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Embedding and Sustaining Inclusive Practices in STEM

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EMBEDDING AND SUSTAINING INCLUSIVE PRACTICES IN STEM

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Abstract

In the UK, data collected nationally by the Higher Education Statistics Agency has shown persistent differences in degree outcomes for specific student groups, such as students with disabilities. In response to this, the Higher Education Funding Council for England are funding 17 projects to help address these inequalities. Building on its expertise in this area, The Open University is leading the Inclusive STEM project, with colleagues from the University of Leeds and Plymouth University, to evaluate, scale up and promote inclusive educational practices (focusing on the STEM disciplines but with wider application across higher education.)

There are challenges with inclusive distance learning, many of which are particularly prevalent in the STEM disciplines because of the use of practical and field activities, and the use of mathematical and symbolic characters. Online and blended learning approaches, including digital access to learning resources, bring opportunities for more inclusive practice, but they can also lead to unforeseen and unquantified barriers for students. Integrating an inclusive approach to teaching and learning requires universities to embed and sustain practices that consider the diverse needs of all students throughout curriculum design and delivery. The Inclusive STEM project has identified examples of good practice in these areas and is evaluating, improving and scaling these up throughout higher education. This has included surveying staff to better understand their knowledge, skills and perceptions about inclusive teaching and learning.

We will explore case study examples of inclusive practice, and we will discuss how these can be applied by practitioners in HE in order to create a higher education environment in which students of all backgrounds and characteristics are able to succeed.

Keywords: Inclusive practice, accessibility, STEM, distance learning, barriers.

1 INTRODUCTION

It is recognised that inequalities in education are a global concern [1], [2]. One specific group of people with inequitable outcomes from higher education is students with disabilities [3]. In the European context, for example, the gap between disabled and non-disabled people with a tertiary education was 9 percentage points [4], and despite policy- and practice-level interventions intended to address this gap [5], [6], it has increased 2 percentage points since 2011 [4].

In the UK, differences in degree outcomes, particularly in terms of completion, attainment and satisfaction, have been of concern for a number of years [7], [8], [9]. The gap between disabled and non-disabled students attaining a higher classification of degree currently stands at 3 percentage points [9]; these gaps have persisted, despite the number of students in higher education who declare a disability increasing [9]. In an effort to address this, England's Office for Students have funded a range of projects *via* their 'Addressing barriers to student success' programme [9], including several addressing specific UK degree outcome gaps for students with disabilities.

These challenges for students with disabilities are particularly prevalent in the Science, Technology, Engineering and Mathematics (STEM) disciplines, which are dependent on activities such as laboratory work, fieldwork, or manipulation of large datasets [10]. To this end, The Open University (OU), the University of Plymouth and the University of Leeds have partnered, supported by the Office for Students, to evaluate, scale up and promote inclusive practice for students for disabilities within STEM disciplines and the wider HE sector. It is intended that by focusing on students with disabilities, an inclusive environment will be created that will support the success of all students.

This paper gives an overview of the approach taken by the project team at The Open University, describing three diverse examples that were work packages within the project. Through these, the paper illustrates the contention by Seale [11] and McAndrew et al., [12] that there is no single solution to inclusivity, and no one group of staff that holds the key to student success.

2   APPROACH

The project team was composed of academic staff from the STEM faculty, accessibility practitioners (STEM-specific and institution-wide), digital content creators and researchers, and staff from other units.   A survey was undertaken to gather a cross-sectional baseline of inclusivity practices and perceptions across the institution. This took place near the beginning of the project, to both inform the project design and play a role in measuring future impact of any institutional initiatives.

The project team recognised the need to investigate the collective impact of multiple issues, as opposed to trying to identify a single cause for degree outcome gaps. Hence, a number of work packages were identified to explore relevant areas and activities across the institution. These were identified in consultation with a wider group of stakeholders including the heads of STEM departments and directors of teaching; and comprised initiatives at a range of scales within the institution, from institution-wide policy to specific teaching activities.

Importantly, the project team sought input from students with disabilities and a diverse range of staff as appropriate for the individual work packages. For a review of how the work packages were selected and how ethical approval was obtained, see Pearson et al [13].

The final work packages selected were:

- Discipline-specific accessibility groups
- Curriculum specification
- IT procurement
- Online labs
- Inclusive language
- Degree accreditation
- Inclusive group-work
- Development of an accessibility policy

This paper focuses on three work packages: inclusive group-work, the development of an accessibility policy and degree accreditation. For a description of the remaining work packages, see Pearson et al., [13].

3   INCLUSIVE GROUP-WORK

The work package focusing on group-work was initiated as part of this project. The Open University has a significant history of teaching *via* group work, at tutorials and residential schools as well as online, incorporating activities such as collaborative practical activities, shared presentations, data collection activities and academic debates. Despite this level of experience, student support staff and staff responsible for designing and/or facilitating group work activities have expressed concern about the continuing challenges faced by some students in participating in these activities. Of particular concern were students with mental health issues (such as anxiety) and students with autism spectrum conditions. Many of these students find that group activities increase their anxiety significantly, sometimes to the extent that this will preclude them from participating.

A work package was therefore created with the aim of creating and sharing guidance for those who design and lead group activities, to help them develop more inclusive activities and practices. A further aim was to develop guidance for students taking part in group-work, to help them consider what it means to work effectively and inclusively in a group.

Adopting action research as a methodology [14], we decided to take a student-centred approach by considering how the experience of an individual student could inform improvements to the experience of students overall. Hence, this work began with a focus group discussion involving students with disabilities. Our approach was exploratory and used a 'listening' method inspired by narrative enquiry [14], [15]. We asked students to recount their individual experiences of group-work and then to reflect on what had been successful in the design and delivery of the activities, as well as what improvements could be made. Powerful and engaging stories of group-work emerged, both positive and negative, alongside strong recommendations for improving students' experience of group-work.

Students identified a number of difficulties, which included an insufficient level of detail about the group-work being available before the module start date (including the dates and duration of group work activities, which is needed for students to plan for support from non-medical helpers), information about the importance and status of group-work in the module, and what possible adjustments that may be available. Students also highlighted the importance of how group-work is initiated, specifically the tone and expectations that are set and modelled by the facilitator.

Having listened to the students, the second stage of the work package involved seeking the voices, opinions and experiences of practitioners. We interviewed individual practitioners involved in designing, facilitating and supporting group-work and listened to see how their concerns echoed or differed from those of the students. We asked the practitioners a similar set of open questions to those we had asked the students, with the aim of identifying good practice, current perceived barriers to inclusion, and adjustments made as an attempt to mitigate those barriers. These interviews identified improvements that could be made to group work design, for example designating roles within the group which might play to the strengths of students with particular needs. They also highlighted the importance of making group-work activities 'authentic' in the sense that they mirror and prepare students for the types of activity that are undertaken in a work setting relating to their discipline. Conveying this 'authenticity' to students allows them to weigh for themselves the potential benefits of participating against the potential costs, emotional (such as increased anxiety), mental or physical (such as fatigue).

At this stage of the project we also actively looked to the relevant literature and for guidance created by other institutions around inclusive approaches to group-work and students with disabilities (e.g. [16], [17]). Using data derived from the first two stages and information from the external guidance, a staff development workshop was devised and delivered to Associate Lecturers responsible for facilitating a range of existing group-work activities across our STEM qualifications. This aimed to both provide support and advice to these Associate Lecturers and to 'reality-test' the findings of the work to date. The workshop was positively received by the participants and results are being used to refine the staff development materials. They will then be re-versioned and offered as a resource for staff at other HE institutions who are tasked with delivering group-work. A complementary set of student-facing materials are being developed to help students prepare for participation in inclusive group-work.

The next phase of this work package will be to use the ideas collected so far to examine the design of particular group-work activities, working with modules that are both under production and currently being delivered to students, to see how the design and/or delivery of these activities can be made more inclusive. These will be used as exemplars to illustrate how other institutions might go about the process of improving the design and delivery of their group-work activities.

A key aspect of this work package has been listening; seeking diverse voices and opinions on group-work from students, practitioners and literature. This active approach has enabled us to capture a rich cross-section of experiences and views and has begun the process of facilitating greater shared understanding between different stakeholders, a key step in supporting practitioners towards more inclusive design and delivery of group-work activities and more equitable learning environments for students.

4   ACCESSIBILITY POLICY

This work package focused on reviewing an activity that was already underway in our institution; the development of an institutional-wide accessibility policy. The policy was developed to underpin the University's commitment to accessibility in teaching and learning, providing a mechanism in which to formally communicate its importance to students and to staff. Although inclusivity has been the bedrock of the Open University since its inception and is embedded within its mission and values [18], a formal policy was deemed necessary to serve as an internal-facing strategic tool for planning, resource allocation and evaluation and an external-facing statement of intent to which the University could be held accountable.

The requirement for a formal policy stemmed directly from accessibility practitioners across the institution who were directly or indirectly interacting with students to meet their needs. With year-on-year increases in the numbers of students with disabilities accessing our curricula, these practitioners felt the institution needed to commit to a 'service standard' that encompassed all aspects of teaching and learning. These practitioners created a ground swell of support for a policy through their existing networks and lobbied institutional decision makers until agreement to develop a policy was approved.

Through this, the practitioners were given agency, workload, and project management support to form a working group to begin to draw up a policy outline. The policy was developed over a period of several months, during which time it gained momentum in the institution as consultation with further practitioners and units contributed to its development. Once finalised, the policy was approved by the University's Education Committee and was released to students.

A phenomenological approach was applied to explore the personal, institutional and political barriers and enablers faced by those involved in the process of developing the policy. In line with this methodology, it was decided that interviews, conducted by an independent researcher, would be the most appropriate way to gather data, since staff were more likely to freely talk about their personal views on institutional processes in a one-to-one setting. Staff who were indirectly or tangentially involved in the policy development, such as those involved in the approval process, were also interviewed.

This work package intends to identify and share lessons from a practitioner-led approach to creating an accessibility policy, which was formed through (and inclusive of) the lived experiences of the people involved. It is hoped that the resulting guidance resources can help inform other institutions that may wish to develop such policies. Few UK universities have such a policy; however, practitioner-led policy development offers a route to formally establishing an institutional commitment to address the differences in degree outcomes affecting students with disabilities.

5   DEGREE ACCREDITATION

This work package addresses a sector-wide inclusivity issue that also bridges the divide between universities and employers. In accrediting degree programmes, professional bodies require universities to ensure students develop key skills and competencies that are required by employers, to give students the best chance of seeking employment in their chosen discipline after graduation. However, some of the specific requirements of accreditation can be incompatible with alternative arrangements that may be needed by some disabled students. Such conflicts can lead to tensions between being able to meet the needs of students and meeting the requirements of professional bodies [19].

This work package involved a systematic analysis of the UK's Quality Assurance Agency's (QAA) subject benchmarking statements, through which degree programmes are quality assured, and the accreditation documentation from a selection of professional bodies across seven STEM disciplines. The purpose of the analysis was to: establish whether and how inclusivity is considered and identify the common skills and competencies that a STEM graduate is expected to demonstrate. The findings are now being used to collate examples of anticipatory adjustments and inclusive practices, which professional bodies and universities can draw upon to discuss accreditation requirements recognising the inclusion of students with disabilities.

Initial results indicate that several accreditation schemes are strongly underpinned by QAA subject benchmark statements, and yet the inclusivity content of those statements is limited and does not offer specific guidance on how to accommodate the needs of students when those needs conflict with required skills or competencies. Across the seven disciplines studied, the most common competencies identified that are likely to present challenges to students with disabilities were: group work, independent project work, use of scientific and mathematical notation, data skills (analysis, evaluation and presentation) and written communication skills. Since group-work is also the one competency identified across all subject benchmarking statements, our group-work work package is well placed to make an impact in this area.

6   CONCLUSIONS

The degree outcomes gap for students with disabilities is a persistent problem for which no single solution exists. Rather, the gap results from many factors and so needs to be tackled by addressing multiple causes at all levels within Higher Education.

This paper has given examples of the kinds of issues that may be present in an institution at different levels, from the institutional level (e.g. a lack of accessibility policy to drive change) down to how individual teaching activities are constructed and delivered (e.g. a lack of guidance on facilitating inclusive group work activities). This paper has also examined the way that practice within an institution is affected by the degree accreditation requirements of professional bodies and how a lack

of clarity in these requirements can be perceived by some university departments as a barrier to adopting a more inclusive approach and making anticipatory (or responsive) changes to improve the accessibility of their degree programmes.

From these few examples, it is clear that barriers to diversity in Higher Education can exist in many forms and at many levels. As a result of the diverse nature of these causes, a wide range of methodologies involving staff across the institution are needed to address them. This holistic institutional approach reflects the scale of the challenge, as well as the complexity of the solutions needed to reduce the differences in degree outcomes identified for students with disabilities. Although this work was undertaken in a STEM context, the approaches taken required engagement of multiple stakeholders across the institution and could therefore be applied beyond STEM.

This paper does not offer a solution but rather a call to action in Higher Education. The findings presented from this project are intended to help inform others concerned with addressing differences in degree outcomes in their own institutions. We argue that sharing practices and developing institutional standards is a necessary foundation to enable the Higher Education sector to create a more equitable learning environment for all students.

ACKNOWLEDGEMENTS

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