills and independent living skills. 		
Pre-entry	<p>Do:</p> <ul style="list-style-type: none"> Use university websites and prospectus as a first line accessibility check. Use open days to check against own skills and requirements. Establish contact with the university department and Disability Services. Organise to visit both and start planning an approach. Establish contact with current students with VI studying a similar STEM subject. Open dialogue with 	<p>Skills to develop:</p> <p>It is noted that specialist and subject skills are best developed gradually likely starting in a school environment during A-level and continuing through pre-entry and transition.</p> <p>The skills a student might need to develop are highlighted in the above pre-application stage. Additional skills relevant at pre-entry may also be:</p> <ul style="list-style-type: none"> Start to develop skills to manage time effectively and cope with the change from highly supervised learning to 	<p>Barriers to progression and methods of resolution:</p> <ul style="list-style-type: none"> The main barrier to progression is if any part of the institution is not aware in advance of how to meet a student's needs. This is not limited to the student's department or the disability service but includes IT and e-learning systems, the library (electronic and physical resources) etc. All facets may need to consider not just general good practice 	<p>Identification, access to and resourcing of appropriate support and equipment:</p> <ul style="list-style-type: none"> DSA Needs Assessment centres should ensure that assessors working with students studying STEM subjects have appropriate training and access to relevant information so effective study strategies and aids are identified. Accessibility of the physical campus, IT and e-learning, the library, student services

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	<p>university department to discuss specifics of access approach including to lectures, tutorials, labs, notes and reading list. Check availability of core texts and lecture notes in appropriate digital formats.</p> <ul style="list-style-type: none"> ▪ As an outcome of above, identify additional equipment and software that will be needed at university. Ideally do this prior to engaging fully with the assessment of needs process and as early as possible. <p>Information needs and advisors:</p> <ul style="list-style-type: none"> ▪ Access to a range of local information including local VI services. ▪ Clear advice on navigating the DSA process as a STEM student with VI. 	<p>university.</p> <ul style="list-style-type: none"> ▪ Skills to manage finances. ▪ Staff management skills for working with study support workers. <p>Supporting and advising on development:</p> <ul style="list-style-type: none"> ▪ In order to continue developing skills noted above during pre-entry students would need access to resources, technology, training and advice during the summer period prior to university. This is necessary to ensure that a basic set of skills are in place to cope with the course pre-entrance. Such pre-entry support requirements would ideally be recommended and funded as an outcome of the needs assessment. ▪ The student needs to 	<p>but also good practice in STEM subjects and the specific needs of the individual student.</p> <ul style="list-style-type: none"> ▪ Failure to proactively embed inclusive practices for STEM teaching throughout delivery may leave significant barriers which cannot be addressed at short notice. <p>Information needs of and advisors for teaching staff:</p> <ul style="list-style-type: none"> ▪ Teaching staff need to know what has to be in place for a student in advance to enable the student to achieve. This advice may need to be specifically tailored for STEM subject areas so as to be practical and useful. ▪ Schools and colleges could start to integrate in to transition by starting some teaching 	<p>and teaching and learning should be identified via appropriate audits. This should include differentiation between STEM and text based subjects.</p> <ul style="list-style-type: none"> ▪ Issues with when DSA funding can be made available may currently preclude students being able to practice/learn skills in advance pre-entry. This would need to be resolved. ▪ The university, as well as DSA funding, may need to consider provision of technology, software or equipment. E.g. student may need dedicated terminal in computer lab and exam arrangements may also require procurement of a full mirrored setup. ▪ Universities may need to consider what specialist skill training

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	<ul style="list-style-type: none"> ▪ Technical information on the institutional systems they will need to access and use on arrival – including information about specialist STEM software and equipment. ▪ Assistance locating and establishing contact with current students with VI in similar STEM subjects. 	<p>know what support is available on entrance in advance, to enable planning.</p>	<p>earlier, particularly skills, via on-line resources or in partnership with the HEI.</p>	<p>falls within their remit as subject specialists rather than under that of the assistive technology trainer.</p> <ul style="list-style-type: none"> ▪ Universities may need to run events and information days to raise awareness of how STEM subjects are taught at university. This awareness is required by the needs assessor, assistive technology trainers and other study support workers in addition to the student. <p>Information needs of and advisors for support staff:</p> <ul style="list-style-type: none"> ▪ Active dialogue between existing (school) support staff, university support staff, DSA needs assessors and university teaching staff is required for a collaborative approach. ▪ Staff in various roles

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				require access to resource banks and training resources in methods for accessing and working with STEM content.
Transition	<p>Do:</p> <ul style="list-style-type: none"> ▪ Orient and settle in, navigate living independently and take time to integrate into social network including attending fresher's week! ▪ Take responsibility for learning! ▪ Work with the Disability Services Team to empower decisions about support. ▪ Proactively engage with peers, staff, authors of books you require access to etc. – transition is about networking. ▪ Make the most of tutorials – take the opportunity to ask 	<p>Skills to develop: It is noted that specialist and subject skills are best developed gradually likely starting in a school environment during A-level and continuing through pre-entry and transition.</p> <p>If the above has not occurred then a student may commence their course without basic required skills. Their ability to acquire these while studying will depend on the course demands.</p> <p>Additional skills relevant to transition include:</p> <ul style="list-style-type: none"> ▪ Explicit learning about the culture of the HEI and department including 'who is who', 'who does what' and 	<p>Barriers to progression and methods of resolution:</p> <ul style="list-style-type: none"> ▪ The most significant barriers to transition are the school not appreciating the requirements of the university course and the university not understanding the requirements of the student or how they previously approached learning at school. ▪ Lecturers might not be willing to adjust or able to be flexible in their teaching approach. ▪ Lack of alternative formats or staff not having the required skill set to create accessible 	<p>Identification, access to and resourcing of appropriate support and equipment:</p> <ul style="list-style-type: none"> ▪ Feedback mechanisms should be available to all students but explicit invitations to provide regular feedback from students with VI may allow timely identification of need for support or equipment. ▪ During transition there may be a need for additional support which might lessen later in degree. Use of mentoring and regular meetings to ensure the student has points of contact. This may need to be identified and

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	<p>questions, discuss your learning style, try out methods of interacting with your subject.</p> <p>Information needs and advisors:</p> <ul style="list-style-type: none"> ▪ General and also STEM specific advice and guidance regarding the skills needed to access their course and how to approach their studies throughout transition. 	<p>'who is in my network'.</p> <ul style="list-style-type: none"> ▪ Develop self-discipline, motivation and skills to manage time effectively and cope with the change from highly supervised learning to university. ▪ Learn to develop own learning methods e.g. how to use and take STEM lecture notes during class etc. ▪ Become an independent learner in terms of assistive technology etc. and develop confidence to communicate their use of technology/strategies when meeting with study support workers, teaching staff and, in future, employers. ▪ Develop interpersonal and networking skills which enable access to informal peer support. <p>Supporting and advising on development:</p>	<p>formats for STEM study – including equations and diagrams.</p> <ul style="list-style-type: none"> ▪ Lecture notes not available prior to class. ▪ Inaccessible IT and laboratory resources. ▪ Inaccessible assessments. <p>Information needs of and advisors for teaching staff:</p> <ul style="list-style-type: none"> ▪ Staff may need to adapt their teaching style in a manner appropriate to their subject – external training and support may be required and may need to be provided centrally via e.g. HEA and JISC TechDis. ▪ Training in both the use of simple accessibility techniques but also in the creation of accessible electronic formats. ▪ Discussion and agreement as to the 	<p>funded via DSA.</p> <ul style="list-style-type: none"> ▪ External support mechanisms such as the BlindMath mailing list and similar which can provide support to both the student and department staff should be identified. ▪ IT, e-learning and library support may be required by both student and staff. Staff responsible for these systems may need to identify and resource changes to increase accessibility – both general and STEM specific e.g. for equations in electronic resources. <p>Information needs of and advisors for support staff:</p> <ul style="list-style-type: none"> ▪ Support assistants, mentors, notetakers and alternative formats creation with STEM expertise may be

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		<ul style="list-style-type: none"> ▪ The development of study skills specific to an individual may require input from a study skills specialist with an understanding of STEM subjects or possibly in collaboration with other study support such as readers, note-takers etc. ▪ A key question regarding the continued development of STEM specific specialist skills is: where does this learning take place? The STEM department holds the STEM expertise so a collaborative approach between the student, the department and support professionals may be required. 	<p>examination process involving both specialists and university staff may be required. Technology might need to be purchased by university as students may not be allowed to use their own laptop with access technology.</p>	<p>required. This may require recruitment and training on which advice from external bodies may be needed. Ideally a national bank of such specialist services is required to ensure timely access to the right support.</p>
Later years	<p>Do:</p> <ul style="list-style-type: none"> ▪ Focus on academic studies as access issues should have 	<p>Skills to develop: Students should by now have acquired a rich STEM and specialist skill set.</p>	<p>Barriers to progression and methods of resolution:</p> <ul style="list-style-type: none"> ▪ Attitudes and 	<p>Identification, access to and resourcing of appropriate support and equipment:</p>

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	<p>been lessened by now. However, continue to review, reflect and act to make necessary changes including reflection on approaches to learning.</p> <ul style="list-style-type: none"> ▪ Consider a placement if offered. This will require proactive organisation. ▪ Research placement, company and role; organise an initial visit to the placement venue, and consider organising a phased first week. ▪ Ensure that placement is reflected upon and evaluated both for academic and personal specialist skill development. <p>Information needs and advisors:</p> <ul style="list-style-type: none"> ▪ To plan for placement with a collaborative team including the Department Placement Team and the Disability Service. 	<p>Additional skills relevant to later years may include:</p> <ul style="list-style-type: none"> ▪ Use of a complex set of communication, technical, subject and soft skills to determine, with others, how to access placement systems and software. ▪ Developing mobility, orientation and travel skills in employment venues if on placement. ▪ Development of research skills in preparation for dissertation writing. <p>Supporting and advising on development:</p> <ul style="list-style-type: none"> ▪ Students may require specific advice or support in adapting to work ethos for placement year. ▪ Development of research skills may require further training or support. 	<p>apprehension regarding placement may result in a student not taking up this opportunity or staff advising against it.</p> <ul style="list-style-type: none"> ▪ There may be a need for a suitable work environment for a student with VI to be identified by the university and for the employer to be aware of the student's individual needs. This process requires proactive organisation and a collaborative approach. ▪ Lack of advance notice on reading lists may impact on access to resources and timely transcription or creation of alternative formats. <p>Information needs of and advisors for teaching staff:</p> <p>By this stage, department staff should be aware how to work to ensure access but new lecturers and</p>	<ul style="list-style-type: none"> ▪ The student continues to need to be organised and proactive in arranging and communicating regarding their needs for access. This includes with respect to a placement. The student may require suitable staff support in this. This may need to be foreseen and funded via the DSA. ▪ It is important that students on placement have a point of contact at the university and are visited at their placement. They may require additional or earlier visits. <p>Information needs of and advisors for support staff:</p> <ul style="list-style-type: none"> ▪ STEM placements potentially pose additional issues for students with VI. The situation needs

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	<ul style="list-style-type: none"> Assistance from staff in identifying suitable placement venues. 		<p>tutors may be involved at any stage. The department needs to ensure that approaches are agreed and disseminated.</p> <ul style="list-style-type: none"> The university including the department should review and evaluate regularly and identify any required changes to approach. Should the modules or degree change consideration of the impact of this may be required. 	<p>clarification, documenting and disseminating on a national basis.</p> <ul style="list-style-type: none"> Staff will require information regarding Access to Work if it applies for the placement in order to support the student.
Career planning	<p>Do:</p> <ul style="list-style-type: none"> Explicitly reflect on placement or work experience learning if applicable. Consider what skills or experience may need to be developed. Explore available jobs, and requirements to organise relocation. Consider whether post graduate study is appropriate. 	<p>Skills to develop: Students should by now have acquired a rich STEM and specialist skill set. Additional skills relevant to careers may include:</p> <ul style="list-style-type: none"> CV/Application and interviewing skills. Ability to build and communicate a portfolio of strategies around support so as to be empowered but also to take on some level of 	<p>Barriers to progression and methods of resolution:</p> <ul style="list-style-type: none"> Employers not being familiar with VI or how to meet access needs. Job information may not be clear or available in alternative/accessible formats. Careers resources may not be accessible or may not be specific 	<p>Identification, access to and resourcing of appropriate support and equipment:</p> <ul style="list-style-type: none"> STEM specific advice on navigating Access to Work funding is needed to ensure that graduates are able to assist in assessing STEM specific needs and to communicate these to people without a STEM background.

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	<ul style="list-style-type: none"> ▪ Evaluate interview experience and gain feedback to improve skills. <p>Information needs and advisors:</p> <ul style="list-style-type: none"> ▪ Access to role models of graduates with VI working in STEM based industries. ▪ Access to work experience, internships. ▪ Advice on Access to Work, rights, welfare and benefits should be given in a timely manner and while still at university. ▪ Access to specialist VI careers advice and STEM specific advice including in exploring options, locating and applying and interviewing for opportunities. 	<p>responsibility for access needs in order to educate/reassure potential employers.</p> <ul style="list-style-type: none"> ▪ Skills to explore open source software or variant/new software including ability to self-teach and to use technology flexibly. ▪ Negotiating skills e.g. to ensure that recognition of experience in accessibility is seen as a selling point. <p>Supporting and advising on development:</p> <ul style="list-style-type: none"> ▪ Access or advice on diversification of skills or continuing professional development may be required. ▪ Students should know their rights under Equality Legislation and this information should be clearly signposted. ▪ Staff may need awareness of how to 	<p>enough to meet the information needs of a student/graduate with VI.</p> <ul style="list-style-type: none"> ▪ Access to suitable role models during the final year may be difficult to arrange. <p>Information needs of and advisors for teaching staff:</p> <ul style="list-style-type: none"> ▪ A central bank of accessible resources is required to assist students with VI to plan their career progression after university. Such resources would also assist advisors within institutions. ▪ Staff need to be aware that students with VI may require specialist careers advice and access to role models. 	<ul style="list-style-type: none"> ▪ Students should be directed to regional services – especially if relocating. <p>Information needs of and advisors for support staff:</p> <ul style="list-style-type: none"> ▪ Specialist advice should be offered to students with VI regarding career planning in general and STEM careers specifically. This advice may not be available locally so may need to be 'bought in' or communicated via a central resource.

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		assist a student with VI to prepare for interviews and psychometric tests and alternatives to these. Students with VI may benefit from specialist advice and practice in these skills.		