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Chapter 2

Inclusive Frameworks in Online STEM Teaching and Learning

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ABSTRACT

In recent years, many higher education providers have looked to audit the inclusivity of their learning and teaching through the use of an inclusive curriculum ‘framework,’ ‘charter,’ or ‘toolkit.’ The development and implementation of just such a ‘toolkit’ is one of a suite of measures the Open University is using to address issues around the degree awarding gaps which have been identified as priority areas in our access and participation strategy (APS). The ICT’s three principles are: 1) Is the material accessible to diverse groups of students; in terms of the language and images used)? 2) Will diverse groups of students see themselves reflected in the material? 3) Does the material equip students to participate in a global and diverse world? This chapter will share the learning from use of the ICT in STEM, its limitations as an auditing tool, the transformative effect on practice it has had on reviewers, and critical perspectives on the extent to which it enables or inhibits broader inclusivity approaches such as decolonisation.

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INTRODUCTION

In recent years, many UK Higher Education providers have been concerned with the evaluation and improvement of the inclusivity of teaching and learning. One popular approach to achieve this is via the use of an inclusive curriculum ‘framework’ (Kingston University, n.d.), ‘healthcheck’ (University College London, n.d.) or ‘toolkit’ (Manchester Metropolitan University, n.d.). This chapter will outline a case study in the Faculty of Science, Technology, Engineering and Mathematics (STEM) at the UK’s Open University: a pilot of the use of a bespoke framework – the ‘Inclusive Curriculum Tool’ – for auditing the inclusivity of online, distance learning and teaching materials.

We present our findings as a linear narrative, tracking the way in which our understanding of key concepts such as ‘inclusivity’ and ‘curriculum’ changed as the complexities of what we were trying to achieve became apparent to us. Through our example, we offer readers an instructive case study, focusing on the lessons learned from such an approach, which we hope will guide their own research, design and practice in inclusive online teaching and learning.

In particular, we highlight discipline-based considerations in STEM, and raise the fundamental question: ‘What does an inclusive STEM curriculum look like?’ In seeking to answer this question, we first present the common principal themes which emerged from the Inclusive Curriculum reviews. We then present a meta-evaluation of the review process by centering the voice of practitioners – the auditors who undertook reviews using the Inclusive Curriculum Tool. We present the practitioner voice collected via reflective journals and one-to-one interviews. We discuss critical perspectives on the extent to which the Inclusive Curriculum Tool, and, by extension, inclusivity frameworks in general, can achieve a truly inclusive curriculum. We conclude with some recommendations for practitioners looking to undertake inclusivity reviews using an inclusivity framework.

BACKGROUND

Defining ‘Curriculum’: Teaching and Learning in an Online and Distance Context

The Open University is Europe’s largest distance Higher Education provider, with over 50 years of experience in designing and delivering distance education. The structure of distance teaching and learning at The Open University differs from most other Higher Education providers. Students are provided online learning materials through a Virtual Learning Environment and, for some modules or to students with accessibility needs, in print materials. These learning materials are the primary source of student teaching and learning, effectively forming a ‘digital textbook’ (including multimedia audio-visual, interactive and assessment elements), subdivided into ‘study weeks’ of equal time-commitment. They are generated by ‘module teams’ consisting of academics, academic developers, learning designers and curriculum support staff.

Each student on a module is additionally supported by an Associate Lecturer (AL) who will offer personalized academic and pastoral support primarily by email and phone, facilitate synchronous group learning events and forum activities which support the written materials, and provide distance ‘correspondence’ teaching via extensive feedback on assignments.

Because of the primacy of produced module materials, the word ‘curriculum’ in The Open University context is frequently defined *prescriptively*, in the sense that it “[provides] us with what ‘ought’ to happen... more often than not [taking] the form of a plan, an intended program, or some kind of expert opinion about what needs to take place in the course of study” (Ellis, 2003, p.4). Curriculum is often identified – mostly or entirely – with the produced materials themselves and the processes surrounding creating new materials (‘module production’) or maintaining existing materials (‘module presentation’). In discussing ‘inclusive curriculum’, then, we make clear that this narrow, prescriptive definition of ‘curriculum’ is the one which was initially considered. The Inclusive Curriculum Tool focuses on identifying changes that could be made to written module materials, with little regard to the way in which it is delivered or supported by Associate Lecturers or other teaching practitioners.

It is also important to note that, in The Open University context, creating a new module, or adapting an existing one, incurs considerable costs, not least in staff time, and as such, modules are produced to last for a specific lifespan of several years, depending on the discipline. For example, a module in Computing might be expected to live for a relatively short lifespan of five years before its content becomes outdated, whereas a Mathematics module may have an expected lifespan of ten years or longer. It is important to bear in mind that, even where suggested improvements are identified by the Inclusive Curriculum Tool, the opportunities for implementing amendments to module materials can be limited, depending on where the audited module sits within its expected life cycle.

Though historically The Open University’s teaching and learning model has been somewhat *sui generis*, the wake of the Covid-19 pandemic has seen a rise in interest in distance and blended teaching and learning models. As other institutions develop and expand online and distance teaching and learning provision, we anticipate a greater convergence of pedagogical approaches, and offer our lessons learned as an instructive model for the pitfalls and opportunities of enhancing inclusivity in this context.

Defining ‘Inclusivity’: Institutional and Sector Influences

In any endeavor to enhance inclusivity, it is important to explore the factors which shape and define what ‘inclusive’ teaching and learning means. In this section, we reflect upon the institutional and sectoral influences which defined our (perhaps naïve) initial understanding of an *inclusive* curriculum.

The Open University was founded on the principle of ‘open entry’, removing the requirement for entry qualifications on our undergraduate programs. The principle of ‘inclusivity’ is fundamentally tied to The Open University’s mission to be “open to people, places, methods and ideas” (Open University, n.d.). One of The Open University’s stated values is to be ‘inclusive,’ with this characterized via a social justice mission: “We promote social justice through the development of knowledge and skills” (Open University, no date). Since its founding over fifty years ago, The Open University has sought to include students from structurally underrepresented and marginalized groups in Higher Education, most notably older learners, disabled students, careers, serving military personnel, and students in secure environments (e.g., prisons and secure hospitals).

More recently, and like many other Higher Education providers, however, The Open University has set a strategic priority in its Access and Participation Strategy (APS) to close awarding gaps for students in minoritized groups, with particular focus on ethnicity, disability and socioeconomic status. In this context, the University both has a relatively low proportion of international students, whilst the Virtual Learning Environment curriculum is not localized and is thus identical in all parts of the UK (and beyond). The Inclusive Curriculum Tool was developed by a range of stakeholders across the university as one of a

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suite of measures to address awarding gaps. The meaning of ‘inclusivity’ in the context of the Inclusive Curriculum Tool is thus influenced heavily by the institutional priority of closing awarding gaps.

A further exploration of the definition of ‘inclusivity’ can be seen through the Inclusive Curriculum Tool’s three principles, which are articulated through the following questions:

1. Is the material accessible to diverse groups of students (not just in terms of accessibility for disabled students; in terms of the language and images used)?
2. Will diverse groups of students see themselves reflected in the material?
3. Does the material equip students to participate in a global and diverse world?

For the Inclusive Curriculum Tool, then, the concept of ‘inclusivity’ is explicitly conceptualized via the principles of accessibility, diverse representation, and internationalization (Atkin et al., 2015), with particular emphasis on disabled students and students from minoritized ethnicities.

By comparison, other providers have explicitly tied their frameworks to other specific sector-wide critical approaches such as Anti-Racist Curriculum (Anti-Racist Curriculum Project Working Group, 2021), mental wellbeing in the curriculum (Hughes & Spanner, 2019), and decolonizing the curriculum (SOAS, n.d.; De Montfort University, n.d.). The Inclusive Curriculum Tool does not mention these approaches explicitly – but the influence of these approaches is clear in the language of the Inclusive Curriculum Tool itself. Later we will question the extent to which the definition of ‘inclusivity’ that the Inclusive Curriculum Tool offers is sufficient in achieving a truly equitable experience for all students.

The Inclusive Curriculum Tool and Review Process

The Inclusive Curriculum Tool consists of a series of prompts, which ask questions pertaining to inclusivity. These prompts were developed by a large team of practitioners and stakeholders from across the University, influenced by the Inclusive Curriculum principles. The Tool has undergone iterative modifications and enhancements based on feedback from end users and recipients of feedback. Table 1 below gives a comprehensive list of the 22 prompts in the version (version 4) of the Inclusive Curriculum Tool used in this initial pilot.

Prompts are categorized into thematic groups – Epistemologies, Pedagogies, and Language, Culture and Communication – within a spreadsheet format. Version 4 was also accompanied by a reading list to guide reviewers. Interestingly, many of these readings centered around the approach of decolonizing the curriculum (see Bhambra, Gebrial and Nişancıoğlu, 2018), to which we will return in the discussion section.

An Inclusive Curriculum review consists of a practitioner trained in the principles of Equity, Diversity and Inclusion (EDI) scrutinizing learning materials, guided by prompts in the Inclusive Curriculum Tool. Users of the Tool record their findings within the spreadsheet against the prompts, with the reviewer detailing any issues or queries identified in either the spreadsheet or in a document format. The Tool encourages users to record instances of good inclusive practice and identify issues or queries. These findings are then collated into a single report for the module team. The reviewer also presents an overview of their findings in an online meeting with the module team, who then use the feedback to inform curriculum development and implement required change where possible, but subject to the module life cycle challenges mentioned above.

Table 1. The prompts from version 4 of the inclusive curriculum tool

0	How is the whole module team ensuring inclusivity as part of the learner journey (student experience)?
	Epistemologies
1	Identify any assumptions about a shared lived experience of students.
2	Is there material from different UK contexts where appropriate?
3	Is there material from outside of the UK, USA and Europe where applicable?
4	How is a diversity of views expressed in the material, and are there any limitations of particular viewpoints acknowledged?
5	How do activities and the material create respect and an appreciation of the value of difference?
6	Are external readings and references by diverse authors? If not, could they be? Is the positionality of these authors examined where appropriate?
	Pedagogies
7	How does the material give the opportunity to draw on personal lived experiences of students?
8	Does the material reflect diversity rather than reinforcing stereotypes?
9	How do the activities and materials give the opportunity to recognise and learn from different parts of the world?
10	How do the activities and materials allow students to use their own experiences and to share ideas and experiences to enrich the understanding of other students?
11	Which activities or materials make students aware of how their experience and viewpoints are shaped by their cultural, historical, geographical, economic, religious and other contexts?
12	In what ways are students' skills developed to critically examine/challenge the activities and materials? If not, how could they be?
13	Is there a range of assessments that are accessible, non-discriminatory and timely?
14	To what extent are there opportunities for learners to critically engage as partners with the assessment (process, content, approaches, etc.)?
15	Are there opportunities to critically engage with equality and diversity themes in assessment that relate to learners' lived experiences?
16	Do activities and assignments enable students to demonstrate their understanding in different ways (written, spoken, visualisations, etc.).
	Language, Culture and Communication
17	Is language that refers to people respectful and appropriate?
18	Is there any use of idiom, exclusive cultural reference or colloquialism?
19	Is the use of English language simple, transparent and accessible and appropriate to the level of study?
20	Is the teaching voice inclusive of genders, ethnicities, (dis-)abilities, educational backgrounds and socio-economic statuses?
21	Is imagery and multimedia content used representative of diverse cultural, historical, geographical, economic, religious and other contexts?

Inclusive Curriculum in STEM Disciplines

When we were first presented with the Inclusive Curriculum Tool, a key motivation for us was to answer the question: ‘What does an inclusive *STEM* curriculum look like?’ Whilst we could see the application of the Inclusive Curriculum Tool to disciplines in the social sciences or the humanities, we were initially curious but skeptical that the tool would unearth many inclusivity issues relevant to STEM teaching and learning. Over the course of this project, our thinking has developed considerably, and we will return to the question of what an inclusive STEM curriculum looks like in the conclusion to this chapter.

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In the Faculty of STEM, we recruited a team of fifteen Associate Lecturers from across the faculty to pilot the use of the Inclusive Curriculum Tool on fourteen STEM modules. In this initial pilot phase, we expressed a particular interest in hiring Associate Lecturers from a diverse range of lived experiences with an interest and enthusiasm for Equity, Diversity and Inclusion (EDI). Recruiting Associate Lecturers with a range of disciplinary expertise was of secondary importance to us, and, as it turned out, the Associate Lecturers who expressed interest happened to represent a diversity of lived experiences and disciplinary areas.

The aims of this pilot were:

- To evaluate the Inclusive Curriculum Tool's effectiveness in auditing the inclusivity of STEM modules, and feed back to the Inclusive Curriculum team on improvements that could be made to the tool itself;
- To identify good practice and potential inclusivity issues in STEM modules to feed back to module teams;
- To train, develop and build a community of Associate Lecturers in Equity, Diversity and Inclusion (EDI) issues, and to evaluate the effect of using the Inclusive Curriculum Tool on ALs' teaching practice.

Associate Lecturer reviewers underwent intensive training in EDI issues in teaching and learning, facilitated by external providers. Additionally, they met with the project team in four workshops, spaced evenly throughout the six months of the project, where they shared their experiences of the training and how they applied the Inclusive Curriculum Tool. We asked them to keep reflective journals of their experiences, alongside their completed Inclusive Curriculum Tool spreadsheets. At the end of the process, Associate Lecturers met with the module team of the module they had been reviewing and presented a summary of their findings within a synchronous online meeting. They also handed over to module teams their detailed completed Inclusive Curriculum Tool spreadsheets as a written record of the issues they had identified. Subsequently a number of the reviewers agreed to be interviewed.

RESULTS FROM REVIEWS

This section will report the common issues and themes identified in the fourteen STEM modules reviewed by Associate Lecturer reviewers. We also detail some gaps reported in module reviews but not covered by the Inclusive Curriculum Tool.

Language

Given the Inclusive Curriculum Tool's explicit focus on 'Language, Culture and Communication', with five prompts dedicated to identifying such issues, it is unsurprising that the Inclusive Curriculum reviews picked up some issues related to inclusive language.

In particular, the use of colloquial language was identified as particularly problematic, despite the best of intentions. Colloquialisms are often employed by academic authors with the intention of making learning seem more engaging, more embedded in 'real-life contexts', or friendlier in order to allay anxieties surrounding the isolation of distance learning. The latter is particularly important in the con-

Figure 1. Summary of common themes identified in inclusive curriculum reviews

Language	Colloquialisms, cultural bias, pronouns
History	Western perspectives, problematic figures
Images	Representation, story behind the image
Case Studies & Data Sets	Western bias, disaster narratives, stereotyping

text of entry-level modules, where students may have little or no study experience in Higher Education, and/or may have several years' gap since their last experience of formal education. However, colloquial language can work against inclusivity if there are cultural assumptions of familiarity behind particular proverbial or metaphorical uses of language.

Another point worth noting when it comes to inclusive language is the gender of pronouns when used to refer to a hypothetical or unspecified person. It is common in STEM disciplines to imagine hypothetical students or scientists in the context of word problems and thought experiments. Up until around fifty years ago, such hypothetical people would have always been referred to using 'he/him/his' pronouns, but the assumption of the male gender has rightly been challenged in more recent times. Historical efforts to redress the balance have tended to center on either an increased use of 'she/her' pronouns, or to use 'he or she'-style constructions, both of which dominate in module materials. However, with an increased visibility and awareness of non-binary people, the use of the singular 'they/them/their' pronoun has seen increased popularity over the past ten years. This usage, however, has not been consistently applied to module materials, and the lack of any such references to non-binary people was identified by some reviewers.

History

The way the history of STEM disciplines was presented was one of the most prominent themes to emerge from the reviews. In many modules, especially in subjects whose content is primarily theoretical in nature, the primary learning material is supplemented by historical asides, highlighting key figures in the historical development of the discipline. Reviewers recorded a number of issues with the way in which such historical information was presented.

Firstly, it was noted that the history of STEM disciplines was often presented as an exclusively Western narrative, with the achievements and perspectives of individuals and cultures from the Global South marginalized or ignored. Reviewers were acutely conscious of the fact that many STEM disciplines developed significantly in the context of historical Western dominance over the past 200 years,

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and so it was unsurprising that the history of the discipline was situated predominantly in Europe and North America. However, when presented without the global historical context which explained Western dominance, the result for the learner was a story of STEM disciplines as an exclusive inheritance of Western culture and values.

Where individual historical figures were profiled in module materials, reviewers identified that these individuals were primarily from a Western canon, and therefore the sample drawn consisted overwhelmingly of white men from Europe and North America. One reviewer noted her module's complete absence of 'real women'. Hypothetical women were represented in word problems and illustrative cartoons, but there was no mention of actual, real practitioners past or present in the field. Additionally, it was recognized that there were several historical figures whose contributions to the development of STEM subjects was celebrated in learning materials, but without mention of the individual's links with more problematic episodes in the history of STEM disciplines – most egregiously, the eugenics movement which actively promoted racism under the guise of scientific objectivism.

Images

The images used to support learning in the module materials were also a common topic of discussion in Inclusive Curriculum reviews. These range from photos of real places and people, to cartoons, to diagrams, charts and graphs. Unsurprisingly, little comment was made around the latter category, except in highlighting generally good practice and small issues in accessibility, especially regarding figure descriptions.

Representation of diverse people and cultures, however, was noted as limited in several modules, with one reviewer particularly calling out the lack of representation of people with visible disabilities and diverse skin tones, even in cartoon representations. Prompt 21 in the Inclusive Curriculum Tool explicitly asks reviewers to comment on the diversity of representation in imagery, so it is unsurprising that this was a common issue highlighted in reviews.

However, several reviewers also commented that diversity of representation was not sufficient to create a sense of inclusivity, and that the implicit narrative behind the image also mattered. Concerns were raised about images in which marginalized people were seen to be portrayed in ways that would reinforce stereotypes, or in ways which were seen to be submissive or subservient to another individual.

CASE STUDIES AND DATA SETS

In STEM disciplines, use is frequently made of real-life case studies and/or using real data sets to illustrate and contextualize learning. Similarly, to the comments on images, reviewers frequently picked up a lack of diversity in the context of case studies and data sets. Many came from British contexts, reflecting the authors' cultural backgrounds. Even amongst examples selected from the United Kingdom, reviewers identified a bias towards examples taken from the south of England, prompted by Prompt 2's explicit focus on the diversity of local and national contexts within the United Kingdom. These covered a wide variety of interpretations, from geographical and cultural considerations of the 'four nations' which make up the United Kingdom and OU (Scotland, Wales, England and Northern Ireland/Ireland), to socioeconomic cultural considerations that suggested a bourgeois bias in the familiarity with specific cultural artefacts and references.

In reviewers' reflections and in discussion with module teams, difficulties were expressed around the availability and familiarity with case studies and data sets from a more global outlook, especially where language barriers existed, and where open public access to reliable data sets was limited. Nevertheless, Prompt 3 in the Inclusive Curriculum Tool was influential in practitioners' thinking on how much a STEM curriculum can (or should) have a local or global outlook.

However, in similar terms to the comment above about images, it was also noted that having diverse case studies and data sets was not in itself sufficient to ensure inclusivity. Where case studies and data sets *were* drawn from the Global South, reviewers expressed concerns that these had the potential to reinforce negative stereotypes, as these often focused on ecological disasters or negative health outcomes. Reviewers called for a more critical lens to be applied to the use of case studies, to avoid stereotyping and to present more positive views of global diversity.

Other Issues: Assessment and Pedagogy

The Inclusive Curriculum Tool has several prompts relating to assessment, and Associate Lecturers reported some issues relating to STEM. It was frequently highlighted that, where a module did contain more inclusive content, this was often not part of the examinable material. In addition, many reviewers noted a lack of opportunity in peer learning activities for students to learn from one another's diverse lived experiences. Both observations suggest a view of STEM teaching and learning as one which centers the positivist aspects of STEM disciplines, with less value and relevance attached to individual and cultural lived experience as being a fundamental part of disciplines. We will return to this in the discussion section.

The Practitioner Voice

So far, we have considered only the results of the reviews as per the Inclusive Curriculum Tool's intended purpose. As mentioned above, the Inclusive Curriculum Tool was designed to identify inclusivity issues in published module materials, with an understanding of 'curriculum' identified with the processes surrounding production and presentation of these fixed learning artefacts. What had not been in scope for an Inclusive Curriculum review was a review of Associate Lecturer practice, particularly the interactions between AL and student in tutorials and one-to-one tutor-student contact.

This section reports the unintended outcome of using Associate Lecturers to conduct the Inclusive Curriculum reviews. We recruited Associate Lecturers as reviewers primarily because of their familiarity and expertise with module materials. We did not anticipate that the review process would have a transformative effect on the reviewers' own practice in teaching and learning.

A representative sample of 10 of our 15 Associate Lecturer reviewers volunteered for subsequent semi-structured interviews. Using these practitioners' voices from interviews and through their reflective diaries, we share insights, considerations and recommendations for the Inclusive Curriculum Tool and inclusivity frameworks in general.

Power, Positionality, and Hierarchy

Higher Education has strict hierarchies of power in learning and teaching that practitioners are unconsciously unaware of. This can impact our way of being and the confidence we have in trying to effect

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change in the inclusivity space. While undertaking the role of auditing modules described within this chapter, Associate Lecturers felt they were in a submissive role and struggled with concerns including the usefulness of their approach, confidence in presenting their findings to the module and leadership teams and how they would be ‘received.’ Most Associate Lecturers were happy to share their findings for a variety of reasons, including intrinsic reward, but themes of power came through many of the shared reflections.

- “I was constantly wondering if I was doing the right thing...”
- “I was extremely nervous as I wanted the comments and feedback to be received in the spirit in which they were intended.”
- “How will they take it?”

This highlights that power relations can act as a barrier to self-efficacy. We can use the theoretical framework of Bourdieu & Lacquant (1992) and the conceptual tools of habitus, capital and field (see Grenfell, 2008) to consider inequalities of power. The structures of dispositions through which someone perceives and acts is called ‘habitus’ and these are acquired following positions that person has lived through. Likewise, their (cultural and social) ‘capital’ have value in a particular social ‘field’, such as the academy.

Here, Associate Lecturers were generating knowledge to share with others in a perceived higher position to them, to use if they felt so inclined. Power is not just what someone perceives themselves to have, but how others perceive that person and their position. Associate Lecturers are particularly aware of asymmetrical power relations within the institution. Being an Associate Lecturer is different to being an academic at other Higher Educational Institutions where contribution to, and development of, curriculum content and assessment are the norm. In contrast, the Associate Lecturer’s role is to be a facilitator of learning materials developed by more authoritative others.

The nature of these hierarchical practices drove concerns from our reviewers, early in the process, around whether their findings would be actioned. A key anxiety was how to ensure that the Associate Lecturer and therefore, by extension, their recommendations, would be taken seriously.

- “[I will] hopefully meet with the module team but I don’t hold out much hope as the module chair does not seem very receptive to change, as well as the fact the module is on teach out [i.e. it is nearing the end of its life cycle and will be replaced by a new module soon].”
- “I do fear going into module teams as I am just perceived as an ‘AL’ ... I might need to qualify my background by stating that I have worked in HE for almost 30 years...”
- “Will the module team know who did the review?”

Internalized ideas of power can lead to a feeling of being in a position of vulnerability and lacking in power within the perceived hierarchy could become a barrier to knowledge sharing. Bourdieu & Lacquant (1992) describe a paralysis resulting from a sense of futility because of these constructions of power.

- “I feel petrified about talking to module teams”
- “How receptive will they be to my comments and observations?”

These comments show that Associate Lecturers would have liked to become an integral part of the process and to see the changes they recommended implemented. However, the main means of disseminating their findings was through verbal communication and ALs expressed feeling nervous about finding the right words.

- “[I am] still feeling nervous but feeling slightly more confident after having put together my slides for the presentation to the module team. I’ve been concerned the whole time about doing it ‘wrong’.”

The challenge then is to avoid power and focus on developing a mutual relationship that is collaborative. This gives legitimacy to those who feel they have less power to make change. Identifying common interests that exist amongst Associate Lecturers and the module teams helped to deconstruct hierarchies so that everyone was working towards a shared goal through a process of collaborative learning. Associate Lecturers fed back that this approach supported positive dialogue with module teams and gave them agency to express their ideas and recommendations in a safe space with time to discuss and reflect.

- “I did well in highlighting considerations rather than things that must be changed... [and I] acknowledged the difficulties they have with changing module materials, and especially when working with many team members who all have different approaches”.
- “I viewed it as an opportunity to reimagine my role with others”

Success, then, was determined by the work of each individual supporting and facilitating the work of the other members within that group, with everyone working towards a mutual goal. This process builds on the theory of network organizations where work conducted by one member is recognized as a positive development by another member, who may then be able to use it and expand on it in their own work. This in turn may help others to make further developments, leading to a cumulative development which produces an outcome much greater than possible if a problem or task was tackled only by isolated individuals.

Furthermore, this approach allowed ALs to have confidence in the differences in their experience using the Inclusive Curriculum Tool and for the module teams to recognize and take ownership of the recommendations being made.

- “[The module team] really seemed interested in what I had to say.”
- “They seemed to value the points that I was making and be very grateful for them. I was really pleased with how well it went.”

Experience, Training, and Constructing Knowledge

The level of knowledge and training in the issues surrounding Equality, Diversity and Inclusion was another major factor that affected reviewers’ self-efficacy, suggesting that the Inclusive Curriculum Tool may only be as good as knowledge, experience and confidence of the person who is using it. Poor confidence acted as a barrier to Associate Lecturers’ belief in their own capabilities to execute the task.

- “I have no background in EDI [Equality, Diversity and Inclusion] so how will my voice be valid?”

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- “I was constantly sort of thinking ‘Well, what do *I* know about this?’”
- “I applied to do it because I was interested in it, not because I had any expertise in it.”

The reflections of Associate Lecturers highlighted the necessity of a social constructivist approach to ‘learning’ their roles as reviewers. Social constructivism predominantly focuses on lived experience and interpretations of meaning (Schwandt, 1994), and this was underscored by Associate Lecturers. There was a keen sense of responsibility and a recognition that, through this process, reviewers become knowledge creators. Even though our sample of Associate Lecturers was far more diverse in terms of lived experience than the Faculty’s Associate Lecturer population, concerns were raised that existing knowledge may not be enough and questions were frequently raised around how this experience, the process and the outputs could be impacted by personal and lived experience.

- “Situated knowledge, is a factor definitely”
- “...lack of confidence in knowing whether, what I was doing was right or useful, because of feeling like my lived experience was quite sheltered.”
- “I think it is difficult because the Inclusive Curriculum is not just in terms of having professional experience, but it’s also having awareness and willingness to explore the topics that are coming with it”.

Associate Lecturers felt that the Equality, Diversity and Inclusion training provided was vital in supporting the process. This involved active learning, a process that required the undertaking of meaningful activities and group discussions. This further suggested a social constructivist approach to ‘learning to become a reviewer’, with learning being conceived of as an active process of constructing knowledge to make sense of the world (Adams, 2003). At times, the activities and discussions were identified as challenging but as reviewers felt increasingly empowered, they were better able to share their thoughts more openly and deeply and to think about the developing self throughout the process.

- “Once I’d done the training, I had a very different perspective.”
- “Having the training encouraged me to reflect on the perspectives of other groups of people.”

Interaction with other reviewers and project team members was also identified as a crucial factor supporting self-efficacy. The Inclusive Curriculum Tool was felt to work better when used as part of a team that can provide feedback to close the loop. Practitioners with experience of social constructivist approaches to teaching and learning will not be surprised by this observation and will recognize the benefits of an approach which allows a group of learners to work on their own task and then report back to the whole class to enhance the learning experiences of others within that group.

- “If somebody could have said ‘yes, what you’re doing is useful’, it just would have given me a bit more confidence.”
- “What I would really like to see is a systematic exchange of findings between all of us ALs who have carefully audited a module which we are teaching and who have also undergone all of the training.”

Reflections on the Inclusive Curriculum Tool

In addition to the concerns discussed so far, reflections on the tool itself highlight the danger of trying to do too much with a single tool or framework and raise questions of whether one size can really fit all. A key concern was that the Inclusive Curriculum Tool contained too many prompts, and this would lead to divergent approaches in using the tool. Relatedly, Associate Lecturers argued that each reviewer is likely to view the material preferentially through a particular theoretical lens, influenced by their own lived and professional experience. On the one hand, the process has been transformative for those involved and broadened their understanding:

- “It has made me look at my practice through a range of different lenses.”

On the other hand, however, the perspective of one person was highlighted as being unlikely to result in a review which is equal and equitable across all lenses and theoretical approaches that the Inclusive Curriculum Tool seeks to achieve.

- “[I] constantly wondered, ‘Who am I to make these judgments with not being [in] a minority?’”
- “I am very conscious of the lens that I see things through that of a middle-aged white woman!”
- “I’ve always been very, very interested in issues regarding discrimination, whatever that is. And over the last few years this has been very much around issues around race. But my PhD itself is around gender. I don’t have all the answers. I don’t think anybody has.”

In considering the necessity for plurality of reviewer voices, Associate Lecturers strongly felt that, while the spreadsheet is simple enough for anyone to use, its usefulness and purpose must not be weakened by becoming a ‘tick-box exercise’ which is only performed once and by a single user with a single perspective. Rather, it needs to become a regular and embedded process.

- “I don’t want this tool to be seen as an add-on. It should be a core part of the learning design process and become the backbone of any curriculum design process.”

Implicit within this observation is a fundamental challenge to whether the Inclusive Curriculum Tool is broad enough in its scope to address all aspects of the curriculum, while being concise enough to not be overwhelming and unwieldy for a single user.

- “Because it’s got so many sections, it allows it to be thoroughly analysed. But... [The Inclusive Curriculum Tool’s] weaknesses are that breaking stuff into individual parts is sometimes not relevant... I found myself putting stuff in one box and then finding it repeated in another and just thinking, ‘hang on, this is all related?’”
- “As an auditor, you’re taking a micro-approach to it... It doesn’t lend itself to significant structural changes for learning design or content, because [of] the way that you’re not looking at the overall picture. You’re looking at the tiny little individual elements.”

Nevertheless, the tool was identified for its value in stimulating personal reflection on inclusivity issues more broadly, suggesting that the tool may function as a catalyst for change rather than a reagent itself.

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- “I think that the tool is important because it starts asking questions about what else needs to be changed for, actually, the tool to be effective.”

Transformative Effects on Practice

The most prominent – and unanticipated – theme to emerge from the reflections and interviews was the transformative effect the process of training, discussions, use of the tool and reflections has had on the practice of the Associate Lecturers. Despite the original intention of the tool being to make changes to module materials, it emerged that the greatest changes occurred within the perceptions and practices of the Associate Lecturer reviewers.

- “The whole process has really made me reflect as an academic and as a facilitator of learning.”

Associate Lecturers emphasized how their reflective and reflexive skills were enhanced with respect to inclusive pedagogies, leading to an impact on practice.

- “[It] definitely made me reflect on my own practice.”
- “It has made me think about my own pedagogy.”
- “It has made me think about the language I use when I am giving feedback.”

An enhanced awareness of the lived experiences of other people and the impact (positive or negative) we can have as educators were also highlighted.

- “I now give consideration of different perspectives or viewpoints.”
- “...Internally, I certainly feel a lot better equipped to support students. Because I feel like I’ve got more understanding of how they may see module materials. Whereas before I just sort of thought, ‘well, it’s in the material’.”
- “It’s encouraged me to just really question any assumptions that I’m making and sort of be conscious about... assumptions.”

Recommendations for Future Inclusive Curriculum Reviews

Associate Lecturers made a variety of practical recommendations for the future use of the tool to audit modules. Many expressed the need for a meeting with the module team in advance of conducting a review to be able to set out the expectations from all parties on what the review will entail. This may also help in navigating power inequalities and set the tone for efficient information exchange, a key driver in enabling effective change to be made.

- “When I was doing it, completely isolated from [the module team], I wasn’t sure.”
- “You don’t know how personal [the module team] felt about the information [in the module materials], what they were willing to change, who wrote it, you know. But... I did meet them. And it revealed... I thought it was a much lighter meeting. And I felt, if that had been at the beginning, it might have changed how I worked through it.”

Additionally, Associate Lecturers expressed a need to know from the beginning of the process whether the module team were going to follow up on agreed actions. They were keen to close the feedback loop and participate in a truly collaborative change.

- “You really need to know before you start...what [the module team is] gonna do with the outputs.”

DISCUSSION

Having given an overview of the Inclusive Curriculum Tool, the common themes it raises in the review process, and the effect on practitioners who use it, we now turn to a critical discussion of the themes which emerge from using the Inclusive Curriculum Tool, and gaps which an inclusivity framework approach may risk missing.

Microexclusions

At its most basic level of usage, the Inclusive Curriculum Tool allows potentially harmful content to be identified – for example, discriminatory content, outdated/offensive language, or harmful stereotypes. We were relieved to discover only a small number of such issues. Instead, many of the Inclusive Curriculum reviews centered around the identification of what we term ‘microexclusions’. These are small absences of diversity which, in isolation, are negligible in their effect on inclusivity, but in aggregate can cause significant exclusionary barriers for our students. To return to some examples stated above, use of the tool allowed reviewers to notice that, in one module, there was not a single real woman mentioned in the discipline’s history, in another, that there were no representations of people with visible disabilities, and in many of the older modules, the language did not acknowledge the existence of non-binary people using they/them/their pronouns.

Notwithstanding the very real effect of microexclusions, questions remain on whether addressing these minor inclusivity issues is sufficient in bringing about a truly inclusive curriculum, and whether the Inclusive Curriculum Tool allows for the identification of knottier inclusivity issues. From our research, it seems that, rather than promoting root-and-branch structural and pedagogical challenges, the Inclusive Curriculum Tool is particularly adept at identifying minor changes to module materials.

Omissions in the Inclusive Curriculum Tool

In their reflections, reviews and interviews, Associate Lecturers and academics from module teams commented on issues for which the Inclusive Curriculum Tool provided limited or insufficient guidance. Firstly, many academics expressed the desire to address inclusivity issues in production, i.e. during the process of the module being written and before it goes live to students. The structure of the Inclusive Curriculum Tool suggests a usage which critiques and reflects on *extant* curriculum, rather than curriculum in development. As such it can be seen as a ‘rapid response’ tool to existing curriculum, but less useful if there is nothing yet to critique. Due to this feedback, the team responsible for the Inclusive Curriculum Tool is currently modifying it so it may be used effectively in module production.

Associate Lecturers also highlighted how pivotal the initial stages of any module are in developing a sense of belonging for all students. The Inclusive Curriculum Tool sees the module synchronically,

rather than diachronically over the eight months of a module's presentation. If, for example, the module contains inclusive content, but that content appears only in the latter stages of the module's presentation, then it is too late for some students who may have already decided the subject is not for them. A greater focus on the initial stages of a module is called for, where students can quickly see themselves and their lived experience represented in the learning materials. Developing a sense of belonging seems likely to go beyond the scope of the Inclusive Curriculum Tool's focus on module materials, and requires a more holistic view of teaching, learning and student support.

The Inclusive Curriculum Tool was developed primarily to address awarding gaps, as laid out by the University's Access and Participation Plan. However, despite awarding gaps being intricately connected with assessment, the Inclusive Curriculum Tool centers 'curriculum' rather than 'assessment' as the main object of inquiry. This means that some crucial aspects of the student experience are omitted in the review process; most notably there is no mention of whether marking guidance for Associate Lecturers encourages inclusive practice in feedback to students. Indeed, this further raises the question of whether a review of the instrument of assessment itself in isolation is sufficient to capture the complexity of the entire assessment and feedback cycle and suggests a more holistic view may be necessary to ensure inclusive assessment and feedback practices.

What Is 'Curriculum' Anyway?

At the outset of this project, we believed we had a good understanding of what was meant by 'curriculum' in the Open University context. However, as mentioned above, an unexpected benefit emerged from the Inclusive Curriculum review process, namely the transformative effect on the teaching practice of the Associate Lecturer reviewers. This was pivotal in changing our understanding of what needs to be considered when reviewing 'the curriculum' for inclusivity. A more holistic definition of 'curriculum' is needed – one which goes beyond a consideration of materials alone – to capture and address the complexities of inclusivity in teaching and learning. In particular, the interactions of the student with practitioners and with other learners are integral to an inclusive curriculum.

Our experience with our Associate Lecturers shows that key to ensuring an inclusive curriculum is intensive staff development in inclusivity for practitioners, ensuring they are given space to reflect and engage with one another. It is not just the materials that we provide that need to be audited and reconfigured, but those delivering and facilitating learning must also undergo positive change to be able to deliver a more inclusive experience for all.

For one of the main authors of this chapter, also one of the Associate Lecturer reviewers, the main reflection from the process was taking the learning from Inclusive Curriculum reviewing into everyday practice. She finds that she is more open to learning and considering her positionality with every interaction that she has with students. This has meant that she now recognizes that we all have different starting points and lenses through which we evaluate and consider information. This in turn impacts the way we interact with and use tools like the Inclusive Curriculum Tool and leads her to conclude that a series of in-depth training and reflection is needed before anyone attempts to implement an approach/framework such as the one described here.

What Is ‘Inclusivity’ Anyway?

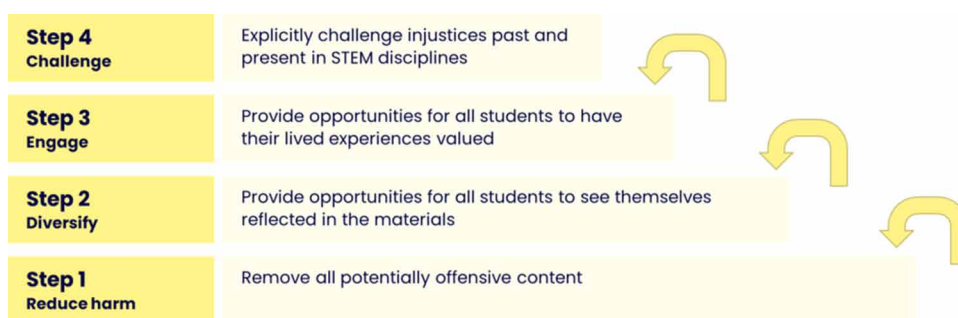
Our experiences with the Inclusive Curriculum Tool have led us to critically evaluate our understanding of ‘inclusivity’. As set out above, the Inclusive Curriculum Tool principles embed a theory of inclusivity which explicitly centers accessibility, diverse representation and internationalization. However, the prompts themselves show embedded influences of other theoretical approaches to inclusivity – for example, student-as-partners approaches to assessment, diversification and critical pedagogies – whilst the reading list that accompanied the tool centered decolonization as its central approach. One of our main criticisms of the Inclusive Curriculum Tool is that it tries to operationalize too many theories all at once. This leads to a situation where different reviewers select and emphasize different approaches depending on their confidence, professional background and lived experience.

For better or worse, the Inclusive Curriculum Tool has revealed multiple overlapping inclusivity goals. From the experiences of our reviewers, we identified at least four different potential purposes of the Inclusive Curriculum Tool, which appeared to indicate a stepwise approach towards greater inclusivity (Fig 2). The level attained by the review depends on the stage of the reviewer’s journey towards greater understanding of inclusivity issues.

A superficial review might identify any potentially offensive content and go no further, whereas a reviewer trained in a diversification approach to inclusivity might also identify opportunities in language, history, images, case studies and data sets for diversification. Most of the reviews undertaken using the Inclusive Curriculum Tool reached this understanding of inclusivity, showing perhaps that this is where it finds the limits of its effectiveness as a tool.

Although the Inclusive Curriculum Tool included prompts which ask reviewers to consider critical pedagogies which encourage students to engage with teaching, learning and assessment to explicitly value lived experience, few of our reviewers suggested ways in which this could be engendered in module materials. The reasons are unclear but could relate to the attempt to operationalize multiple theories at once, or practitioner anxieties about challenging hierarchical structures on a deeper-than-surface level. One further probable reason is that reviewers were not convinced that these approaches to inclusive pedagogy were of as much relevance to STEM disciplines as to other disciplines. Certainly, few reviews undertaken reached the level of calling for explicitly challenging injustices past and present in STEM disciplines, which suggests that, despite the reading list which accompanies it, the Inclusive Curriculum Tool does not facilitate decolonizing or other forms of critical theory.

Figure 2. A stepwise approach to greater inclusivity



Transformative Effects on Practitioners

As a tool for building a more inclusive curriculum then, the Inclusive Curriculum Tool has limitations, at least in so far as the impact on online learning materials, before versus after a review. However, as noted above, use of the Inclusive Curriculum Tool did seem to have an unintended consequence, namely a transformative effect on the practice of the practitioners who used it. Many of our Associate Lecturers reported that the Inclusive Curriculum Tool gave them a sense of legitimacy in challenging both the assumptions that they had made as discipline experts and teaching practitioners, and the structures of authority in which they work. Having the Inclusive Curriculum Tool as a framework, sanctioned by the University, gave them the confidence to give challenging feedback to module teams that they would not have felt able to do before.

Associate Lecturers reported that using the Inclusive Curriculum Tool, and, crucially, being given the space to discuss inclusivity issues with their peers and leaders, broadened their own perspectives, leading to an impact on their own teaching practice. The further that practitioners increased in their confidence and understanding of the structural issues at play, the further their thinking progressed ‘up the staircase’ in Fig 2, and the greater they realized the extent to which dismantling the existing system was required. However, as noted above, neither the Inclusive Curriculum Tool itself nor the institutional review process facilitated the structural change that many felt was necessary, leading to some frustration on the part of both Associate Lecturers and academics on module teams.

Operational Considerations

As we have seen, the use of the Inclusive Curriculum Tool raises complex theoretical questions about the meaning of inclusivity and curriculum, but nevertheless has yielded positive effects in the identification of ‘microexclusions’ and in transforming the practice of reviewers. We conclude the results section with some comments on operational issues.

As mentioned above, the process of production and presentation of modules in The Open University is complex and stretches over several years of planning and development. Opportunities to make significant changes to module materials are limited and depend upon where the module sits in its life cycle. Many module teams were grateful to receive the feedback from reviewers but were frustrated by the inability to implement changes for several years. This suggests that, as part of the process, module teams should be encouraged to create action plans which will set out in greater clarity what changes will be made, when, and by whom.

On the question of ‘by whom’, it is also worth remarking on who should conduct reviews themselves. The project we are reporting on used only Associate Lecturers as reviewers, but other parts of the university have also used student reviewers, and reviewers working in teams to produce a richer diversity of viewpoints. Additionally, whilst auditors with lived experiences of marginalization are more likely to unveil richer dialogues from a review, it is important to acknowledge the emotional labor of inclusivity work in teaching and learning. It is emphatically not the sole responsibility of minoritized people to fix curriculum for inclusivity, and, on the other hand, it bears pointing out the obvious fact that belonging to a minoritized group does not automatically produce a comprehensive review. Either way, it is important to further highlight the essential role of intensive training in inclusivity issues in teaching and learning for potential reviewers.

FURTHER PHASES OF THE INCLUSIVE CURRICULUM PROJECT

Based partly on feedback from this first phase, the Inclusive Curriculum Tool has undergone iterative improvements. In this section, we report briefly on changes implemented to the Inclusive Curriculum Tool and the approach to Inclusive Curriculum reviews.

The Inclusive Curriculum Tool Version 5

Figure 3 shows a summary of the prompts in the latest version of the Inclusive Curriculum Tool, version 5. Following reviewer feedback on the difficulty of memorizing prompts, this summary ‘poster’ was developed as an aide-memoire to be displayed on the wall next to the reviewer’s workstation. The tool itself can still be found in the format of a spreadsheet, with an alternative format of a Word document also available.

Despite feedback that the previous version was too overwhelming, the number of prompts has been increased to 24, and reoriented around the themes of ‘Context’, ‘Communication’, ‘Pedagogy’ and ‘Assessment’. In many places the prompts themselves are augmented by significant additional guidance to clarify and offer exemplars.

Notably, the tool has reduced the number of prompts around assessment to one single prompt. However, development is currently underway to develop further guidance around Inclusive Assessment. Further guidance is being written to reviewers to enhance the quality of reviews, embedding advice on the value of training and lived experience, and modifications are being made to the tool to facilitate its use in the learning design phase of module production. Version 6 is due for release in Autumn 2023.

Further Phases of the Inclusive Curriculum Project in STEM

In the STEM Faculty, we have reviewed a second tranche of modules using the Inclusive Curriculum Tool, focusing on modules which have upcoming opportunities for implementing the results of reviews, either because they are due to have a post-launch review (in the early stages of a new module), a mid-life review, or because a replacement module or refreshed version of the module is being written.

Many of our Associate Lecturer reviewers in the second phase were reviewers from the first phase who have carried on, and new reviewers were allocated mentors to support development of learning. Associate Lecturers met their module teams at the beginning of the process to set out clear expectations and allay fears and anxieties resulting from perceived hierarchies. However, opportunities for inclusivity training were limited and sorely missed, and so the third phase (in train at the time of writing) has made training a central requirement for involvement in the project. The third phase will also pilot the use of reviewers who do not necessarily teach on their assigned module, but who have a broad disciplinary expertise in the area.

RECOMMENDATIONS FOR PRACTITIONERS

We conclude with a series of recommendations for practitioners seeking to use an inclusivity framework to review and improve the inclusivity of their teaching and learning.

Figure 3. The 24 prompts of the Inclusive curriculum tool version 5

Inclusive Curriculum Tool
PROMPTS
 Version 5 - December 2021

Context:
 Drawing on the student & tutor perspective

1 Are you aware of any comments or feedback about inclusion and representation from students or teaching colleagues?

Communication: Language

2 Is there any use of idiom, exclusive cultural reference or colloquialism?

3 Is there any use of English language inappropriate to the level of study? Is the language used in the teaching voice simple, transparent, respectful, accessible and appropriate for academic purposes?

4 Is the language appropriate and inclusive?

5 Is there acknowledgement of the Welsh language/British Sign Language? Is there opportunity to acknowledge other official minority languages in the UK?

Content: Module Materials

6 Are there images of people with diverse characteristics? Is the proportion of images of people with a diversity of characteristics reflective of our OU students, UK society, the global context?

7 Considering the text, are any images out of context?

8 Are any of the images potentially stereotypes?

9 How many videos or widgets are there of people of diverse characteristics and experiences? What proportion of the total number are these?

10 Is there any stereotyping in the videos?

11 Do audio clips have the voices of people of diverse characteristics in them?

12 Is the content of the discussion inclusive, appropriate and respectful?

13 If you are using case studies, widgets or evidence, do they reflect diversity?

14 Are there any case studies that reinforce stereotypes?

15 Is there material from the four UK Nations: Northern Ireland, Wales, Scotland, England, and also the Republic of Ireland.

16 Is there material from, as well as about, other countries, including the global South?

17 Are readings and references by diverse authors? If not, could they be?

Pedagogy: Activities - promote reflexivity

18 Is there a diversity of views expressed in material? If there is a viewpoint from a particular background or experience is that acknowledged and are any limitations created discussed?

19 Is there guidance about acceptable behaviour in group activities?

20 Are there activities and material that create respect and an appreciation of the value of difference?

21 Are there activities that allow students to use lived experiences and diverse ideas to enrich the understanding of other students?

22 Are there activities or material that make students with privilege aware of how their experience and viewpoints are shaped by their cultural, historical, geographical, economic and other contexts?

23 Are there opportunities created for direct discussion of race, culture, disability or other aspects of identity? Can opportunities be created for direct discussion of racism, sexism, ableism, sectarianism or other prejudicial views?

Assessment

24 Is there scope for assessment questions to encourage responses about diverse lived experience? Does the module material sufficiently support students who might want to write about diverse experience?

Don't Start With Curriculum

Inclusive teaching and learning is so overwhelmingly complex that it is difficult to know where to start. It might be tempting to start with 'the curriculum' (in the sense of the materials used for teaching and learning) as the easiest piece of the puzzle to start with. However, the results of our experiences with

the Inclusive Curriculum Project suggest that although curriculum change is important, it is slow and is not likely to have major impact on institutional priorities such as closing awarding gaps. A more comprehensive approach is likely to yield quicker results with greater impact. Inclusive assessment and feedback may be a more natural place to start if looking to close awarding gaps.

Curriculum Includes Practice

Notwithstanding the above, if you do decide to undertake a review of curriculum, consider the curriculum to have at least two parts: the writing and maintenance of written and interactive asynchronous online learning materials AND the personalized interactions between a student and their teaching practitioners. In this chapter, we have seen that these two aspects are interconnected and form a symbiotic relationship in promoting inclusivity in online teaching and learning.

Invest in Staff Development and Inclusivity Training

By far the greatest impact comes from developing staff awareness in inclusivity issues in teaching and learning. This takes both time and resource. The training and development must allow practitioners to reflect on their own practice and engage in socially constructive dialogue in a safe space with others. Practitioners with lived experience of marginalization can bring particularly valuable perspectives to both training and inclusion work, but it is important to recognize that the greatest change comes when *everyone* does the work.

Empower Reviewers to Challenge Hierarchies

Whether reviewers are staff or students – and we recommend that both bring valuable perspectives – they must be empowered with the confidence and support to be able to deliver critical feedback to those in established positions of power. Explicitly recognizing positionality at the beginning of meetings is an effective way to establish an atmosphere of mutual respect and collective responsibility.

Use a Clear Theoretical Approach

Our results indicate that an inclusivity framework yields the best results when it has a clear, unambiguous theoretical underpinning. Many approaches to inclusivity exist, and while each has its merits, it is important to lay out at the start what approach has primacy. It is also important to bear in mind that some theories require significant training and experience, especially critical pedagogies and theories which require practitioners to challenge themselves to unlearn and relearn fundamental tenets of their disciplinary knowledge and teaching practice.

STEM TEACHING AND LEARNING CARRIES SPECIFIC CHALLENGES

The context of STEM teaching and learning carries with it specific challenges when it comes to inclusion. The explicit focus in STEM disciplines on positivism and abstraction may make building inclusion into the STEM curriculum distinct from other academic disciplines. Indeed, in recent years, the ques-

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tion of inclusivity in STEM has become a political hot topic, with, for example, the applicability of the decolonization movement to STEM contexts being the subject of forceful challenge.

In their discussion of LGBT+ inclusion in STEM, Reggiani et al. (2023) counter the suggestion that inclusivity is irrelevant to STEM, stating that the “positivist epistemology and the language of STEM further reinforce marginalization by rendering LGBT + identities and experiences seemingly irrelevant, as if LGBT+ people in STEM can take their identities off like a jacket at the laboratory, office, or classroom doors” (p.3). A similar comment could be made about other forms of minoritized identities in STEM. Furthermore, Gebrial (2018) argues that:

...the construction of a curriculum at any education level is the product of a power struggle; however, it is not perceived as such. Rather, it appears as a ‘natural’ process, in which disciplinary canons and narrative framings come into being through apolitical, ‘rational’ means that do not themselves need to be scrutinized. (pp. 25-26).

Building greater inclusivity in STEM, then, may require more than addressing ‘microexclusions’ in module materials, and may call for a more fundamental shift in the mindsets of STEM practitioners. We argue that STEM should be thought of not only as a body of knowledge and practices, but as a human activity, which is subject to social factors, injustices and marginalization, which affect participation in STEM at all levels. Our results show that positive changes in mindset can and do occur, but practitioners require training, space for reflection, support in negotiating hierarchies of power, and safe spaces in which to discuss their learning.

Returning to the question ‘What does an inclusive STEM curriculum look like?’, it is important to bear in mind that any attempt to answer this question necessarily depends on the conception of what constitutes STEM disciplines themselves. As noted in our results, much of the content which did raise inclusivity issues in module materials was not considered sufficiently core to the subject to be reflected in assessment. The answer to what is ‘core’ to our STEM disciplines will determine what is included and what is left out in STEM teaching and learning, and, crucially for inclusivity, who is included and who is left out.

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KEY TERMS AND DEFINITIONS

Change: To alter or modify something from its current state.

Constructivism: The theory of constructivism posits that people make meaning of and produce knowledge based upon their pre-existing experiences.

Critical Reflection: A process of recognizing, assessing and challenging presuppositions or assumptions about issues known, the way the world is perceived and the beliefs and values we foster.

Curriculum: In this chapter, refers to materials and content, planned and organized by teaching practitioners, of a particular course of learning.

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Decolonization: A theoretical approach to education whereby critical consideration is applied to institutions and assumptions, based on the way in which the legacy of colonialism has shaped, and continues to underpin, the institutions (including academic disciplines) of the modern world.

Epistemology: A theory of how knowledge is created.

Equality: The state of being equal, especially in status, rights, or opportunities.

Equity: Pertains to fairness and impartiality.

Global South: A term referring to the majority of the world and its population, roughly equating to the areas outside of Europe and North America.

Higher Education: A term used to describe the institutional providers of undergraduate level education.

Inclusion/Inclusivity: Refers to the practice or policy of providing equal access to opportunity and resources for people who might otherwise be excluded or marginalized.

Meaning Making: Refers to the process of how people construe, understand, or make sense of life events, relationships, and the self.

Pedagogy: A theory of learning.

Positionality: A consideration of the implicit power relations at play in human interactions one has as a virtue of one's identity, status, or lived experience in a social context.

Practitioner: A teacher or educator engaged in the practice of teaching and learning.

Reflexivity: This term refers to the interrogation and examination of self-belief in relation to generally refers to the examination of one's own personal values, held beliefs, judgments and practices during the research process and how these may potentially influence research processes.

Social Constructivism: Social constructivism posits that all knowledge develops as a result of social interaction and language use and is therefore a shared and collective experience rather than an individual one.