

Building momentum towards inclusive teaching and learning

A good-practice guide for undergraduate physics



The **Institute of Physics** is a leading scientific membership society working to advance physics for the benefit of all.

We have a worldwide membership from enthusiastic amateurs to those at the top of their fields in academia, business, education and government.

Our purpose is to gather, inspire, guide, represent and celebrate all who share a passion for physics. And, in our role as a charity, we're here to ensure that physics delivers on its exceptional potential to benefit society.

Alongside professional support for our members, we engage with policymakers and the public to increase awareness and understanding of the value that physics holds for all of us.

Our subsidiary company, IOP Publishing, is a world leader in scientific communications, publishing journals, ebooks, magazines and websites globally.

You can help us transform the future of our discipline.
Invest in physics today at **iop.org/fundraising**.

Find out about our strategy for success at **iop.org/strategy**.

Contents

Introduction	5
Background to the inclusive learning project	6
Summary of good practice in an inclusive physics department	7
Good practice in physics departments	10
Degree accreditation and competence standards	29
Next steps for the IOP	30
References and further reading	32
Acknowledgements	33
Appendix: Breakdown of responses to the survey of disabled student members of IOP by disability compared to national statistics	34



Introduction

The Institute of Physics is committed to ensuring that all students can achieve their potential in physics and to removing barriers to participation for all. This includes removing barriers for disabled students.

By moving towards a more inclusive learning environment many organisational, structural and cultural barriers to disabled students can be removed. The focus on inclusivity means that “individual interventions is the exception, not the rule” as set out in the Department for Education’s report *Inclusive Teaching and Learning in Higher Education as a Route to Excellence*. This requires all staff in higher education – academics, support staff and senior institutional managers – to consider the needs of disabled students in all that they do – including the design, delivery and assessment of all academic teaching and learning.

There are particular challenges in providing an inclusive learning environment in all the physical sciences and especially in physics, due to the wide range of activities involved, such as lab sessions, problem classes and fieldwork, and the use of mathematical and scientific notation. General good practice guidance on inclusive curricula do not normally contain specialist information on the particular accessibility challenges of courses with substantial mathematical content given its non-linear nature (ie the relative positioning of letters, symbols and numbers and their relative sizes) and the limitations of assistive technology in manipulating this content.

This report is the culmination of a project investigating the moves towards more inclusive undergraduate teaching and learning in physics departments and the barriers that physics and other STEM departments face.

This good practice guide has been based on the main themes and findings from the project and highlights actions that physics departments and schools have already taken to implement a more inclusive environment. Although this report outlines good practice that has already been adopted, this should not be interpreted as definitive guidance on making individual reasonable adjustments as part of any university’s duties under the Equality Act (2010). For further details on such adjustments, see the Equality Challenge Unit’s 2010 report *Managing Reasonable Adjustments in Higher Education*.

Background to the inclusive learning project

The principle behind our project was to identify good practice already adopted by physics departments and share this with others in the sector. This project was initiated partly in response to changes in funding for English-domiciled disabled students aimed at rebalancing the support offered by universities as part of their duties under the Equality Act and the support provided in the form of Disabled Students' Allowances (DSAs), a summary of which can be found on the Disability Rights UK website. Physics departments in England were invited to participate in this project. Almost 20 heads of departments expressed a wish to participate and visits were ultimately arranged with 11 of them.

A small specialist team visited each department and provided an external view on the moves towards inclusive learning in that department. These were informal, supportive and constructive discussions, based on a dialogue with staff. During most visits, the team also met with university disability support professionals to understand their perspective. All departments were provided with a confidential report that highlighted good practice already in place and made suggestions for improvement.

The Institute also ran a survey of its disabled student members to find out more about their experiences of studying physics. The survey was disseminated to all student members of the Institute during October and November 2016, inviting those who were “disabled, with specific learning difficulties, mental-health conditions or other health conditions” to participate, targeted at UK-based disabled undergraduates in physics. There were 262 responses received with 247 of these being from UK undergraduates (representing a response rate of approximately 14%). The remaining responses were from postgraduates and a very small number of those outside the UK.

Students were asked to identify their disability or impairment and this is presented compared to national data in the appendices. The survey data is intended to be broadly representative of the disabled student community in physics and higher education more broadly. It should be noted that a lower proportion of students with specific learning difficulties responded than would be expected for this cohort. As this group does not always define themselves as being disabled, and also may avoid forms or surveys, it is common for this group to be underrepresented in activities such as this. The proportion of students stating that they had a mental-health condition is much larger than the national data suggests, but this mirrors the disclosure rates of this group and the discussions with departments, who all reported a rapid increase in students presenting with mental-health difficulties during their course.

Summary of good practice in an inclusive physics department

Based on the discussions that took place within the visits and the student survey, the following are features of good practice identified in physics departments that are actively working towards a more inclusive learning environment. These are explored in more detail in the next section.

Strong and effective leadership

- Engagement of senior management in discussions on the need to take more strategic approaches to inclusive learning, including the consideration of anticipatory approaches
- Regular discussions and sharing of expertise to embed good practice and to document support strategies for future provision
- A named, visible champion for disabled students, acting as the focal point of contact for support and reporting into departmental decision-making structures

Clear and consistent policies and practices

- Consistently applied policies and practices on inclusive learning, such as the use of lecture capture, provision of lecture notes, attendance policies that support the identification of student health or mental-health issues
- Assessing the impact of policies and practices on disabled students during review processes, such as peer review, programme review, or curricula or assessment review
- Encouraging feedback specifically from disabled students

Ongoing training and development

- Training, development and networking opportunities for those involved in supporting disabled students and opportunities to share good practice both within and beyond the department
- Appropriate disability awareness training for everyone embedded into departmental processes, such as induction or away days, and in response to specific, identified needs

Encouraging disclosure

- A positive culture of disclosure emphasising the benefits to accessing the support available with ongoing opportunities and clear signposting on disclosure
- Clear processes on disclosure

Engagement with central student support services

- Understanding the need to put anticipatory adjustments in place as well as individual reasonable adjustments in the absence of a formal support plan
- Good communication with central support services for disabled students, especially with the central disability office

Summary of good practice in an inclusive physics department

Communicating disabled student support within the department

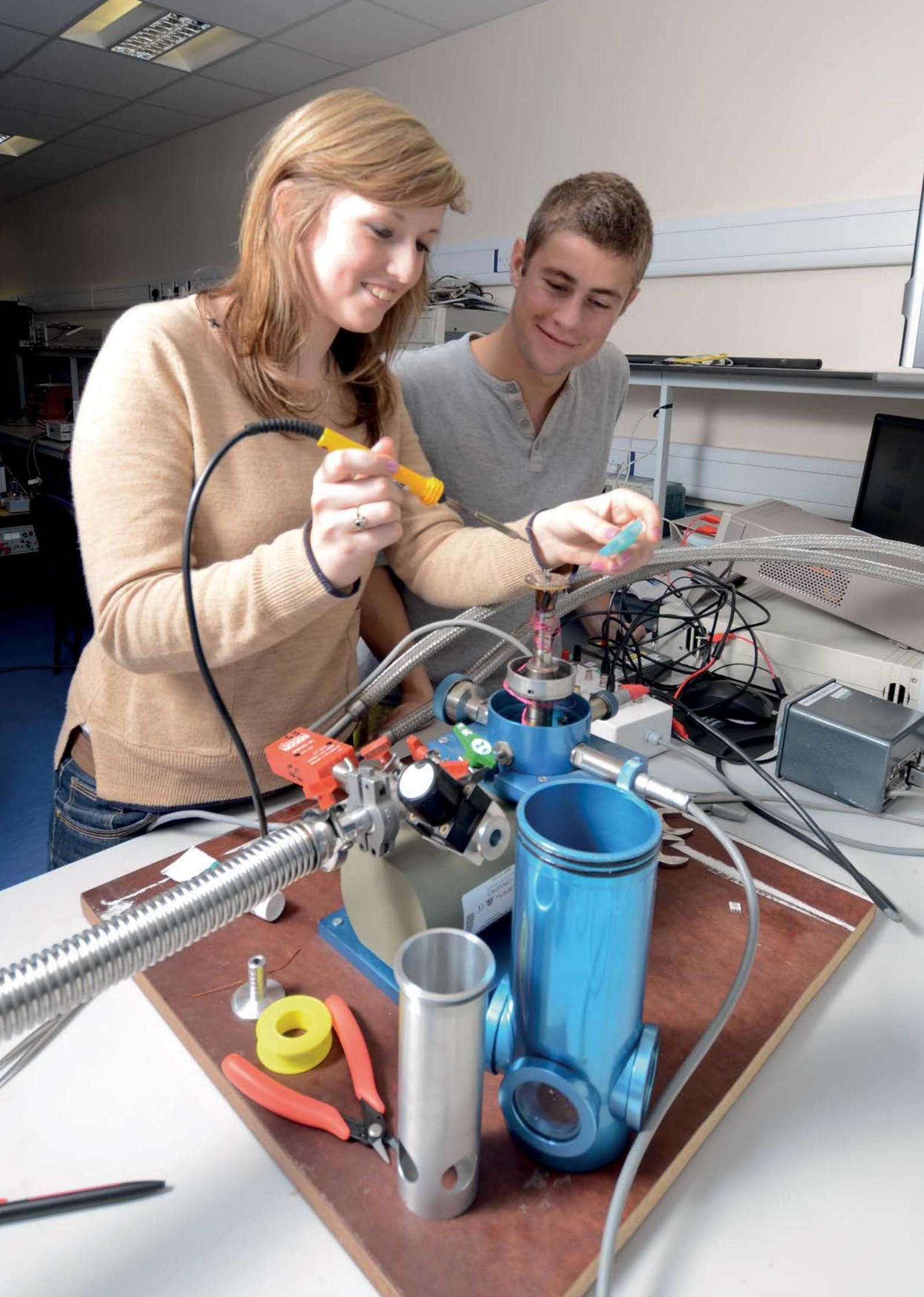
- Clear process for disseminating disabled student support plans (or equivalent) across all those involved in teaching and learning in the department, ensuring understanding of the need to make adjustments and the process for doing so

Ensuring adjustments in all assessment conditions

- Understanding the need to make adjustments in all assessment situations including departmental assessments and in-class tests

Lab accessibility and assessment

- Offering flexible learning and assessment opportunities in the lab
- Communication to technical staff, tutors and demonstrators about the needs of individual disabled students and the need to consider anticipatory adjustments



Good practice in physics departments

Strong and effective leadership

Engagement of senior management in discussions

All of the departments visited were in universities with a clear and visible commitment to equality and diversity evidenced through strategic plans and robust equality policies. All the central disability services had visible pages identifying the support available for disabled students. Several universities also provided significant advice and guidance to academic staff on supporting disabled students and some provided information and guidance on how to offer a more inclusive learning environment. Some were also providing additional expertise through specific support for inclusive learning such as a member of staff working with departments to identify, share and embed good practice across the university.

ACTION

There is a university disability interest working group that meets termly and an equality and diversity network both of which report into the university's Equality and Diversity Committee. There has been a working group on Disabled Students' Allowances changes, which is now morphing into an inclusive learning working group.

Against a strong university commitment to equality and diversity, there was also evidence in all departments of strong and effective leadership on equality and diversity more generally from the head of department and other senior academic staff, such as the director of teaching and learning, director of admissions or director of studies.

“ The physics department is just like a big family for me. I received outstanding academic and personal support from foundation year students to head of department.
4th year MPhys student with a visual impairment

ACTION

There is a departmental student charter supporting “equality of opportunity and respect for diversity”. Over the past few years, the department has sought to embed inclusive practice and share this with the wider university. For example, the department adopted an inclusive approach to its virtual learning environment (VLE) and the university developed a policy in this area based on the approach taken by the physics department.

ACTION

The school has its own equality and diversity webpages providing information to staff and students, which includes the school's own introduction videos for students with Asperger's Syndrome now being rolled out across the university.

Discussions on departmental committees

All departments visited had an Equality and Diversity Committee (or equivalent) primarily as a result of participation in gender-equality initiatives such as the Institute's Project Juno or Athena SWAN, although, in most, gender equality was the main focus. In a small number of departments, occasional discussions had taken place at the Board of Studies or at the Teaching and Learning Committee, but this was generally a one-off in response to a particular disabled student or a particular issue that had arisen during the year.

Named departmental champion for supporting disabled students

Most departments visited had adopted their university model of having a specific departmental representative for supporting disabled students – named members of staff responsible for supporting all disabled students in that department. In many departments, this was a clearly identifiable role commonly called departmental disability representative or coordinator, undertaken either by an academic or administrative support member of staff. Where this was undertaken by an academic member of staff, it was generally recognised in the workload model. In a smaller number of departments, the role was undertaken by the director of teaching and learning, or director of undergraduate studies, or equivalent. Many universities often provided support for this role in the form of training and development, networking opportunities and engagement in university inclusivity/disability equality groups and discussions.

ACTION

“Disability and dyslexia contacts (DDCs) in academic departments and schools provide targeted support for disabled students. DDCs have discipline-specific knowledge that enables them to identify core competencies within the discipline to inform whether or not a particular adjustment is reasonable within their specific context. This information informs the disability service’s recommendations. They also act as a local point of contact for disabled students and coordinate support within the department.”

Just over half of those who responded to the student survey, when asked if they were aware of a member of staff within their physics department who was responsible for supporting disabled students, said they were. A further 36% of respondents said they were unsure. Only 7% of respondents reported that there was no member of staff responsible for this area. Of the half who said that there was a departmental member of staff, 76% agreed that they were helpful and supportive.

ACTION

Once per term, the departmental disability representatives meet with each other to share practice and information. For example, the physics DDR has recently given a presentation on how the department supported a blind student.

ACTION

The faculty accessibility specialist, who is based in the department, helps to coordinate staff and resources across both the department and wider faculty, and liaises with the university on all aspects of accessibility.

Making progress on leadership

There were visible commitments to equality and diversity more generally in all departments visited although only a small number of departments were systematically discussing issues on inclusive learning or monitoring progression of disabled students specifically. There was general acceptance that this should happen in the future and that departments could be using their equality committees or teaching and learning committees to greater effect to kick-start more strategic discussions in this area. Physics departments were not generally capitalising on the expertise of staff in this area and many were not ensuring that these staff could report to appropriate departmental committees or to senior management. There were generally few opportunities to disseminate any training or knowledge to others in the department although there was recognition that this could be done in teaching away days, for example.

Good practice in physics departments

Embedding discussions on disabled students and inclusive learning issues in departmental committees and capturing the expertise of staff supporting disabled students would enable physics departments to share learning and practice across the whole department and ensure the anticipatory benefits of any adjustments could be adopted to avoid reinventing practice particularly for students with low incidence impairments. It would also enable them to engage more staff in discussions on inclusive learning and teaching.

While this had happened in some departments, it was generally as a result of a one-off issue raised through the particular circumstances or barriers that one or two students faced. We hope that departments can use the good practice already adopted by other departments in this guide to raise their own baseline for disabled students in physics.

Clear and consistent policies and practices

Some universities and departments had already considered how to move towards a more inclusive environment, and there had been efforts to develop standard policies and practices on generic inclusive provision such as lecture capture, lecture notes on virtual learning environments (VLEs), embedding inclusivity into review processes and provision of training and development. In some cases, the university disability officer confirmed that discussions had already taken place regarding the potential impact of the changes to Disabled Students' Allowances (DSAs) with plans for the provision of support no longer funded by DSAs were already in place, and in others discussions on this were still underway. Any implementation of support had not necessarily filtered to individual departments.

Lecture capture

In all departments visited there had been progress towards implementation of some form of video and/or audio lecture capture systems as part of university initiatives in this area. The level of adoption of lecture capture systems varied greatly:

- Lecture capture had been universally adopted, with individual lecturers having to opt out of recordings generally as a result of university policy
- The facilities to record were in teaching rooms but it was left to the individual lecturer to opt in to the system
- Lecture capture was in its early stages and only a few lecturers were currently using it

Adoption of lecture capture

Where lecture capture had been widely adopted, this has been driven by strong leadership from the university or senior members of the department as it was seen to be an inclusive approach to support all students including those without disabilities.

ACTION

The university is progressing towards its aim of adopting best practice in digital and inclusive learning and lecture capture has been rolled out with virtually all staff adopting this.

“ When I applied I was told that lecture capture would be used and this was why I chose the department over others. Nobody in the department uses it or provides enough resources.

1st year BSc student with mobility impairment

It was also generally acknowledged that, given the nature of physics lectures with spoken and written content and the continuing use of chalk and talk, there were limitations to how well lecture capture alone could meet the needs of some students, but there was a sense that this

was not necessarily acknowledged at the university level. Some individual lecturers also used visualisers, but, again, there were limitations as to how well this technology met the needs of all students. Some departments were working with learning technologists to develop innovative solutions, such as the use of touchscreen PCs to capture written content, or pressure-sensitive floor sensors in front of writing boards to enable cameras to track the lecturer as content was written.

Lecture capture is now available in most large lecture theatres. The lecture-capture system allows for playback in chunks and the department monitors views – it is especially used by students during revision periods.

ACTION

Lecture notes

In terms of provision of lecture notes (either in advance or after the lecture), practice varied:

- There was a policy (university or departmental) that notes would be provided in advance for all students
- There was a policy (university or departmental) that notes would either be provided in advance or within a certain period following the lecture
- Notes were only provided to individuals as a reasonable adjustment when included in the student-support plan

There is a long-standing departmental policy that all lecture notes are made available electronically on the VLE and the department has adopted a minimum standard of what should be made available.

ACTION

In one department where lecture capture had been widely adopted, it was considered that a brief outline of the lecture content or signposting reading materials for the session to be an appropriate alternative to providing notes in advance.

The university has a policy of ensuring lecture notes are available to all students online a week in advance on the VLE and the expectation is that students will access the notes prior to the lecture.

ACTION

With the implementation of lecture-capture systems, provision of lecture notes, and standard adjustments to exams, many physics staff expressed a general view that those students with specific learning difficulties and some other hidden disabilities were reasonably well accommodated without the need for further individual adjustments. There was little overall monitoring of the environment to ascertain this.

Equality impact assessment during review processes

As universities and departments move towards a more inclusive learning environment, consideration of equality during review processes will help embed inclusive learning and accelerate culture change. This was not yet happening as a matter of course although one or two physics departments had adopted their own systems. One physics department included inclusive teaching as a criterion in its peer review of lecturers. Two departments reported that inclusive teaching and learning was a criterion in programme review. One department acknowledged that while equality impact assessment was a criterion in university programme review, it was not generally understood how to apply this in practice.

Good practice in physics departments

ACTION

There is a lecture peer-monitoring system in place and, through this, the department would pick up on any lecturer not making their lectures more accessible or not making reasonable adjustments.

ACTION

When the department reviews its programmes, inclusivity has been a consideration. For example, in the introduction of a new style of exam paper for a Level 1 exam, consideration was given as to whether this might unfairly disadvantage students with certain disabilities, including dyslexia. A subsequent analysis of marks was undertaken to determine if there was such a disadvantageous effect and none was found.

Attendance monitoring

All departments were monitoring student attendance either at lectures, tutorials, problem-solving classes or practical sessions and in some this was now being used as a means of actively identifying students at risk of disengaging with their studies. These departments commented that lack of attendance was often a first sign of mental-health issues and/or illness impacting on studies and a discussion on attendance provided an opportunity to signpost support systems to students. In a few cases, departments acknowledged that attendance monitoring caused tension for some disabled students where their needs made it difficult for them to access locations or could lead to them missing teaching sessions.

Almost one third of respondents to the survey (29%) said that they had suspended their studies or repeated a year because of their disability or impairment. Almost three-quarters of these respondents said that they had a mental-health condition, although many also had other disabilities or impairments. Only a very small number of respondents to the survey studied part-time (1%), not unusual for physics undergraduate degrees, and the majority of these were doing so through distance learning. Around half of them said that they were part-time because of their disability or health condition.

“ I have suspended and repeated the third year twice due to depression caused by anxiety linked to my Asperger's. I found the department supremely supportive although perhaps a little more structured support with returning to studies could have avoided the second suspension as I found stepping back into third-year degree-level physics/maths after a year off started the symptoms of depression and anxiety up again.

3rd year MPhys student with Asperger's and a mental-health condition

Feedback from disabled students

Generally, there were few routes to gain feedback specifically from disabled students, although some departments said they felt they had sufficiently good relationships with all their students and that individual feedback was welcomed and often provided. In one department, there was a specific disabled student representative on the Staff Student Liaison Committee and in one other, one of the student representatives was disabled.

ACTION

The end of module questionnaire distributed by the department specifically asked students whether they have experienced discrimination on ground of gender, ethnicity and disability. Any comments made by students are anonymised and circulated to the board studies for discussion.

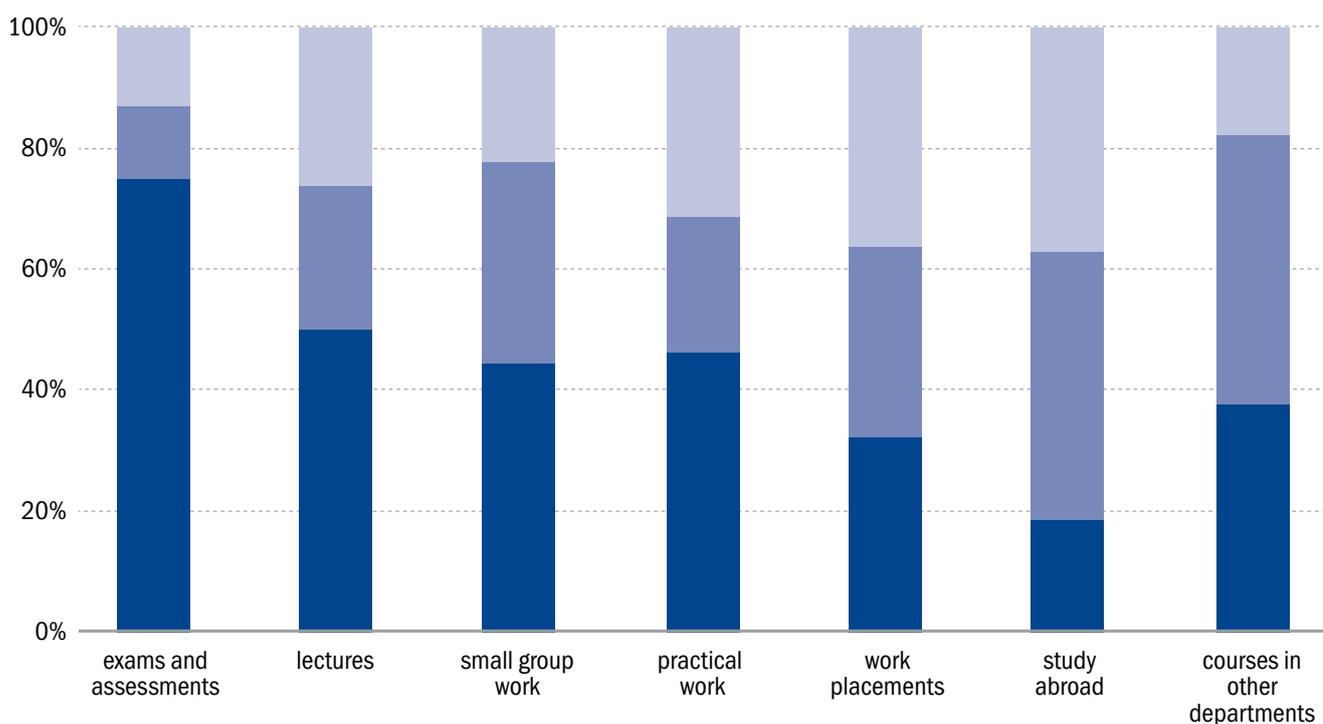


Good practice in physics departments

Responses from the student survey indicated that disability-related barriers for exams and assessments were dealt with quickly and efficiently by departments but in other areas, students had not found the same level of support. Fewer than 50% of respondents said that barriers were addressed quickly and efficiently for small group and laboratory activities. In addition, although the number of responses were very small, students undertaking work placements, courses in other departments or studying abroad, were also less likely to report that barriers could be removed quickly and efficiently.

“ I am very grateful for the support that I have received from my university. I wish that there was more support for disabled students wanting to do work placements and career advice as I have missed out on a lot due to my disability.
3rd year MPhys student with a long-term health condition and a mental-health condition ”

Figure 1: Responses to the question: “In general, any disability-related barriers I experienced in the following situations were dealt with quickly and efficiently by my department.”



Making progress on policies and practice

Implementing standard policies and practice on inclusive learning at the university level may not necessarily lead to more inclusive provision in STEM subjects because of the additional resource required to deliver this. Ensuring that lecture capture functions properly in the STEM environment, or that lecture notes with mathematical notation are made accessible, requires additional resource. While many departments were providing lecture notes, there was no consistency of format and accessibility of the notes to ensure compatibility with assistive technologies had generally not been a consideration. Physics staff need specialist advice and expertise in order to implement effective strategies in inclusive learning and teaching, and

need to be aware of the limitations of the different methods they use and the barriers they can present to students with different needs. Physics departments need to have a more solid understanding of baseline standards for accessibility, which requires specific technologies and specific training that is not currently being provided.

There is a need to adopt practices consistently across the whole department to ensure that all staff are engaged in providing an inclusive learning environment, not only those with a specific role for supporting disabled students. Physics departments could also do more to identify feedback specifically from disabled students in order to improve policies and practice, to embed and document support strategies that work and to share good practice.

Ongoing training and development

Training, development and networking opportunities

Many university staff-development units and equality and diversity offices were offering training on equality and diversity more generally and on inclusive teaching practices. Some central disability services offered training for those supporting disabled students on the impact of particular impairments in the study environment, such as specialist workshops on students with Asperger's. In several universities, all new academic staff had to undertake a certificate in learning and teaching practice (PGCAP) and this should have included information on inclusive learning. Most universities also offered training to postgraduates who were involved in teaching or demonstrating (as well as lab marking) and sometimes this included information on inclusive practice. Many physics staff questioned the effectiveness and relevance of this training without a focus on the expectations and requirements of teaching within a scientific domain.

“ I have had mostly good experiences but there have been times where I wish staff had to learn about disabilities and how they affect students so that help could be given less begrudgingly.

3rd year MPhys student with mental-health conditions and specific learning difficulties

Training embedded into departmental processes

In all departments there was an expectation that academic staff would have undertaken training (usually online) on equality and diversity; in several departments such training was mandatory and take-up monitored. This was partly in response to external gender-equality initiatives, such as Project Juno and Athena SWAN.

Only one department had run specific disability-awareness training for its staff, and one other department had offered bespoke sessions on inclusive learning and disability at a departmental teaching away day.

There is a departmental disability meeting once a year to discuss the likely support required for the next cohort of students and to address any issues that have already arisen with respect to accessibility or provision of teaching for disabled students.

ACTION

Good practice in physics departments

Where departments interviewed students as part of the admissions process, in most cases disability-awareness training had not been undertaken by interviewing staff. While reasonable adjustments would be made for those who had disclosed a disability at that point, departments recognised that they could be more proactive about ensuring that interviewing staff were more disability aware.

ACTION

It was made clear that for more complex cases all staff would be expected to participate in specific training to ensure that student's needs were understood.

Making progress on training and development

All departments recognised that they could do more on training and development of staff but they also recognised the limitations of the current offer from universities given that it was not specific to the science environment. Embedding disability-awareness training into induction processes or into departmental away days, for example, will ensure that all staff in the department engage with moves to offer a more inclusive environment.

Encouraging disclosure

A positive culture of disclosure with ongoing opportunities

There were differing approaches to encouraging students to disclose their disability within departments. Some of the departments took a pro-active approach, highlighting that disclosing a disability allowed students to access a range of support and reasonable adjustments. Support for disabled students was mentioned during open days, admissions, interview days, induction, throughout the year and when approaching exams. In one university, the disability office was structured by faculty liaison, so that each disability officer could develop a relationship with a faculty. In that case, the science faculty disability officer attended open days and interview days so that she could have conversations directly with students at that time to signpost support.

ACTION

The department offers a talk for disabled students at the open day from a disabled member of teaching staff, who had been a student at the university, and she would discuss her own experiences with students and provided information about the different avenues of support available.

Some departments had clear guidelines for staff on how to escalate disclosure of health or disability-related issues often through utilising a senior tutor or director of studies role.

ACTION

Every student has a personal tutor, who they meet once per week for the first two years. This allows students to develop a good relationship with their tutor, who provides support for disclosure and referral if necessary.

“ I have discussed my situation with my personal tutor and found them extremely understanding. Many people feel uncomfortable discussing mental-health issues but my personal tutor was professional and supportive, and encouraged me to stay in regular contact.

1st year BSc student with a mental-health condition

However, there were a few where the primary responsibility for disclosing a disability to the university remained with the student and in these cases they were more unclear on the role that they should play in supporting students to disclose.

All departments mentioned that one particular concern was the increasing number of students with mental-health difficulties, either in identifying these students before they reached crisis point, or in supporting these students in the most appropriate way.

Clear processes when students disclose

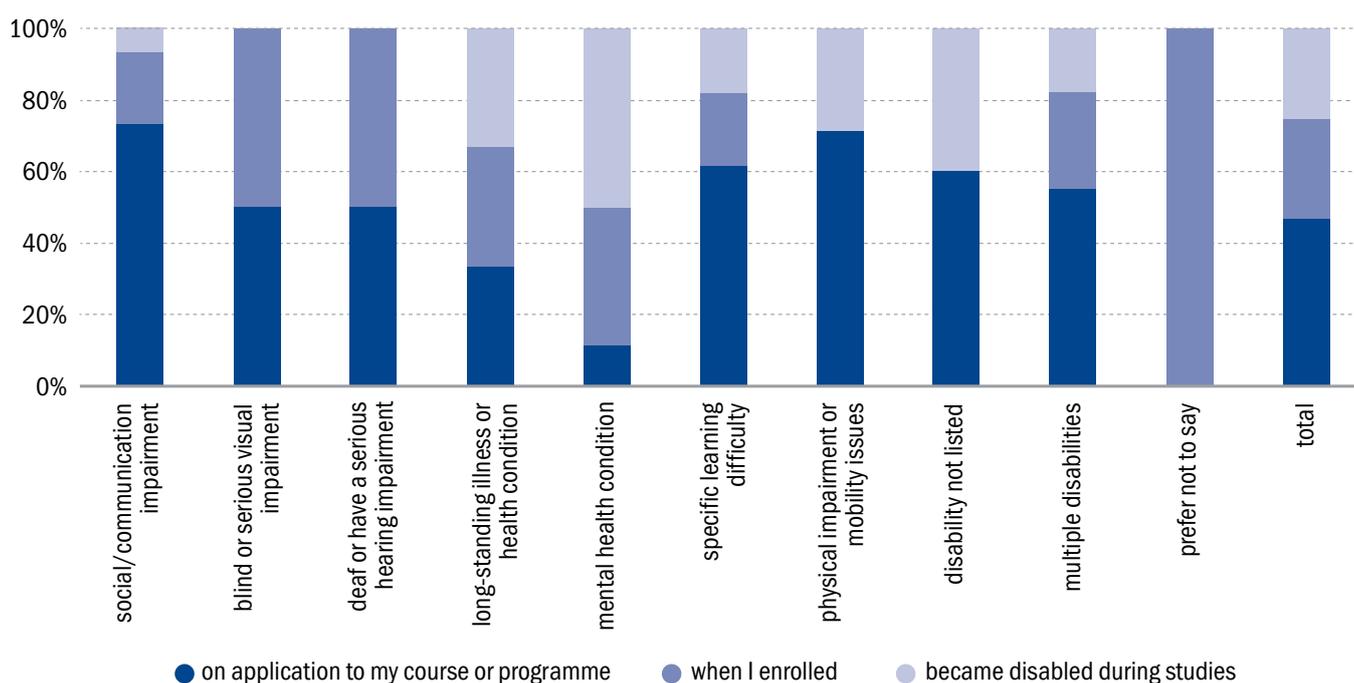
If students disclosed that they had a disability on their UCAS form, the majority of departments were made aware of this from the central admissions team at that point. Departmental admissions tutors would then engage with students who were likely to need more complex adjustments during the admissions process so that support could be discussed prior to the course starting. In one department, this would only happen with those with firm, but not insurance, offers. One university had a policy of not making this information available to anyone other than the disability office.

The admissions tutor would discuss any issues with the faculty disability advisor and directly with students with complex needs as part of the admissions process, to ensure that they are aware of the support that is available and to consider what support could be put in place before arrival.

ACTION

In the student survey, 89% of respondents said that they had declared their disability to their university. Respondents were most likely to disclose their disability on applying for the course (47%). A further 28% waited until they enrolled on the course and 25% reported that they became disabled while on their course.

Figure 2: When students disclosed their disability to the university by type of disability.





“ It took me quite a while of being disabled before I realised I was. I don't know if anyone else could have spotted it or done anything to check (though my work quality and lecture attendance did take a downturn) but it might have been useful to have been taught beforehand about depression and how to spot it in yourself and others. I would be doing much better if I'd known enough to spot this earlier.

2nd year MPhys student with a mental-health condition

Students with mental-health conditions prior to enrolling were the least likely to disclose their disability on their application to the course. They were also the group most likely to become disabled during their course. Students who did not disclose their disability were asked to comment on their reasons why. General themes from these responses were:

- Not wanting to be treated differently from their peers, fear of discrimination and lack of understanding of their needs
- That disclosing their disability would make no difference as there was limited support available for their needs
- Unsure whether they had a disability, for example, due to a lack of formal diagnosis or unaware that their difficulties would be considered a disability

Some students expressed regret at not declaring their disability as they'd found it difficult to cope as they progressed through their course.

“ At the beginning, I felt like I wanted a fresh start but now I wish that I had disclosed before problems escalated.

3rd year MPhys student with physical/mobility impairments and mental-health conditions

The department are aware that a high proportion of students across the university who take a leave of absence do so for mental-health reasons and that a high proportion of these students do not return, or return too soon. The university had recently produced a report on access to mental-health services for young people more generally as it was an issue of increasing concern. The university had a mental-health support service that worked closely with the disability office.

ACTION

Making progress on disclosure

Evidence published by the Equality Challenge Unit in their 2012 report, *Evidencing Equality*, shows that disclosure can be higher where steps are taken to encourage disclosure and highlight the positive benefits of doing so, rather than simply making generic statements about attitudes towards disability. Having a positive culture of disclosure, emphasising the benefits that this will bring and having clear signposting routes on disclosure will in turn lead to more students disclosing. There may be a need for targeted guidance on encouraging students with mental-health conditions to disclose.

Good practice in physics departments

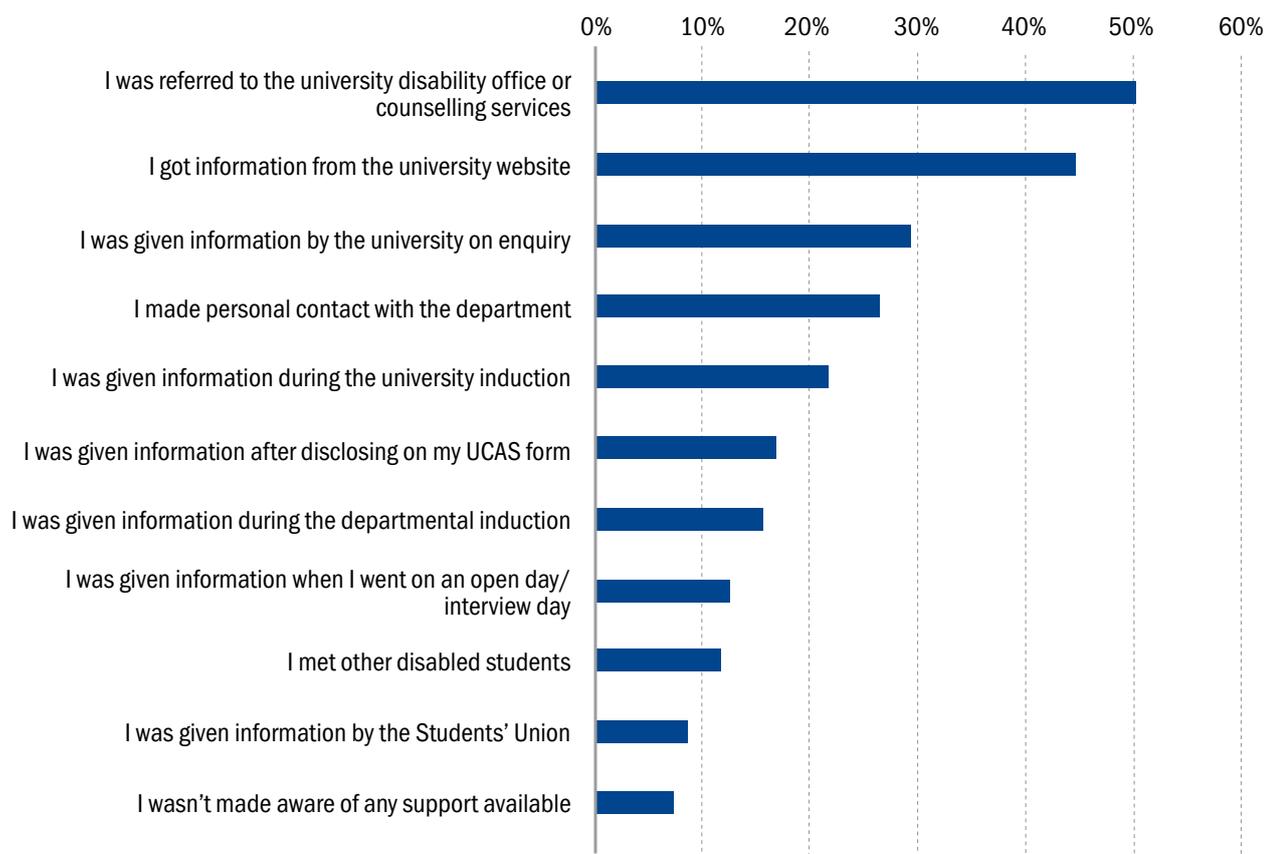
Engaging with central student support services

Anticipatory adjustments in the absence of a formal plan

While inclusive teaching and learning practices will benefit students who do not wish to disclose their disability, the formal process of being assessed by the disability office is still the main gatekeeper to accessing support and removing barriers in most departments.

Respondents to the survey were asked how they were made aware of the support that may be available to them. Half said that they were referred to a disability office or counselling service, and nearly as many found out information from the university website. A much lower proportion of students mentioned activities related to applying and enrolling on their course, for example during induction days, although 26% said that they made contact with someone in their department. A very small number of students (7%) said that they did not receive any information about disability support despite 82% of these saying that they had disclosed their disability. While it could be that students interpreted this question as proactively receiving information (a few said that they made contact with staff or researched information themselves), this may be an indication that there needs to be more proactive engagement with disabled students to ensure that they know how to access the support they need.

Figure 3: How disabled students were made aware of the support that may be available for them.



“ I managed to find a group of students who have the same disability as me – studying with them has been invaluable.

2nd year MPhys student with social communication disorder

Once a student had disclosed their disability, whether during admissions or on the course, students were signposted to, or identified by, the university's central disability office. All university disability services reported that they used a document or plan to communicate and capture a disabled student's study needs, although students had to register with the university disability service in order for this plan to be created. Many departments raised concerns about the length of time it took for these plans to be sent through, particularly for students who disclosed or were identified as having a disability during their course. In only a very small number of departments was support discussed with the student during the referral process so that adjustments could be implemented prior to the formal plan or funding in place. The most common practice was to refer the student to disability services and wait for the plan to be produced.

The physics department has, in the past, been very responsive to the needs of disabled students and has put arrangements in place without immediately involving the disability office or university, although this has been funded by the department.

ACTION

Good communication with central disability office

Concerns were raised that plans could often be generic and provide little information on some of the distinctive aspects of the physics course, such as lab work, problem classes and worksheet-type assignments. Many plans only systematically covered lectures, tutorials and exams and written assignments such as essays. Concerns were raised that when plans were very generic, with similar text used in many of them, particular issues could be easily overlooked. Where departments worked closely with disability services, for example when a disability advisor was allocated to subject areas, these concerns were lessened. Once the plan had been produced, there were no clear channels for departments to feedback on or inform the plans except in the most complex cases. Departments did not necessarily feel it was part of their role to monitor the effectiveness of the plans if they had not been involved in developing them, nor in providing the support.

“ I have a document that outlines that I should be receiving teaching material before the lecture (if it hasn't already been made available) and that I receive 25% extra time in examinations.

2nd year MPhys student with a specific learning difficulty

An accessibility audit was done several years ago that involved technical and academic staff with someone from the disability office walking round the experiments to identify what would and would not work well. There is general feeling that this audit has helped influence the information in the student-support plan.

ACTION

The student survey highlighted similar concerns. Of the respondents that had disclosed their disability, 58% reported that they had a document or plan from the disability service outlining the adjustments they required, while 14% of respondents indicated that they were not sure if they had a plan or not.

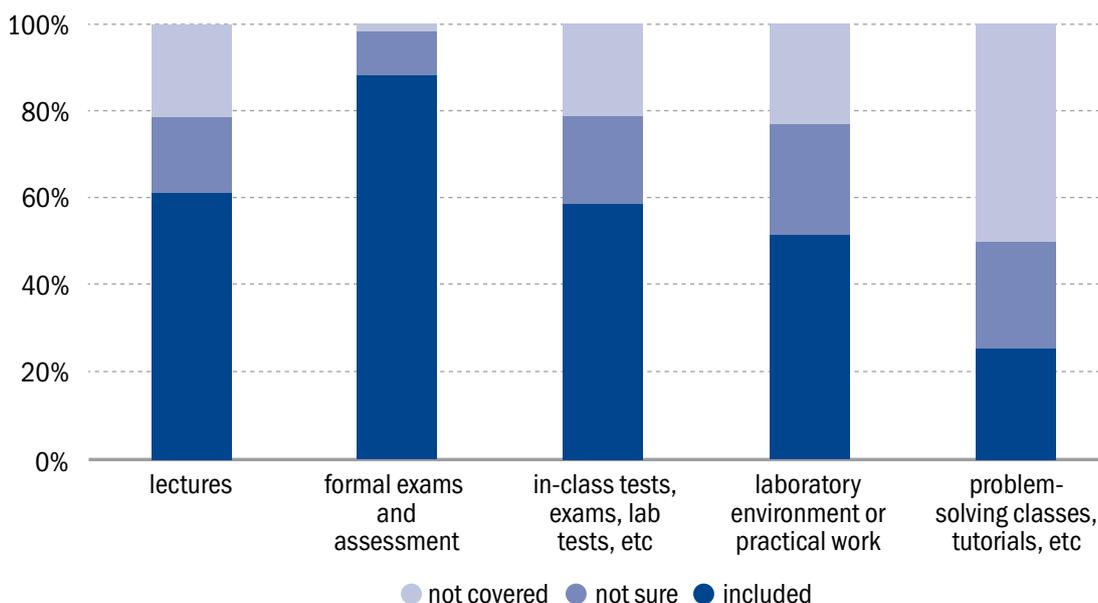
Of those who had a plan, it was most likely to cover formal exams and assessments, and least likely to cover labs and practical work. More than half of the students with social or communication impairment, visual impairment and specific learning difficulties who had a plan, indicated that this did not cover “laboratory environment or practical work” or “problem-solving classes, tutorials, etc”, although they thought it was applicable.

Good practice in physics departments

ACTION

The physics department has been working closely with the university over the past few years to ensure that the [student-support plan] better reflects departmental situations in the lab, so that students and staff understand better how to promote an inclusive lab environment.

Figure 4: The areas of teaching and learning that were, or were not, covered in the student-support plan.



“ I had a document produced based on a meeting and interview at the beginning of my studies. However, circumstances change, for instance I need more hours of support for note taking due to increased length and complexity of the material, as well as longer extensions on deadlines in year 4 than in year 1, I find it difficult to make the disability office understand that. True, the medical condition of blindness does not change, but the level of access needs increases as you progress in the degree and it is difficult to assess when you are 17–18 years old and only just about to start a science degree.

4th year MPhys student with a visual impairment

Making progress on communicating with support services

The Equality Challenge Unit's evidence shows that students who do not receive support for their disability are more likely to withdraw from their course or have lower outcomes than their peers with no disability. Initiating discussions on anticipatory adjustments will enable departments to be more confident that there is support in place while specific support plans are being drawn up, particularly given the length of time that this could take. There is a need for STEM student-support plans to be specifically tailored to the STEM learning environment. This will involve STEM departments working in partnership with central support services to ensure that all aspects of the learning environment are covered where necessary, engaging all teaching and learning staff in the provision of support in these plans.

Communicating student support needs

Clear process for dissemination of plans across the whole department

The process of disseminating student support plans from disability office to departments was broadly similar across the visits, in that plans were sent to the central point of contact in the department and it was then up to the department to develop a process of dissemination (unless the student had requested that this didn't happen). In the main, departments used either student record systems or emails to disseminate plans. Some departments had very proactive disability representatives and/or administrators who took responsibility for dissemination of the plans, and supported academic staff and students to ensure appropriate information was shared. Generally, it was the case that module leaders were informed, via the student record system or email, and it was their responsibility to inform other members of staff who may be working on the module (for example lab demonstrators).

The student support plan is now attached to the student record and the disability office is starting to train academic staff to enable them to understand how to access it. Within the department, all plans are sent to the director of studies who then communicates with all appropriate staff, including the undergraduate lab and safety coordinator.

ACTION

The department maintains its own information systems as part of its student information management processes... The teaching administrator has standard emails that they send out to all known disabled students at set times of the year and to members of staff who will be teaching disabled students.

ACTION

There was much less consistency when it came to disseminating student-support plans to other departmental (non-academic and technical) staff and others involved in teaching and learning (such as postgraduate demonstrators). In the majority of departments, even if technical staff were made aware of the support plans and adjustments required, others such as postgraduate demonstrators or those taking tutorials who were not academic staff were not routinely included in dissemination of information.

There was little consistency when it came to notifying other departments in the university of a disabled student's needs (for example, if they were taking a chemistry option or were studying a joint degree). In one or two universities, there was a formal policy on how other departments would be notified and responsibility was clear. In the main, it was generally unclear how other departments would find out about a disabled physics student. In one university, it was the student's responsibility to notify other departments.

There is a system for sharing information between departments where modules are taught jointly or where the department teaches other students.

ACTION

Making progress on communicating support

There was often an assumption that staff in the department would simply understand the process for accessing the support plans and putting support in place, yet it was rarely actively discussed and unlikely to be covered in either university or departmental induction processes. Nonetheless, generally for academic staff, whatever system was in place, it worked. This was not necessarily so for other staff, students or technical support staff. Reviewing processes for sharing plans and training staff to access and understand the content of the support plans would ensure that everyone involved in teaching and learning, students understood the plans, how to access them, and how to put the support in place.

Ensuring adjustments in all assessment conditions

Making adjustments in all assessment situations

Unseen problem-solving is a requirement for all accredited physics degrees and all physics departments used the traditional formal examination method at the end of the year to determine progress. Most departments also had some level of in-class assessment throughout the year (often computerised, especially in the first year) as well as problem-solving tutorials. While some departments ensured that in-class assessments were reasonably flexible to ensure accommodation of adjustments, there were often timetabling constraints. Some departments worked round this by, for example, setting 45-minute tests in the hour-long session to allow extra time for all students.

ACTION

All assessment criteria are published online and reviewed annually by the Education Committee. Formal examinations remain the predominant method of assessment, but in year 4, students can choose modules in such a way that almost half of their marks come from other forms of assessment, such as reports, presentations, talks, oral exams and group presentations. The department has also been trying to develop its feedback mechanisms to provide more individual, one-on-one feedback.

Reasonable adjustments to formal end-of-year examinations were generally handled systematically by central examinations offices, often with little direct involvement from the department. This meant that there was little monitoring of how accessible the exam paper itself was.

“ My dyslexia makes remembering formulas really difficult... the policy of giving equations but testing us on our understanding of the science rather our ability to remember complex equations has made studying physics and doing well achievable for me. If they didn't do this then I would not be able to shine.

Part-time BSc student with specific learning difficulties

ACTION

In terms of exams scripts, once the paper has been drafted, there is an exams editor who looks at the language, diagrams, etc and may suggest changes to ensure that it is accessible.

It was generally the norm that reasonable adjustments for exams could only be provided based on the recommendations in student-support plans. Most examinations offices had a deadline by which students had to have their support plans in place in order to receive the appropriate adjustments. Some departments were extremely proactive about notifying students of this deadline and would meet with students with complex arrangements to ensure that they understood what was in place.

“ Getting extra support for being dyslexic is looked down on like an unfair advantage, which is wrong, as I can understand things and appreciate nature better than some of those and can argue conceptually and apply using intuition – many students now just read and do stuff from memory without really thinking about things and why a mathematical relationship will work.

2nd year MPhys student with specific learning difficulties

The director of student experience meets with all students who require adjustments to examinations to ensure that they can discuss what is most useful. He also meets with other students who have specific, even temporary, needs or if they are undergoing anxiety or exam stress to discuss if the department can support them in some way during the exam period.

ACTION

The director of studies emails all students early in the term to ensure that they are aware of the need to put exam adjustments in place as early as possible and informs them of the deadline by which they need to do this.

ACTION

In the main, there were standard adjustments to formal examinations or ongoing assessment in the plans (eg 25% extra time, large-print paper, amanuensis, automatic deadline extension). Some universities offered a dyslexia sticker scheme, but there was often confusion about how this operated in practice within the department, particularly in lab classes and outside of formal examinations. In some departments, there was a general feeling that automatically extended deadlines didn't help students to manage the workload within the physics environment and could result in some students having huge workload pressures towards the end of term.

““ The high workload compared to other subjects puts a lot of pressure on students with mental-health conditions, and it's important that departments are understanding of this. **1st year MPhys student with a mental-health condition**

There was a new university-wide policy that no examination should exceed four hours, and therefore a student requiring 50% or even 100% extra time on a three-hour paper would be given a bespoke paper rather than sitting a very lengthy exam.

ACTION

The departmental disability co-ordinator sits on the mitigating circumstances panel that meets to consider any student who has performed not as well as expected. He would encourage any disabled student who had been experiencing barriers to their course, or who had issues around reasonable adjustments not being implemented properly, to submit their case to this panel.

ACTION

Making progress on exams and assessment

The Equality Challenge Unit guidance on disability legislation: Practical guidance for academic staff from 2010 highlights that: “Inclusive practice in assessment stems from careful consideration of learning outcomes, assessment criteria and the accessibility of assessment practices when the programme is being designed.”

There is a plethora of good practice in exams and assessments in the inclusive learning environment, but much of it is generic and not tailored to STEM. As the reasonable adjustments required by disabled students will depend on the assessment criteria, it is important that departments are clear on what is being assessed and that they communicate these to disability staff creating support plans and to students. Departments could consider reviewing competence standards and the purposes of all assessments bringing together the advice of subject specialists and disability specialists as well as considering the overall accessibility of the exam paper.

Lab accessibility and assessment

Flexible learning opportunities

Practical work is a fundamental component of an accredited physics degree and there was wide variation in the way that individual departments approached lab accessibility, assessment and adjustments. Where departments had recently refurbished their labs, they had built in, or were currently building in, accessibility at that time, giving them a good understanding of the accessibility of the labs overall and of individual experiments.

Departments assessed lab work in a variety of ways. Some assessed work by demonstrators asking students to talk through their experiments, some required experimental write-ups to be submitted at the end of lab sessions, and others allowed students time to finish the write-up in their own time. All departments required students to use (usually paper-based) lab books, although a few were trialling electronic lab books for students with disabilities if they requested them. Most departments would allow disabled students to use computers during lab sessions (either using networked computers within the lab or bringing in their own laptops) although some commented that they had never had a request for this.

ACTION

There is networked assistive software available in the labs. The department is relatively flexible in how students collect and write up their lab notes, with access to computers for all. The department is supportive of students who wish to use assistive tools and strategies during practical sessions.

Communication with technical staff, tutors and demonstrators

In the main, there was a general assumption that lab tutors and demonstrators would pick up and help with any difficulties and the evidence was that this did happen. Demonstrators and tutors had enormous amounts of goodwill to ensure that all students could access the labs, but only a few departments had planning in place to ensure this happened in advance or routinely.

In one department, the disability representative was also the first-year lab tutor and was able to timetable experiments at the beginning of the year knowing which students would need which adaptations. In this case, the department was already planning for the possibility of a student with sensory impairments the following academic year and had had discussions about making adjustments in the lab.

Making progress on lab accessibility

One of the areas where evidence of genuinely inclusive practice was particularly limited was in the practical work, and this is an area where technology could be used much more effectively, such as use of video and photos to capture data or collaborative writing tools to encourage discussion and teamwork. In the online learning environment, there is much good practice in terms of accessing experiments remotely and working in groups interactively through Skype chat, video and so on.

In one or two universities there was a STEM laboratory working group or equivalent bringing together laboratory staff from different disciplines to discuss inclusive practice and developments to lab work. This offered an opportunity for staff to learn from each other and to share good practice. There were differences in the criteria for assessing written work in labs with some departments assessing presentation and written skills while others didn't. The assessment criteria for lab situations needs to be clear and communicated to disability staff creating support plans, to lab tutors and demonstrators and to students.

Degree accreditation and competence standards

Accreditation is the means by which the Institute monitors the content and standard of physics degrees and keeps the wider community of physicists informed of this. The skills and achievements of graduates of accredited degrees are set out by the Institute outlining the key concepts that must be covered in all accredited programmes and the core competencies that must be achieved by all physics students. Details of this can be found on the IOP website. Departments are able to interpret these within the context of inclusive learning widely and are able to interpret how the competence standards will apply in many situations.

Nevertheless, the visits uncovered a degree of hesitation within departments with respect to making some reasonable adjustments and ensuring that they were still within the guidelines of degree accreditation. The degree accreditation processes are designed to ensure that there is no room for discrimination against any disabled student who is able to meet the core competencies for an accredited degree. Should departments wish for specialist advice on individual circumstances, this can be provided by IOP staff, who are more than willing to discuss individual cases or more general concepts around achieving the competence standards for physics. For further information, please contact [**accreditation@iop.org**](mailto:accreditation@iop.org).

Next steps for the IOP

This project has demonstrated that there are enormous amounts of goodwill and a great deal of knowledge, expertise and experience from individual members of staff in physics departments built up over many years of supporting disabled physics students. During the visits it was clear that many physics departments have worked incredibly hard to find solutions to even the most complex of barriers to disabled people in the physics environment, sometimes with little specialist input or funding. Many departments had developed their own expertise and knowledge in this area at the local level but this is being reinvented in different departments and even within the same department over time. But this isn't necessarily what will lead to long-term cultural change or moves to genuinely embed inclusive learning in physics. The Institute will continue to support the moves towards a more inclusive learning environment in physics but we cannot provide the solution alone. We're already working with partners to address some of the issues raised in this report, particularly around the need for more specialist advice and guidance in the STEM environment.

“ It's really difficult and I wish that there was more support available from the IOP and other places.
2nd year MPhys student with a mental-health condition

STEM Enable: a national resource for information and advice on accessibility in STEM

There is little documentation of support strategies that work, particularly for students with low incidence impairments and high or complex support needs. There is a real need for an increased understanding as to why the physics, and STEM, environment needs specialist input, advice, guidance and training, and for further knowledge and expertise to address the specialist nature of STEM courses. To address this issue, we are working in collaboration with the University of Bath to establish STEM Enable, a new national online resource for accessibility in STEM. The resource is a searchable wiki to provide information on different support strategies and assistive technologies initially for students with print impairments in maths and physics. It is hoped that over time, STEM Enable can be a fully searchable resource for all STEM subjects and strategies for students with many different impairments.

Providing networks to share good practice and support strategies more widely

This project has identified a need to share practice in this area across physics departments, STEM departments more generally and nationally to initiate conversations and find a common consensus on what inclusive learning in physics and STEM might look like. We hope to establish a formal support network for those supporting disabled students in physics, similar to that already provided for heads of physics departments, student outreach officers, directors of teaching and learning and directors of admissions. As part of this, we should also plan to embed discussions on inclusive learning within the other networks offered to physics staff.

We also hope to establish an Accessibility Advisory Forum to champion accessibility issues within the Institute and the physics community more broadly, and to provide advice and guidance to inform best practice particularly on digital accessibility.

Identifying specific training needs for the STEM environment would also enable the dissemination of good practice. Through our new network, we may be able to identify specific training needs for physics staff and whether there is a way of addressing this issue on a wider scale. Providing specialist input will engage STEM academics appropriately and raise the bar for inclusive learning in physics and supporting disabled students.

We will continue to work with the other STEM-learned societies to help address some of the STEM-wide barriers to disabled people given the shared components across many of our subjects. Improving lab accessibility and using technology to greater effect is just one example and other subject disciplines may have good practice to share. Addressing the needs of those with mental health conditions in STEM is another. Part of this work should also involve the need to promote a shared vision of inclusive learning in physics and the STEM environment more generally.

Understanding core competencies

There is a need for sharing specialist expertise and more clearly defining what inclusive learning in physics, and STEM, looks like. We have a role to play in not just promoting good practice but raising the baseline for inclusive teaching and learning in physics and STEM. Part of this is ensuring that there is a common understanding of some of the core competencies for physics so that organisations and individuals involved in supporting disabled students share understanding of the types of adjustments that can and cannot be made, and the types of support needed in different situations. This also means ensuring that our degree accreditation processes are fully understood in the context of inclusive learning so that this is not a barrier to disabled students' progress.

Further research

“ The barriers you face as a graduate student are often quite different. In particular, the emphasis on measurables such as publication, which need to happen by a particular timescale, put a lot of pressure on people whose disabilities make it difficult to work a normal working week at times (such as chronic fatigue).

3rd year PhD student with specific learning difficulties

During the visits, the issues around postgraduate research students and staff were touched upon, although not routinely discussed or followed up. This report should be seen as the start of ongoing work to identify further barriers to supporting other disabled students and staff in physics departments.

If you are interested in getting involved in the Institute's work in this area, contact us at diversity@iop.org.

References and further reading

The Department for Education's 2017 report Inclusive Teaching and Learning in higher education as a route to excellence is available to download online at www.gov.uk/government/uploads/system/uploads/attachment_data/file/587221/Inclusive_Teaching_and_Learning_in_Higher_Education_as_a_route_to-excellence.pdf

A guide produced as part of the National HE STEM programme in 2012 on Good Practice on Inclusive Curricula in the Mathematical Sciences, edited by Emma Cliffe and Peter Rowlett, is available to download online at www.mathcentre.ac.uk/resources/uploaded/inclusivecurricula.pdf

The Equality Challenge Unit's 2010 report Managing reasonable adjustments in higher education is available to download online at www.ecu.ac.uk/wp-content/uploads/external/managing-reasonable-adjustments-in-higher-education.pdf

A summary of the support provided through Disabled Students' Allowances can be found at www.gov.uk/disabled-students-allowances-dsas/overview

A summary of the changes affecting English-domiciled disabled students can be found on the Disability Rights UK website at www.disabilityrightsuk.org/government-response-dsa-funding

The Equality Challenge Unit's 2012 report Evidencing Equality: approaches to increasing disclosure and take up of disabled students' allowances, Equality Challenge Unit, is available to download online at www.ecu.ac.uk/publications/evidencing-equality-approaches-to-increasing-disclosure-and-take-up-of-disabled-students-allowance/

The Equality Challenge Unit's 2010 guidance on the Equality Act Disability legislation: Practical guidance for academic staff is available to download online at www.ecu.ac.uk/publications/disability-legislation-practical-guidance-for-academic-staff-revised/

Details of the Institute's degree accreditation can be found on the IOP website at www.iop.org/education/higher_education/accreditation/page_43310.html

Our 2008 report Access for All: A Guide to Disability Good practice for University Physics Departments is available to download from the IOP website at iop.org/publications/iop/2008/page_42867.html

STEM Enable can currently be found at <http://stemaccess.referata.com>

Acknowledgements

We would sincerely like to thank all the departments for their hospitality on the day. We know how disruptive such visits can be and we were pleased to see that so many staff were prepared to give up their time and to engage in positive and open discussions.

Those departments are:

- Department of Physics, University of Bath
- Department of Physics and Astronomy, University College London
- Department of Physics, University of Durham
- Department of Physics, Lancaster University
- Department of Physics, University of Liverpool
- School of Physics and Astronomy, University of Manchester
- School of Physical Sciences, The Open University
- Department of Physics and Astronomy, University of Sheffield
- Department of Physics and Astronomy, University of Sussex
- Department of Physics, University of Warwick
- Department of Physics, University of York

With particular thanks to our specialist visiting team, Dr Abi James of Assistive Learning Ltd and Dr Margaret Meehan of Swansea Innovations Ltd.

Appendix

Table 1: Breakdown of responses to the survey of disabled student members of IOP by disability compared to national statistics.

	Respondents to student survey	% of respondents	No. of respondents that declared disability to university	HESA no. and % of disabled physics undergraduates (2014/5)	HESA no. and % of all subjects undergraduates
Social/communication impairment	17	6.8%	16	110 (6.4%)	2,905 (1.7%)
Blind or serious visual impairment	4	1.6%	4	20 (1.2%)	2,500 (1.4%)
Deaf or serious hearing impairment	2	0.8%	2	30 (1.8%)	3,995 (2.3%)
Long-standing illness or health condition	9	3.6%	9	130 (7.6%)	16,395 (9.4%)
Mental-health condition	72	28.8%	55	125 (7.3%)	13,250 (7.6%)
Specific learning difficulty	48	19.2%	45	660 (38.5%)	75,740 (43.2%)
Physical impairment or mobility issue	8	3.2%	8	30 (1.8%)	4,360 (2.5%)
Disability not listed	5	2.0%	5	165 (9.6%)	18,185 (10.4%)
Multiple disabilities	81	32.4%	78	125 (7.3%)	12,485 (7.1%)
Prefer not to say/not known	4	1.6%	1	320 (18.7%)	25,310 (14.5%)
Total	247	—	223	1715	175,145

For further information contact:

Jenni Dyer, Head of Diversity

IOP Institute of Physics

76 Portland Place, London W1B 1NT

Tel +44 (0)20 7470 4800

Email diversity@iop.org

www.iop.org/diversity

Registered charity number 293851 (England & Wales)
and SC040092 (Scotland)

This guide is available to download from our website and if you require an alternative format please contact us to discuss your requirements.



The Kitemark is a symbol of certification by BSI and has been awarded to the Institute of Physics for exceptional practice in environmental management systems.

Certificate number: EMS 573735