From Care To STEM: Perception of and Engagement With STEM Among Care-Experienced Adults

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Abstract

Care-experienced young people are significantly less likely to enrol in university and study STEM subjects than their peers, yet the reasons behind this gap remain poorly understood. STEM identity - the extent to which an individual sees themselves as a "science person" - is a known predictor of STEM engagement and career pursuit but has never been examined specifically among care-experienced individuals. This study investigated STEM identity levels among 64 care-experienced adults and 19 adults without care experience, and explored which interventions were associated with STEM identity strength. Participants completed an online questionnaire measuring current STEM identity, perceived barriers to STEM, childhood exposure to STEM role models, frequency of childhood science conversations, access to targeted STEM/higher-education programmes and other demographic questions. Care-experienced adults reported significantly lower current STEM identity than those without care experience ($M = 3.82$ vs $M = 4.38$), and most participants agreed that their care background had been a barrier to pursuing STEM. However, STEM identity was not rigidly determined: participants who had a STEM role model in childhood, discussed science more frequently growing up, or accessed a targeted STEM/higher-education programme showed significantly stronger STEM identities. These findings provide the first quantitative evidence that care experience can reduce STEM identity, while also demonstrating that this gap is preventable. Targeted support and early exposure to STEM role models and conversations can help reduce this gap and therefore encourage a greater number of care-experienced young people to pursue STEM subjects.

Participation in STEM subjects and careers is critical to addressing the challenges facing 21st-century society (Hooker, 2017). Yet despite its growing importance, higher-level participation in STEM subjects remains persistently unequal across different demographic and social groups. One explanation for this lies in how science itself is perceived from an early age. Research using the draw-a-scientist task, most notably the meta-analysis by Miller et al. (2018), has found that children's mental images of scientists remain disproportionately male, despite some diversification since the 1960s. Such findings suggest that ingrained stereotypes about who "does" science may shape individuals' decisions to pursue higher-level STEM subjects and/or careers. However, existing research on stereotypes and STEM participation has focused overwhelmingly on gender and, to a lesser extent, socioeconomic status, with comparatively little attention paid to care-experienced young people - a group who face distinct barriers to educational engagement, are underrepresented in STEM careers and whose relationship to STEM participation remains poorly understood.

"Care-experienced" refers to individuals who have spent time in the care of their local authority, whether through foster care, residential care, kinship care or other placement types at any point in their childhood. This population is far from marginal: the NSPCC's (2024) Children in Care statistics briefing reported that there were approximately 107,000 looked-after children in the UK in 2022/23, a number that had increased by 8% over the previous five years. Given this scale, the educational experiences of care-experienced young people deserve closer attention, particularly as existing evidence already points to marked differences in their access to and progression through higher education. Research from the Rees Centre at the University of Oxford (2025) has found that care leavers are around four times less likely to enter higher education by age 22 and two and a half times more likely to drop out than the general population. While these figures speak to higher education more broadly, they raise the question of whether similar, or

even more pronounced disparities exist within STEM specifically, a field already shaped by its own exclusionary stereotypes. Although research in this area is limited, Harrison (2020) found that care-experienced students were more likely to pursue higher education courses in sociology, social policy and creative arts than medicine, physical sciences, mathematics and engineering. This pattern was later confirmed in more detail by Harrison et al. (2022), whose study of care-experienced graduates in the UK found that this group was underrepresented in natural sciences (15.9% vs. 20.0%) and maths, engineering and construction (5.4% vs. 7.7%) when compared with their peers. Researchers have proposed several explanations for care-experienced young people's broader disengagement from education, including placement instability, disrupted schooling, and inconsistent access to guidance and support, but none of this work has considered whether, or why, these disparities extend specifically to STEM.

One factor that has not yet been considered in this context is STEM identity. STEM identity refers to the extent to which an individual sees themselves as, and is recognised by others as, a person who belongs in STEM. It is typically understood as comprising three interrelated dimensions: competence (a belief in one's own ability to understand STEM content), performance (the ability to demonstrate that competence to others), and recognition (being seen by oneself and by others as a "STEM person") (Carlone & Johnson, 2007). Research has shown that every one-point increase on the STEM-identity scale nearly doubles a student's likelihood of pursuing a STEM career (Han & Park, 2026). A growing body of research has examined how STEM identity can be fostered in childhood and adolescence, and how it shapes later engagement with STEM subjects and careers, but this work has been conducted almost exclusively with non-care-experienced samples. Given that this group is evidently less likely to pursue STEM, it remains unclear whether a weaker STEM identity might help explain this pattern, and whether the same factors known to strengthen STEM identity in the

general population could be used to strengthen it in care-experienced individuals too.

Of the three dimensions outlined above, recognition has received particular research attention as a driving force behind identity formation. Current research suggests that STEM identity is not simply a product of individual interest or ability but is actively constructed through relationships with others and recognition. In an interview-based study following 15 successful women of colour through their undergraduate and graduate studies in science, Carlone & Johnson (2007) found that participants consistently described being recognised as a "science person" by established members of the scientific community, a finding they argue was central to their continued identification with science. This role of recognition has since been confirmed on a larger scale by Dou & Cian (2022), whose structural equation model of STEM identity development found that a sense of recognition remained the strongest predictor of STEM identity, even after accounting for home support and parental education. For most young people, though, this recognition appears to be first cultivated within the family. In a study of college students' reflections on their science trajectories, Dabney et al. (2013) found that participants frequently traced their initial interest in STEM back to family influence, while in an interview study of African American and Mexican American college students, Fisher & Padmawidjaja (1999) found that parental encouragement and expectations had the single greatest impact on their science-related career decisions. However, other current research shows that family does not appear to be the only source of this recognition and support. In a qualitative study of 11 African American undergraduates, Russell & Atwater (2005) found that, while home environment played a significant role in participants' persistence through the high school science pipeline, most also identified a specific teacher as instrumental to their continued engagement with science.

Taken together, this research suggests that STEM identity development depends heavily on sustained recognition and encouragement from significant adults, most often parents or family members, as well as stable home environments that foster informal exposure to science. Yet care-experienced young people are, almost by definition, less likely to have access to many of these mechanisms. This raises several unanswered questions. Given that care-experienced young people may have less consistent access to the kinds of relationships and environments known to support STEM identity development, do they show reduced levels of STEM identity as a result, and could this help explain their lower engagement with STEM subjects and careers? And if so, how might STEM identity best be developed in this group? The present study aimed to address these questions directly, investigating current STEM identity levels within this group, identifying the barriers that may prevent them from developing a strong STEM identity, and assessing which interventions and experiences are most effective in strengthening it.

Methods

Participants-

This study investigated the STEM experiences of 64 care-experienced adults and 19 adults without care experience. Participants were recruited via social media and care-experienced charities and networks such as All Of Us UK and Become Charity. Consent was obtained from every participant, and they were all made aware of their right to withdraw before the study began.

Design-

This study employed a cross-sectional, correlational design using an online questionnaire. The primary aim was to compare current STEM identity between these two groups and, within the care-experienced group, to examine associations between STEM identity and a range of childhood and demographic variables, including perceived barriers to STEM, exposure to STEM role models, frequency of childhood science conversations, and access to targeted STEM or higher-education programmes. Ethical permission was granted by the Durham University Department of Psychology Ethics sub-committee.

Measures-

The questionnaire was designed and administered using Qualtrics. Several mean scores were created by averaging responses across related items, allowing broader constructs to be captured more reliably than single questions alone. The most commonly used question type was the Likert scale, where participants were asked to indicate their level of agreement or disagreement with a series of statements using a five-point scale. Some measures were presented to all participants, while others were presented only to those with care experience, with non-care-experienced participants automatically directed past these care-specific questions.

Current STEM identity and childhood science engagement were measured in all participants, regardless of care background. Current STEM identity was assessed using a 4-item subscale (e.g. "I would describe myself as a 'science-y' person," "Science is relevant to my everyday life"), with one item reverse-coded. Scores were calculated as the mean of the four items, with higher scores indicating stronger current STEM identity. Level of childhood science encouragement and talk was measured using a similar 4-item subscale asking how often participants had experienced things such as talking about science at home or discussing

science with friends or peers while growing up. Scores were calculated as the mean of the four items, with higher scores reflecting more frequent childhood exposure to science-related conversation.

For care-experienced participants only, a barriers score was calculated from a set of items capturing negative aspects of their care experience related to science (e.g. "I felt that my care background was a barrier to pursuing science" and “Science was deprioritised in my education in favour of other subjects or support needs”). The overall barrier score was calculated as the mean of the four relevant items, with higher scores indicating greater perceived barriers to accessing STEM. Other questions in the survey, covering areas such as demographic background and access to STEM/higher-education programmes, were asked and analysed in a similar way.

Group differences and associations between variables were examined using JASP. The appropriate statistical tests were selected based on the level of measurement and the distribution of the variables. For continuous variables that met the assumptions of normality, independent-samples t-tests were used to compare current STEM identity between groups, with Cohen’s *d* reported as a measure of effect size. Where the assumption of normality was violated, Mann–Whitney *U* tests were used instead, with rank-biserial *r* reported as the corresponding effect size measure. Where group variances were unequal, Welch’s *t*-test was used. For the barrier-related question, participants were manually divided into high- and low-barrier groups to examine differences in STEM identity in these individuals. Participants with a mean score above 4 were classified as the high-barrier group, while those with a mean score below 2 were classified as the low-barrier group. Participants scoring between 2 and 4 were excluded from this comparison. Current STEM identity was then compared between the two groups using a Mann-Whitney *U* test.

Associations between current STEM identity and other variables were examined using correlation analyses. Spearman's rank-order correlations were used where variables were ordinal, skewed, or otherwise did not meet the assumptions required for Pearson's correlation. This included questions related to childhood science engagement and placement changes.

Procedure-

Participants accessed the study online via a Qualtrics questionnaire link or QR code. After reading the study information and providing informed consent, participants completed questions about their background and demographic characteristics, followed by measures assessing current STEM identity and childhood experiences of STEM. Care-experienced participants completed additional questions relating to their experiences of science within care, including support and encouragement from carers and professionals, access to science-related resources and activities, disruptions to science education, perceived barriers to pursuing science, and other experiences that may have influenced their engagement with STEM. Participants without care experience were automatically directed past these care-specific questions. Upon completion of the questionnaire, all participants were directed to a separate webpage where they could request a compensation voucher. They were then provided with information about the study and their right to withdraw their data.

Results

To identify which factors were most strongly associated with stronger STEM identity, current STEM identity scores were compared across a range of care-related and contextual variables including perceived barriers, placement changes, home role models, childhood science exposure, and programme access. We did

this so that we could compare the relative strength of different factors and infer which childhood STEM experiences were most strongly associated with positive STEM development.

Childhood Care Status and Current STEM Identity

As a preliminary descriptive comparison, mean current STEM identity was higher among participants not currently in care (M = 4.38, n = 19) than among those currently in care (M = 3.82, n = 64).

Perceived Care Background as a Barrier

Descriptive statistics were calculated for participants' agreement with the statement "My care background was a barrier to pursuing science" (1 = completely disagree, 5 = completely agree). The modal response of 4 suggested that most care-experienced individuals agreed that their background had been a major barrier.

High vs. Low Perceived-Barriers Groups and Current STEM Identity

Participants were divided into high-barriers (mean barrier score > 4, n = 24) and low-barriers (mean barrier score < 2, n = 12) groups. Participants with intermediate scores (2–4) were excluded to isolate the extremes. The high-barriers group reported lower current STEM identity (M = 3.667, SD = 0.810) than the low-barriers group (M = 4.583, SD = 1.019). As the assumption of normality was violated, a Mann-Whitney U test was used as the primary test and corroborated by Welch's and Student's t-tests. The difference was significant, $U = 41.5$, $p < .001$, $r = .712$, representing a large effect. Although perceived barriers were associated with lower STEM identity, the high-barriers group's mean (3.67) remained above the scale midpoint, suggesting barriers reduced but did not eliminate STEM identity.

Placement Changes and Current STEM Identity

A correlation analysis was conducted to examine the relationship between the number of placement changes experienced in care and current STEM identity. Because placement-change counts were positively skewed, Spearman's rho was used as the primary test, with Pearson's r reported for comparison. Neither coefficient reached significance, $r(62) = .161$, $p = .204$; $r_s = .098$, $p = .441$, indicating no meaningful relationship between number of placement changes and current STEM identity in this sample. This was a surprising result.

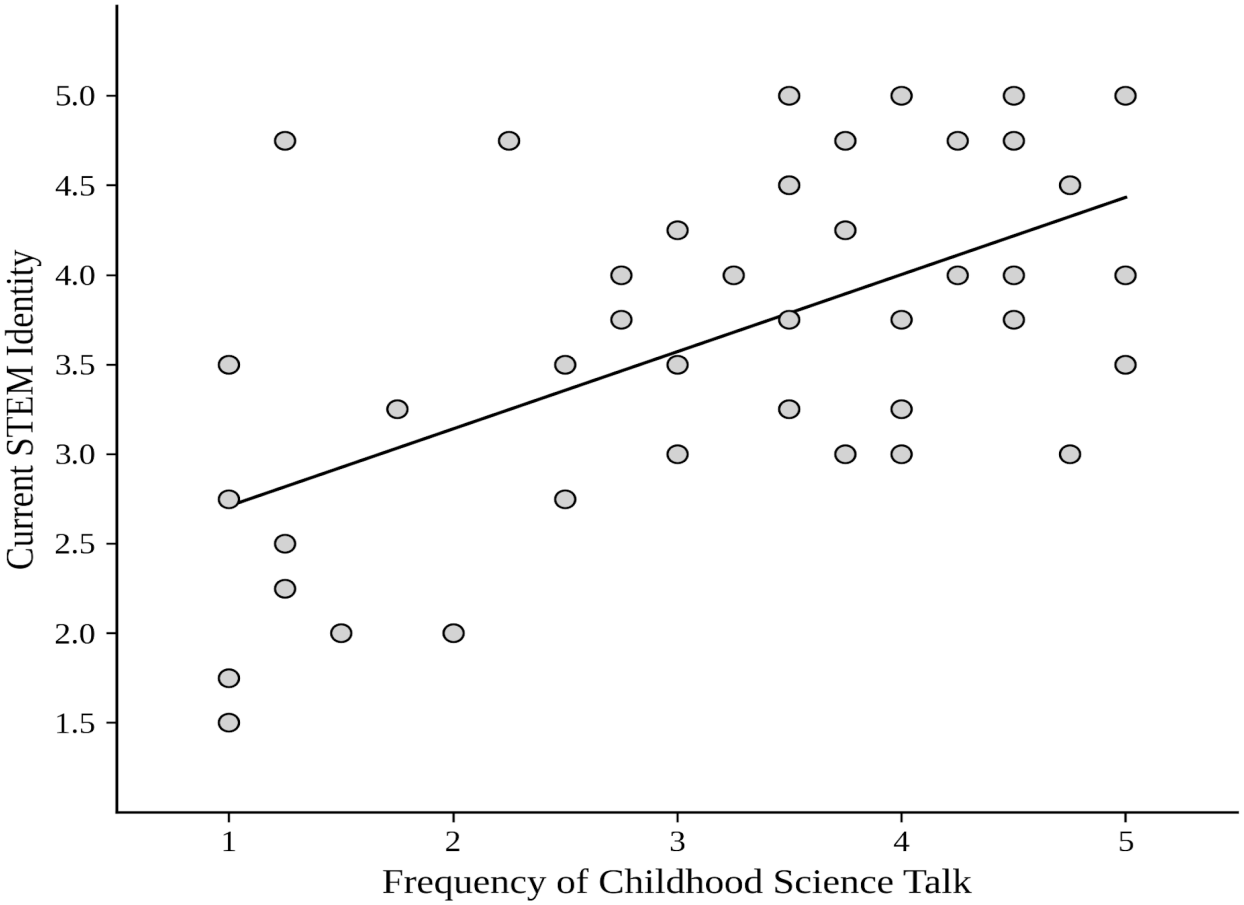
Home STEM Role Models and Current STEM Identity

An independent-samples t-test compared current STEM identity between participants who did (n = 42) and did not (n = 22) have an adult with a STEM background at home during their childhood. Assumptions of normality and homogeneity of variance were met. Participants with a home STEM role model reported significantly higher current STEM identity ($M = 4.208$, $SD = 0.730$) than those without one ($M = 3.091$, $SD = 1.048$), $t(62) = -4.987$, $p < .001$, $d = 1.31$. This was a large effect. These findings suggest that exposure to a STEM role model at home is associated with a substantially stronger current STEM identity.

Childhood Science Talk and Current STEM Identity

A significant, moderate-to-strong positive correlation was found between the amount of science talk at home/with peers during childhood and current STEM identity, $r_s(62) = .660$, $p < .001$. This indicates that greater exposure to science discussion is associated with stronger STEM identity in adulthood.

Figure 1
Scatterplot of Childhood Science Talk and Current STEM Identity



Access to Targeted Programmes and Current STEM Identity

An independent-samples t-test examined differences in current STEM identity between participants who had (n = 18) and had not (n = 43) accessed a targeted STEM/higher-education access programme. Levene's test indicated unequal variances, p = .010, so Welch's t-test was used. Participants who accessed a programme reported significantly higher current STEM identity (M = 4.431, SD = 0.611) than those who had not (M = 3.587, SD = 1.038), t (52.09) = -3.941, p < .001, d = 0.99, a large effect.

Discussion

Through our research, we hoped to investigate STEM identity levels in our care-experienced sample group and assess which interventions and experiences are most effective in strengthening STEM identity in care-experienced young people.

Does care experience shape STEM identity?

These results provide the first quantitative evidence that being in care is associated with a significant reduction in STEM identity, offering one possible explanation for why care-experienced young people are significantly less likely to pursue STEM careers. Current STEM identity was lower among participants currently in care than among those not in care, demonstrating a clear disparity in STEM identity between the two groups. Participants who felt their care background had been a major barrier to pursuing science reported notably lower STEM identity than those who did not. Even so, both the care and non-care experienced groups' average STEM identity remained above the scale midpoint, suggesting that perceived barriers weaken rather than eliminate STEM identity. This suggests that, while care experience can impact positive STEM identity development, it does not extinguish it altogether - even among those who feel most held back by their background, some sense of STEM identity persists, leaving room for it to be strengthened.

Interestingly, the number of placement changes experienced was not related to current STEM identity, suggesting that it is not simply instability within the care system that undermines STEM identity, but rather the presence or absence of specific STEM-related experiences and relationships during childhood.

What can strengthen STEM identity in this group?

Two factors stood out as strongly linked to higher STEM identity. Having a STEM role model at home during childhood was associated with a substantially stronger STEM identity in adulthood, and the frequency of childhood science talk - conversations at home or with peers - showed a similarly strong link. These findings echo prior research on the importance of role models and casual childhood STEM conversations on STEM development (Dou & Cian, 2022; Davis-Hall et al., 2023). As our research has extended this evidence specifically to care-experienced young people, it highlights that the everyday, informal moments of a child's upbringing – as opposed to only formal education - play a meaningful role in shaping whether they come to see themselves as someone who belongs in STEM.

These results have two practical implications. Firstly, foster carers and other caregivers need to be made aware of how important their role is in encouraging STEM identity development. As they are the adults most directly present in a foster child's day-to-day life, they are well placed to shape the informal conversations that happen at home. Educators can support this by sharing relevant activities - such as online video channels, reading materials, or home-discussion topics - that carers can use to spark science conversations outside of school.

Secondly, given the strong link between a home STEM role model and STEM identity, we believe that care-experienced young people - who are less likely to have access to a consistent STEM role model at home - would benefit from more structured opportunities to meet STEM role models elsewhere. If a home STEM role model is absent, schools, social workers, and outreach programmes should work to help fill this gap. For example, this could happen through formal mentoring schemes that pair care-experienced young people with STEM

professionals, STEM ambassador visits to schools and residential care settings, or university widening-participation days aimed specifically at looked-after children. Care-experienced STEM professionals could also be recruited as mentors or guest speakers, offering a level of relatability that generic role models may not provide. Embedding these opportunities within existing structures - such as a young person's Personal Education Plan - could help to ensure that access is consistent and tailored to the needs of different children.

Can targeted support programmes help?

Participants who had accessed a targeted STEM or higher-education access programme reported significantly higher current STEM identity than those who had not. Yet only a small proportion of the sample had accessed such a programme, raising the question of why these opportunities are not more widely available to children in care. Given how strongly programme access was linked to STEM identity, expanding access to STEM-focused extracurricular and outreach programmes represents a scalable, evidence-supported intervention.

Caveats-

As with any correlational study, these findings show association rather than causation - for example, while a STEM role model was strongly linked to higher STEM identity, this does not confirm that the role model directly caused this difference. Future research building on these findings would also benefit from larger sample sizes, particularly for subgroup comparisons such as high- versus low-barriers groups, to strengthen confidence in the effects identified here. Using longitudinal designs could also help establish the direction of these relationships more firmly in future research.

Conclusion

Taken together, these findings suggest that the STEM gap facing care-experienced young people stems from a lack of consistent access to STEM-related experiences and relationships during childhood. Encouragingly, these results point to three clear, actionable routes forward: raising foster carers' awareness of their role in everyday science conversations, creating more structured opportunities to meet STEM role models, and expanding access to targeted STEM and higher-education programmes. Rather than being reserved for the few who happen to encounter them, these opportunities should be consistently encouraged and made available across care settings, so that a child's chances of developing a strong STEM identity do not depend on circumstance. As STEM identity is a known predictor of STEM engagement and career pursuit, strengthening it in this way could, in turn, help more care-experienced young people go on to study and work in STEM.

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