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Article

How Students' Inspirations and Aspirations Impact Motivation and Engagement in the First Year of Study

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Abstract: Within this study, we aim to better understand the inspirations and aspirations of first year Biosciences and Chemistry undergraduates, how these change over the first year of study and their impact on motivation and engagement. Participants were asked to write a short reflective piece at the start of Welcome Week in their first year of undergraduate study. Thematic analysis identified four themes surrounding inspirations and aspirations. The most common theme was students naming a specific career as their aspiration (58%), followed by being inspired by work experience, aspiring to undertake further study and finally personal experience of a specific illness. Our findings showed that students' career aspirations differed depending on ethnicity, with ambitions for medicine and laboratory work showing a marked increase in some ethnically marginalised groups. Focus groups undertaken at the end of the first year of study highlight increased motivation and engagement when students feel their course content aligns with their career aims. Conversely, students are disengaged by course material they feel is irrelevant to their chosen career. Here, we will discuss the impact of these findings on creating an inclusive curriculum and the career readiness of the student body. Conclusions apply to career development modules and how the applied nature of a course can lead to engagement and higher motivation for students as well as curriculum design.

Keywords: aspiration; inspiration; motivation; inclusive; curriculum; careers

1. Introduction

The inspirations and aspirations of students when they arrive in higher education profoundly impact their motivation, engagement and subsequent attainment [1–3]. Students go to university for various reasons, including intrinsic motivation such as academic interest, extrinsic motivation through the wish to pursue a given career [4], or to experience social life away from the family environment. Irrespective of reasoning, students generally arrive with the belief that it is worth spending the next stage of their life learning in higher education.

The choice of institutes and direction of study are often a compromise brought about by financial and personal constraints [5]. The editorial by Bowers-Brown et al. 2019 notes that *"there is very little research within Higher Education research that considers aspiration per se as a fundamental construct in terms of university experience and graduate outcomes"* [3]. A 1997 report by the National Committee of Inquiry into Higher education [6,7] and the 2017 international student survey by educational consultants Hobsons [1] explores the experiences and expectations of full and part-time students. The reports used open-ended questions to determine what attracted individuals to their course of study. Students' motivations, inspirations and aspirations influenced their course choice nearly exclusively for intellectual reasons; stating intrinsic interest in the course, the subjects it covered, and along with its job-related nature.

University curricula enable students to study a particular subject in depth, a change from prior education where a broader range of topics would typically have been covered.

The international student survey 2017 highlights a passion for the subject area as the primary reason for choosing a given topic, with the location of study and pursuit of a particular career as secondary drivers [1]. Interestingly, few students are motivated to go to university primarily because of social pressure or norms [7]. There is also generally a high level of aspiration for study, with different social groups having similar levels of aspiration, however school attainment accounts for nearly all the differences in participation rates between social groups [8].

In higher education, marginalised students have different experiences, academic outcomes and career trajectories. There are many groups of marginalised students, for example, but not limited to; students from marginalised ethnic backgrounds, career leavers, commuter students, mature students, disabled and neuro-diverse students and students from LBGT+ communities [9–11]. Each of these marginalised groups has a wide variety of communities and experiences. United Kingdom (UK) Higher Education currently uses the category of "Black, Asian and Minority Ethnic (BAME)", to gain a greater insight into student ethnicity, experience and outcomes, grouping students together to allow quantitative analysis. There is some criticism within UK Higher Education that grouping BAME students together results in the loss of richness and diversity within the different ethnicities and excludes white students who are marginalised due to their socioeconomic status. Subsequently, large data sets are often analysed further to investigate individual ethnicities, however, initial analysis, and that of smaller data sets continue to use BAME to maintain the focus on addressing institutional bias and remove barriers to engagement/achievement and improve teaching and learning.

Institutional bias and racism can be seen in a range of literature, showing that students from marginalised groups and ethnic minority backgrounds have different outcomes within and beyond higher education than their white peers. For example, students from ethnically marginalised backgrounds are more likely to withdraw from study [12]. For those students who complete their degrees, there is a considerable awarding gap between ethnically marginalised students and their white peers graduating with a good honours degree (a 2:1 or above), with 70% of BAME students receiving good honours compared with 81% of white students [13]. Data from the UK Department of Education for 2018 to 2019 show that 89.6% of white students were in sustained employment or further study one year after graduation [14]. Black Caribbean students had the highest percentage in sustained employment (67.2%) one year after graduation, however their median earnings were the lowest (£19,300 compared to £20,800 for white students). This pattern was replicated for other but not all ethnic groups with students of Pakistani origins earning less than white peers whereas Chinese and Indian students earn more. The picture is clearly complex and lacks the granular detail of geographical location and the nature of the employment or further study [14]. Literature shows a broader issue of under-representation of the UK ethnically marginalised communities within UK STEM (Science, Technology, Engineering and Maths) [15]. Between 2003/04 and 2017/18, the proportion of all staff in STEM who identify as UK White steadily decreased (from 83.1% to 72.2%), while all other groups increased, most notably those from non-UK white backgrounds (from 8.3% to 14.1%). The under-representation of ethnic minority groups in STEM subjects is evident throughout the UK education system [16] and is recognised globally [17]. The problem carries through into the STEM workforce and noticeably into seniority and managerial STEM positions. The UK government and scientific agencies, Research Councils, professional bodies and businesses acknowledge the issue and have various agendas to tackle the awarding gap and the underrepresentation of ethnic communities in STEM [17–21].

Many of the challenges discussed above can be addressed by the design of an inclusive curriculum [22,23]. Such a curriculum provides an equal opportunity to all students to achieve their programme's learning outcomes, irrespective of background and immutable characteristics [23]. The design recognises that students bring a diverse educational experience, cultural capital, and differing confidence and motivation levels. Such a design is intended to improve all students' experience, skills, and attainment. At its core is the

idea of inclusivity which then becomes embedded within the student's experience. There are several practical applications of this idea based around student centred collaboration, encouraging students to work with different peers, a variety of delivery platforms, case studies that are authentic and meaningful to the students and a diversity of delivery from guest speakers and academics [24]. All these approaches are then further underpinned by equipping the students with the skills they need to contribute and work in a global environment.

We wished to better understand the experiences, motivations, inspirations and aspirations of students undertaking Biosciences and Chemistry courses to develop a fully inclusive curriculum that meets the needs and aspirations of the student body, could be used as a foundation for career support and to enhance the education experience. We hypothesised that a lack of attainable aspirations leads to decreased motivation for the course of study for affected students. To better understand students' inspirations and aspirations and how these affect motivation and engagement, newly enrolled students onto our Biosciences and Chemistry programmes were asked to write about their inspirations and aspirations in a 500 word reflective piece. Focus groups were undertaken at the end of the first year of study to analyse how the students' inspirations, aspirations and motivation changed once exposed to the current curriculum and their university experience.

2. Methods

2.1. Participants

This study focuses on the first year of teaching in Biosciences and Chemistry undergraduate degree programmes enrolled during the academic year 2018/19 at Sheffield Hallam University. Student participants were first year cohorts on Chemistry, Biomedical Science, Biochemistry, Biology and Human Biology undergraduate degree programmes. These Biosciences and Chemistry undergraduate courses enrol into first year study around 250-300 students per year compared to approximately 7500 first year undergraduate students per year across Sheffield Hallam University. Students from BAME backgrounds represent ~30% of entrants to the Department of Biosciences and Chemistry undergraduate degree programme, ~18% of entrants at Sheffield Hallam University compared to 16.3% of the population of Sheffield [24,25].

A student steering panel of then second year Biosciences and Chemistry students was put together with nine students representing each of the key demographics (diversity of gender and ethnicity) and from each of our undergraduate courses. This steering panel met multiple times across the project to discuss and inform the project's direction and narrative.

2.2. Ethics

Ethics for this study was acquired through the Faculty of Health and Wellbeing ethics committee following the Sheffield Hallam University Research Ethics Policy (reference: ER8927046). Students were asked to write 500 words about their inspirations and aspirations in Welcome Week and gave consent to be part of the study. Student names were removed from the submissions before analysis. Focus groups advertised via the virtual learning environment were undertaken with participants again giving consent. The resulting transcripts were anonymised.

2.3. Inspirations and Aspirations Reflection

As part of the ongoing work in the Department of Biosciences and Chemistry into the motivation for students in their degree and inclusive curriculum design, first year students were asked to write up to 500 words on their inspirations, aspirations and achievements at the start of Welcome Week (week of the introductory session, before the start of formal teaching). The introduction to the reflective task was *"We'd like to know a little bit about you before your course starts, so we'd like you to write about 500 words on your achievements, inspirations and aspirations. Please write about any achievements linked to your course, what inspired you to apply to your course and what your aspirations are for when you have completed*

your course. Some students come onto their course knowing exactly what job they want upon graduation whereas others have no idea. If you fall into the latter category, please write about the type of jobs you think you'd like, would you like to work in a laboratory? or would you like to work in a customer facing role? for example. What you write here will be collected by your course leader and given to your academic advisor so we can support you better. This will also form part of your portfolio for one of your modules, you'll be able to alter what you have written here before you submit your portfolio if you wish, and we'll tell you more about this piece of coursework in the first few weeks of your course." Of the cohort of 286 students, 202 undertook this work and consented to be part of the study. Only those who agreed for their statements to be analysed as part of this study were included in the analysis (71% uptake).

The written reflections had students' names removed prior to analysis. A thematic analysis was undertaken by an independent research assistant [25]. Career trajectory, named specific career aim or possible career areas, were identified from the students' reflections.

Bivariate analysis was undertaken to determine if student demographics (gender and ethnicity) impacted the inspirations and aspirations of students as well as their career trajectories.

2.4. Focus Groups

The thematic and subsequent analysis informed the focus groups questions. The questions aimed to provide depth and detail of pertinent areas of the initial data set as well as investigate how students' inspirations and aspirations have changed over the first year of study. The student steering group challenged and critiqued the focus group methodology and question set before implementation. Four focus groups were led by the paper's authors and took place after summative poster sessions towards the end of the first year of study. Participants of three focus groups were grouped based on student courses: Biology and Biochemistry (n = 11), Biomedical Science and Human Biology (n = 12) and Chemistry (n = 9). Students from all courses (n = 5) attended the final focus group after a later poster session for those unable to attend the previous main sessions. Focus groups were 30–50 min with discussions based on predetermined questions. The discussions were audio-recorded and transcribed by an external independent company (White Transcription Services Ltd.).

Transcripts of the focus groups were analysed using NVivo (12, QSR International, Burlington, MA, USA). A grounded theory [25] approach was taken with line-by-line open coding to identify key categories within the data followed by axial coding to identify links between these categories. Direct quotes for each category were then identified.

3. Results

This study set out to identify undergraduate Biosciences and Chemistry students' inspirations and aspirations and to determine if these differed by gender and ethnicity. In addition, we aimed to explore how students' motivations and aspirations change over the first year of study.

3.1. Inspiration and Aspiration Themes and Career Trajectories

Previous research has found that marginalised groups experience differences in expectations and barriers to accessing their university studies from early in their courses [12,26]. Here, we aimed to identify common themes around aspirations to study within a Biosciences and Chemistry context. Students at the start of their degree were asked to write a 500 words reflective piece on what motivated them and identify their aspirations concerning their chosen degree. The study was opt-in upon submission of the reflective task and 202 first year students responded to the study call with 71% uptake. Uptake into the study varied with gender and ethnicity with opt-in rates as a percentage of the total course as follows: white female 92% (n = 108), marginalised ethnic (BAME) female 87% (n = 47), white male 73% (n = 95), marginalised ethnic (BAME) male 53% (n = 36). Students' responses were thematically analysed and coded by an independent researcher, who also calculated the frequency of these themes within students' written statements (Table 1).

Table 1. Inspiration and aspiration themes from students' 500-word reflective task identified by thematic analysis (n = 202).

Theme	Comment Examples	Frequency
Aspire to a named career	*"I would love to one day become a research scientist in areas such as cancer research." "Eventually, I will be aiming to become a forensic toxicologist."*	58% (117)
Inspired by work experience outside of school/college	*"Over the summer break, I worked as a lab technician." "I have been on trial days in the pharmaceutical industry."*	31% (63)
Aspire to do further study	*"My dream is to complete an additional degree in graduate medicine, to ultimately become a paediatrician." " . . . go onto a masters to further strengthen my proficiency in biology."*	27% (54)
Experience of a disease or treatment	*"I myself am a sufferer of a genetic disorder." "I am also inspired by my dad, who recently actually passed from cancer."*	10% (20)

As shown in Table 1, four distinct themes were identified from the thematic analysis. Frequencies were not calculated cumulatively, as student's reflections often contained multiple themes. For example, more than a quarter of students outlined how they aspired to further study, and within this group 69% of students also had a named career aspiration. There was no difference in the frequency of students' responses per theme when separated by gender and/or ethnicity (data not shown).

Interestingly, more than half of the participants (58%) aspired to a named career, even at such a comparatively early stage in their degree. Further analysis of the 500-word reflective task showed that another third (31%) of participants mentioned interest in specific types of jobs, or potential careers, but without attaching this to a specific role or job type:

> *"I want my work to contribute in some way to the protection and conservation of the environment, whatever that may entail."*

> *"I don't know exactly what career I want when I finish the course, but I would like to work in a lab and/or in research, because I prefer the more practical side of the subject."*

Here, we define 'career trajectory' as both a named career aspiration and/or an interest in a potential career area. Responses naming a specific career trajectory were coded to identify the career type and to determine the frequency of careers mentioned. These were further delineated and split by student ethnicity (Table 2) and gender (data not shown). Participants frequently named multiple career trajectories, for example, " . . . *work in a pathology lab or in a drugs research lab"* such vocational laboratory work was incorporated together with research in the first instance as it utilised the same core competencies. The students commonly cited research alongside postgraduate study, e.g., *"medicine or medical research".* Thus, research has been included in the laboratory work career trajectory as well as being counted as a distinct category (Table 2).

Table 2. Most common career trajectory by ethnicity. Laboratory work includes NHS laboratory work, other vocational laboratory work, research and research through postgraduate study was also defined as its own aspiration. Two by Two Chi square analysis was conducted comparing the proportion of marginalised ethnic groups (BAME)/white students in the study to the proportion of marginalised ethnic groups (BAME)/white students with each of the individual career trajectory. * Indicates $p < 0.05$, *** indicates $p < 0.005$ in a Chi square test (n = 202).

Student Demographic	% Students(No. Students)	Laboratory Work(Including Research)	Research (As a Defined Subgroup)	Medicineor Dentistry	Teaching
All	(202)	62% (125)	34% (68)	23% (47)	12% (25)
Marginalised ethnic groups (BAME)	22% (45)	10% (13)	13% (9)	45% ***(21)	12% (3)
White	78% (157)	90% *** (112)	87% *(59)	55% (26)	88% (22)

Vocational laboratory work was the most frequently mentioned career trajectory, followed by Medicine or Dentistry, and then teaching. There was some interplay between career themes, most notably of the students who mentioned Medicine or Dentistry as career trajectory a third (34%) also stated research as a possible career. Interestingly, there was a tendency for students from marginalised ethnic groups to prefer medical or dentistry careers and white students to prefer laboratory work ($p < 0.005$ Chi square test between total student cohort by ethnicity vs. Medical of Dentistry/laboratory work as a career trajectory). No difference between ethnically marginalised and white student preferences were seen in aspirations to teach. There was no difference between genders in any career trajectories (data not shown).

3.2. Inspirations and Aspirations Themes Are Present at the End of First Year of Study

At the end of the first year, four focus groups were undertaken. The aim of these groups was to understand how inspirations and aspirations related to career and study had impacted motivation following a year of learning. These focus groups took place during end of term poster sessions in which all first-year students were required to attend and present a body of work they had produced over the prior six weeks. After the main poster sessions, the three initial focus groups (n = 32) were carried out. A final follow up focus group (n = 5) occurred after an additional poster session for those with coursework extensions. It is important to note that students at the additional poster session had not failed the first attempt. These students did not attend the initial poster session as they either had a learning contract that allowed them to have an extension on the poster deadline due to pre-existing learning difficulties, disability and/or mental health issues or had an extension due to unexpected issues impacting their work, such as acute illness or bereavement. Including these students in the study allowed the authors to capture students' voices whose engagement with the program of study occurred in a "non-standard" manner. This mode of engagement sees students attend sessions and complete assessments out of sync with the broader cohort and thus may experience a disjointed journey through assessment and feedback.

Focus groups were transcribed, coded and then categories were determined. Students restated the same overall inspirations and aspirations at the end of their first year of study as those themes identified in their 500 word written pieces at the start of the first year (Table 3).

Table 3. Identification of start of first year inspirations and aspirations present in end of year focus groups. Written reflective piece, n = 202, focus groups, n = 37.

Theme Identified from Reflective Piece (Start of First Year)	Focus Group (End of First Year)
Aspire to a named career	*"I want to go to oncology"* *"I really wanted to . . . be a biomedical scientist"*
Motivated by work experience outside of school/college	*"I was in hospital for a bit . . . they were giving me lessons on biology . . . that made it really interesting"*
Aspire to do further study	*" . . . then go to graduate medicine afterwards"* *"You can go into like doing a Masters"*
Experience of a disease or treatment	*It's mainly because my best friend died of cancer"*

3.3. Motivation for First Year Study Has Multiple Drivers

In addition to the retention of the students' original inspirations, new categories were synthesized from the focus group analysis.

Category 1: Aspirations to pursue particular careers strongly impact motivation and engagement to study. The impact of student career aspirations can have a positive or negative on their interaction with the curriculum. Students appreciate the content they feel will support their careers but can disengage when they feel the content is irrelevant.

"Feel motivated because I feel as though there's quite a lot of practical work . . . I'm actually gaining the skills that I need, that I will need in a career"

"I think I'm more motivated now I know what I want to do . . . I want to be a Biomedical Scientist"

"there's certainly bits that you disengage with because that's not relevant to my career journey"

"I went through a period of time when I was less motivated because I couldn't figure out what I wanted to do at the end of this course."

Category 2: Career aspirations are refined during the first year of study. Due to the means of analysis in the early stages and the anonymity given to the focus group participants, this refinement could not be directly correlated to student demographic or previously identified career trajectory. However, the language used by the focus group participants demonstrates a deeper knowledge of potential careers within the Biological and Chemical Sciences than that articulated in the aspirations task. Transcript analysis shows that the educators' experiences in laboratory classes and a deeper understanding of their courses' subject material affected career aspirations and trajectories.

" . . . the lecturers on the biology course . . . made me want to go down that cell biology route"

" . . . never considered being an analytical chemist. But from doing the labs . . . I do enjoy it and it's something I could go into."

"it's really educated me on what I actually want to do . . . that's why I want to do . . . microbiology"

Category 3: Course content strongly impacts individual motivation and engagement. Many students enjoy their degree and are motivated by the content and find it a positive challenge, but a minority of the students found the challenge too difficult. Again, the background of these students could not be determined from the anonymised transcripts.

" . . . because some parts of it is so, like, challenging, I feel like that has gotten me to engage with it more."

"I feel like at the beginning of the year I was really motivated because everything was, like, spread out, but now everything is . . . close together I'm just getting stressed out and I just don't want to do anything."

Category 4: Educators are key in maintaining student engagement and motivation. Educators design the course and module curricula that impact student motivation and engagement (category 3) and impact career aspirations (category 2). However, the role of direct student: educator interactions in students' engagement and motivation and the positive enthusiasm for the subject matter is transferred to the student.

"People [educators] seem really, really interested . . . well if they are enjoying it then I probably will as well"

"When a lecturer doesn't really care . . . it's like if I wasn't here would it make much difference to what I am learning?"

Category 5: Students whose experiences fall outside the planned delivery have a negative experience of the curriculum. Interestingly, the mood of the four focus groups varied as judged by the language used and the tone of the comments recorded. The initial three focus groups were held with students who submitted assessments on time and were on track with their studies. Conversations were generally positive about the delivery of the curriculum and their interaction with the subject material and the students appeared to be, engaged and satisfied with their studies.

"The better the degree you get, the better your options are, and I just kind of thing that that motivates me a lot."

"I just kind of want to do well for myself . . . I want to prove to myself that I can do it"

"My A-levels didn't go as well as what was planned, and that's kind of driven me on to try and succeed."

The final focus group had a different mood. These students were present at the session as they could not complete the work at the intended deadline for either; personal reasons or held learning contracts that allow them to submit work in an extended timeframe. As a group these students were less engaged in their study, lacked confidence and motivation and were less satisfied with their learning. The switch to the more negative tone may be a result of these students interacting with the curriculum in a fragmented manner leading to an increased effort to reach the same or lower end than they might otherwise have been capable of achieving.

"My grades are not that good."

"[I was] expecting more in terms of accessibility of information and recording lectures and stuff like that."

"The amount of lab time is quite helpful. You don't expect it"

When all categories are taken together the focus groups analysis demonstrated that students are motivated to study if they have a personal interest in the topic. Critically, the focus group data demonstrates that staff have a key role in maintaining that interest and influencing student motivation, through both the content of lectures and the manner the information is presented to them. If the students perceived staff to be motivated and engaging, the students felt more motivated to perform well for those staff members. The content of the course itself also has a key part to play in the students' motivation to study as they are exposed to content and working practices. Each of these observations links directly to curriculum design and highlights the educator's role in delivering that curriculum.

4. Discussion

Here we report on the inspirations and aspirations to study Bioscience and Chemistry at a UK Post-92 University. The student cohort was asked to state their inspirations and aspirations for study on their chosen course through a 500 words reflective piece at the

onset of their undergraduate degree followed by end of year focus groups. The study's outcomes give insight into the initial drivers for student motivation, drivers that motivated students for continual study and highlight the putative areas of curriculum design to tackle disengagement.

4.1. Drivers for Undertaking Undergraduate Study

For most students, career aspirations were cited here as a primary reason for undertaking the course of study, followed by prior experience through work experience. Laboratory work was the most common career trajectory, followed by Medicine or Dentistry and then teaching. Marginalised ethnic (BAME) students tended to favour medical careers, whereas white students tended towards aspiring to research and laboratory work. Medicine and Dentistry are amongst the highest career aspirations within the sciences and admission to undergraduate or postgraduate courses are notoriously difficult.

A direct interest in a biosciences and chemistry topic area was very rarely cited in the aspirations task. Science curricula are often centred around subject knowledge and the application of practical skills through laboratory work. Redesign of any curriculum then should consider the potential work-related futures that the students aspire to and highlight the application of the skills and knowledge gained through the course of study to relevant careers.

Within the focus groups having a named career aim was seen to have broadly positive effect however some students struggled when they do not see how their course would benefit them in the future, hence clear signposting of the skills acquired during study will aid the students to see the relevance of the tasks undertaken and the underlying curriculum design.

4.2. Motivations for Continued Undergraduate Study

Focus groups were used here to explore student motivations at the end of their first year of academic study compared to the pre-enrolment reflective task. Analysis of the transcripts identified a link between the perceived staff enthusiasm for the subject matter and the students' engagement in the content of information presented to them. If the students perceived staff to be enthusiastic, the students felt more motivated to engage with those staff members and the topic. Such a link between academic enthusiasm and student motivation links to the work of Ryan and Deci and the supportive conditions that led to student engagement [27,28].

The practical application of the learning through laboratory classes also feeds into the concept that experimentation and problem solving are motivational factors. The focus groups analysis demonstrated that students are motivated from their personal interest in a topic area, their career aspirations but critically is maintained by their learning experience and the attitudes of the staff who teach them. Reflective logs have been shown to be effective in enabling students to link what they are learning to their future career aspirations [29].

4.3. Impact of Higher Education Setting on Aspiration, Inspiration and Motivation

An institution's processes and environment impact students' aspirations, inspirations, and motivation. Our data suggests the scale of this impact ranging from positive and engaging, to negative and disengaging. Whilst most students will be placed at various points along this scale and experience shifts at different points in their study, it is helpful to consider the experiences of those at the extreme ends of the scale.

At one end of the scale are those who arrive at university equipped with the social capital to translate their aspirations into attainment. They find the transition from further education to higher education straightforward, quickly build rapport with the academic staff, and understand the university framework and what to do to succeed. Characterised by high motivation and engagement, they feel they will achieve their goals if they continue

to work hard. Traditionally the curriculum has been designed for these students and fits the ideas of what higher education is and how it operates.

At the other end of the scale are those who arrive at university with high aspirations but lack the social capital to act on them. These individuals find the transition from further education to higher education difficult, experiencing a disconnect between themselves and academic staff, and have difficulty navigating the university frameworks. As such, their experience does not meet their expectations. Through a lack of understanding of how to achieve their goals these students are at risk of disengagement in study. Despite a range of well-meaning resources and support across the curriculum these students do not connect with the supplied provisions as there may be limitations in the demographic representation of course materials. These resources and the supporting framework then do not align with this group of students' needs or they are not inherently visible to the students, leading to disengagement [30,31]. A student's sense of belonging is one of the factors impacting how a student transitions into higher education [32].

Within the literature, research shows the success of students' transition into higher education can be increased by several interventions. Transition programmes, centred around peer interact and university connection as well as study skills have been shown to increase peer relationships and students' attainment in the first year of study [33]. Case studies of diverse final year students' real life study experiences given to first year students increased the tendency of students to seek out university resources and increased attainment in the first year of study [34].

4.4. Limitations

Student numbers are not high enough for individual ethnicity group analysis. Based on the size of our data set we have conducted our ethnicity analysis based on the categories of marginalised ethnic (BAME) and white, however we acknowledge that "BAME" and "white" students are not a homogenous grouping and that some white communities such as the Roma community, are also marginalised due to their ethnicity. For example, "Asian" encompasses students of Indian, Chinese, Bangladeshi and Pakistani heritage; these student groups have differences in attainment and progressions within the UK education system and transitions and attainment in higher education [35]. The project here is in line with UK Higher Education pedagogy in analysing data through the lens of the BAME awarding gap and thus can form an important element of the wider body of literature aimed at ensuring equity and inclusion for all students, irrespective of ethnicity. Further work, with a larger cohort, will investigate differences in aspirations and inspirations within marginalised ethnic and other groups.

Who was missing from the study? The voice of marginalised (BAME) males was notably quieter in the inspirations and aspirations written reflection with a response rate of 53%. It has been observed that BAME students are less likely to actively participate in such tasks [36]. Data collection occurred upon students' arrival at university and before interaction with the University academic staff. This may indicate that this student group faced barriers to engagement in such tasks before arrival on the course and reflect the different challenges faced by this cohort [12].

Understanding why some students did not engage with the written task, is critical and is a research question in its own right: Are some student groups arriving at university with perceptions of the value of formative tasks? What are the barriers in place to students before enrolment? Previous evidence points towards withdrawal by students of ethnically marginalised backgrounds being linked to enrolment on the wrong undergraduate course for them [37]. Initial pre-enrolment tasks such as those used here could act as an early indicator of voices that are not being heard and provide a framework for future practices.

5. Concluding Points and Implications

The aspirations analysis demonstrated that a defined career goal in Biosciences and Chemistry was a major driver for students studying their undergraduate degree. To main-

tain the flow of students into Bioscience and Chemistry degrees targeting post-16 students with guidance on careers in biosciences and chemistry is a worthwhile strategy, especially for courses such as chemistry that have seen a decline in student numbers in some countries over the past 10 years [38].

Marginalised ethnic (BAME) and white students within this study have proportionally different career aspirations. The learning environment then needs to cater and address the needs of all students to maintain motivation, rather than the visible and vocal students. Embedding cultural awareness into the training of academic staff, would help the performance of marginalised ethnic students across the board [36]. Curricula should be designed to provide positive experiences for a range of career trajectories and not be limited to laboratory experience otherwise, student risk becoming demotivated, this is particularly the case for marginalised ethnic students.

Marginalised ethnic (BAME) students are proportionally less likely to enter higher education with the career trajectory of scientific research than their white peers within this study. For science to become representative of society, those undertaking scientific research, both in academic and industry, need to be representative of society. Thus, the visibility and accessibility of scientific research should be improved before students arrive at university and within their undergraduate studies.

Finally, our focus groups showed that students with a non-standard route through assessment, including those with learning contracts (given to students with disabilities, learning difficulties or mental health issues to support their learning, often including access to extensions) and extensions had lower motivation and course satisfaction. Enthusiastic academics who provide engaging, relevant information linked to students' career aspirations have a central role in maintaining the motivation of this group. Additional projects around the impact of learning contracts and recurrent extensions on the students' assessment journey, engagement and motivation would be of interest, focusing on how to support students that utilise multiple extensions.

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Abbreviations

BAME: Black, Asian and Minority Ethnic, lab: laboratory, STEM: Science, technology, engineering and maths, UK: United Kingdom.

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