Innovating STEM

Lara Lalemi

CEO of Creative Tuition
TODAY’S TALK FORMULA

01 Knowledge and Power
What we teach

02 Curriculum reform
How we teach

03 What can you do?
Supporting students is supporting their mental health.
WHY DID YOU STAY IN SCIENCE?
**Facts and Figures**

2011 Population UK Census

- **White**: 86%
- **Asian**: 8%
- **Black**: 3%
- **Mixed, Other, Unknown**: 3%

UK Population Statistics 2011
# Facts and Figures

<table>
<thead>
<tr>
<th>Category</th>
<th>Women</th>
<th>BAME</th>
<th>Disability</th>
<th>LGBTQ+</th>
<th>Total</th>
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<tbody>
<tr>
<td>UK Society</td>
<td>50.7%</td>
<td>16%</td>
<td>19%</td>
<td>5%</td>
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<td>UK Higher Education STEM</td>
<td>45%</td>
<td>16%</td>
<td>8%</td>
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1. Office for National Statistics Research ‘Report on population estimates by characteristics’ 2017
5. Equality+ higher education: students statistical report 2019
6. Using British Antarctic Survey as a proxy
Where is the problem?

BME students at UK universities are:

- less likely than their white counterparts to graduate from undergraduate degree programmes with a first or upper second class degree (Miller, 2016)
  *Attainment gap at Bristol stands at -7%*

- more likely to lack a sense of belonging in or satisfaction with higher education (Mountford-Zimdars, 2015)

- less likely to complete their first undergraduate degree (Woodfield, 2014, p. 8) - the lowest rates of continuation being amongst Black students (Keohane, 2017)
My MENTAL HEALTH WAS IMPROVED by:

- Supportive Academic/Non-Academic staff
- Therapy
- Mentors
- Decolonising my mind
REFORMING OUR CURRICULUM

U.K. Departments who have started on their practical Decolonising Science journey:

**Wolverhampton University**
Students involved research

**Keele University**
Students involved research, teaching style changes, assessment changes

**University of Sheffield**
Learning material and staff engagement

**University of London, SOAS**
Learning materials and decolonizing science toolkit
WHAT DOES DECOLONISING SCIENCE MEAN?

Widening the goal posts, without lowering the bar
What does it mean to decolonize?

1. decolonizing refers to many inter-related things:
   ○ Student and staff diversity
   ○ EDI
   ○ Student awards and achievement
   ○ Curricula and pedagogy
   ○ Research and knowledge production

2. To decolonize means to address:
   ○ What we teach (curriculum)
   ○ How we teach
   ○ Who we teach and who with
WHAT WE TEACH
Three Main Curriculums

Explicit
THE WHAT

Hidden
THE VALUE

Null
WHAT IS MISSING
Connecting Chemistry to Social Justice in a Seminar Course for Chemistry Majors

Aren E. Gerdon*

**ABSTRACT:** Undergraduate chemistry majors should be encouraged to consider chemistry-based solutions to issues that impact their daily lives as well as the lives of poor and marginalized populations worldwide. Some issues that disproportionately influence historically disadvantaged populations are also directly related to or could be impacted by chemistry. This idea of addressing social justice with chemistry is not often addressed in chemistry curricula but has recently gained importance with students and instructors. In response to this challenge and need, a seminar course was developed to assist chemistry majors in connecting chemistry concepts to social justice issues. The seminar course aimed at teaching scientific research and communication skills but thematically added social justice concepts while focusing on chemistry advances that relate to, for example, environmental racism, forensic chemistry, opioid addiction, women’s health, and food disparities. Students in this course demonstrated an understanding of recent chemistry research while also expressing compelling connections to social justice challenges.
“Chemistry for social justice can be used as an effective guide to educate and enable students to make use of their knowledge and skills while exercising empathy.”
Introducing Social Justice into Engineering

Using a social justice approach to decolonize an engineering curriculum

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Introducing Social Justice into Engineering

1. Develop a socially just framework to reason about curriculum design.

2. Represent a traditional curriculum based on structured interviews with lecturers using a combined Activity Theory/Social Justice framework.

3. Identify potential scenarios of decolonized curricula through a process of interviews with faculty involved in teaching computer engineering, industry partners who employ graduates from the program, and surveys of fourth year/newly graduated electrical engineering students.

4. Formulate a decolonized curriculum structure that represents the insights from the research participants.
HOW WE TEACH

Dr. Neil A. Williams, Keele University
Three Major Changes

1. Introduction of Project Based Learning to introduce more active learning and facilitate co-creation of curriculum. Develop key skills.

2. On-line for laboratory work (pre-labs and in class)

3. Use of more authentic and accessible assessment
Active learning narrows achievement gaps for underrepresented students in undergraduate science, technology, engineering, and math

Changes to laboratory programme

1. Demonstration videos and computer simulations used to provide pre-lab activity and in-class support – Learning Science

2. Smart worksheets introduced to support students with calculations whilst in the laboratory.

3. Changes enabled the class to be shortened to 2.5 hrs and the start time move from 9:00 am to 9:30 am to help commuter students
## Impact on module awarding gap

### 2017/8

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<th>Module Level</th>
<th>Students on module</th>
<th>Avg. Agreed Mark</th>
<th>Agreed Mark Variance White/BME</th>
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### BME Awarding gap reversed from -14.3% to +10.0%!
What are the potential benefits?

Increase in Student/Staff Communication

Improvement in student confidence and engagement
WHO WE SEE

Inspirational Scientists Board

Ally: Professor Fred Manby
WHY IS THIS IMPORTANT?
My Driving Force
Wolverhampton University
Investigating Student opinions of Decolonisation

- Explore STEM students’ experiences of inclusivity through online diaries
- Understand how equality and diversity can be better embedded in the curriculum
- Develop a more inclusive STEM curriculum accommodating diverse learners and reflecting social, political and ethical dimensions of science
**Participant Profile**

**Level of study:** 24 UG/14 PG

**Gender:** 26 female/12 male

**Discipline:**
- 30 Sciences
- 3 Mathematics and Computer Science
- 2 Architecture and Built Environment
- 2 Engineering
- 1 Medicine and Clinical Practice

**Ethnic group:**
- 23 White/White British
- 9 Asian/Asian British
- 4 Black/Black British
- 2 Mixed/Multiple Background

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![Pie charts showing participants' ethnic groups by university.](chart.png)
Dear Diary…

“People from BAME backgrounds who have achieved outstanding things should be celebrated and talked about just as much as white people.”

“Further effort to research and credit the ideas going further than the Enlightenment and to their Eastern/African roots can be incredibly helpful for BAME students to feel (rightfully) more included in their courses.”

“The purpose of the curriculum is to teach science as we understand it, and not history.”

“Things should not be introduced into the curriculum for the sake of diversity, only if BAME scientists have made the same level of contribution.”
MY TOP TIPS TO BEING THE CHANGE YOU WANT TO SEE

No wrong door

01. Conduct surveys/workshops with staff and students about the curriculum.

02. Connect with education social scientists who can work with you on your course reform. You are not alone in this.

03. Participate in a Decolonising Science Workshop/talk to remain informed.

04. Look at your own course as well as environment and analyse where you can bring yourself and knowledge of the world to your course.
Consider becoming a mentor

MY MENTORS
WIDENING THE GOAL POSTS, WITHOUT LOWERING THE BAR
www.creativetuitioncollective.com
WHY DID YOU STAY SCIENCE?
Not everything that is faced can be changed, but nothing can be changed until it is faced.

James Baldwin
Thank you for Joining

Resources from this webinar will be available on the Enhancement Themes website shortly.

For information and resources about our webinar series, please visit the Collaborative Cluster page on the Enhancement Theme website: