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Recommendations for developing effective inclusivity initiatives in Research Software Engineering

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Abstract—Research software engineering in the UK is less diverse in terms of race and gender compared to both academia and the commercial software sector [1], limiting the perspectives needed to address the complex research challenges we face today. To develop meaningful inclusivity initiatives, we need to understand the workplace experiences of underrepresented individuals who contribute to research software development. However, such sociological research often places a significant emotional burden on participants, which is not always balanced by sufficient benefits. In this paper, we introduce ten guidelines for conducting research that promotes ownership and equity for participants from underrepresented groups, with recommendations specific to the research software community. Our guidelines are rooted in a co-production approach, partnering with underrepresented individuals throughout the research process. This ensures that the most pressing issues are addressed, leading to initiatives that can positively influence research software culture and benefit research outcomes.

Developing research software has been an essential aspect of the research process for decades in science and engineering and has an ever-widening presence. Research software is any source code written specifically for research purposes, from single file scripts to large scale applications, and its development can be referred to by multiple terms including software engineering, coding, programming, and scripting. Research Software Engineering (RSE) is now a recognised profession, with RSEs seconded or embedded in one or more research groups to develop the required software. This involves, not only programming, but multiple other aspects, for example, validation, verification, documentation, maintenance (including adapting to changing hardware and software

libraries), licensing, sharing and packaging [2]. This is in addition to the cognitive work of translating scientific concepts and models into software functionality and understanding the tacit assumptions within the research domain. Software practices can have wide reaching implications, for example, the software implementing the epidemiology model used for public policy decision making during the COVID-19 pandemic was strongly criticised for its poor design, writing and documentation [2].

RSE organisations, such as the Software Sustainability Institute and Society of RSE in the UK, support RSEs and researchers who write software in using good software practices to improve the quality of research outcomes. In the UK's Research Excellence Framework, which is used to allocate public funding, software itself is already considered a credible research output and, in the 2029 exercise, the contri-

bution of RSE roles to research will be eligible for submission. As the presence and acknowledgment of the importance of research software continues to grow, the lack of representation of diverse groups within RSE roles [1] and the gaps within current literature on diversity in RSE and software engineering more broadly [3] become increasingly concerning.

In higher education in the UK, various charter marks such as Athena Swan for gender equality, and the Race Equality Charter, have been used to incentivise institutes to engage in Equity, Diversity, Inclusivity and Accessibility (EDIA) initiatives. However, these have been criticised for their lack of understanding of intersectionality (for example, Athena Swan results in differential benefits depending on race and class) and for progressing the careers of those with demographics that dominate the power structures rather than leading to effective change for underrepresented groups [4]. These initiatives also lack a focus on specific professional areas in their institute-wide focus. Recommendations for inclusivity in software engineering and open-source software have been made [3]. However, these are unlikely to account for the unique dynamics of the interdisciplinary research software environment and therefore the relevance and impact remain unknown.

Co-production is a promising research paradigm for addressing these criticisms. Co-production involves researchers working individuals from underrepresented groups throughout the research process to produce meaningful research outputs and effective initiatives [5]. It emphasises the importance of collaboration and partnership between researchers and those who have lived experience of the topic at hand and who will be impacted by research outcomes [6]. However, a significant barrier to the inclusion of underrepresented voices in co-production is the emotional load placed on participants due to the complex interplay of individual and societal influences that govern interactions between underrepresented groups, researchers, and policymakers [6]. Therefore, there must be careful consideration of the approach taken towards methodology when co-producing initiatives, acknowledging that individuals with different identities and backgrounds hold distinct life experiences, values, and interpretations. A more nuanced and in-depth understanding of their experiences is required, and so a more responsible method of data collection is necessary.

In this paper, we aim to provide an overview of responsible practices for exploring the experiences of underrepresented individuals who write software for research purposes, either in RSE roles or as researchers. We present the findings from semi-

structured interviews with eight higher education professionals with expertise in engaging marginalised groups and place our findings in the context of the current literature base. The findings from this research are applicable to research with underrepresented individuals both within RSE and more generally. Additionally, RSE-specific recommendations have been made, where relevant, to provide the most actionable guidelines as possible for the RSE context.

Background

There are multiple factors that contribute to the lack of diversity in roles which involve research software. Stereotypes and bias contribute to ongoing underrepresentation, with the assumption that certain groups are perhaps less capable or interested in writing research software, leading to potential candidates being deterred from pursuing RSE careers [7]. A scarcity of visible role models who belong to underrepresented groups further makes it difficult for individuals to align with these roles, reinforcing the perception that RSE is a field for a specific demographic [8]. Finally, bias in RSE hiring and practice may lead to favouring candidates who have demographics typical of previously hired RSEs and managers, whilst ongoing bias in RSE practices may limit the desire of individuals to associate themselves with the RSE community [1]. In particular, individuals with intersectional identities (having multiple underrepresented characteristics, such as race, disability, and gender), face heightened challenges due to this bias.

Diversity in RSE roles offers two-way benefits: those from underrepresented groups can gain the greater workplace resilience and positive professional outcomes predicted from adopting an RSE identity [9]; and the team and project gain broader perspectives and problem-solving approaches [3]. A more diverse team can stimulate creativity and innovation, resulting in more robust solutions. Furthermore, a more diverse team can promote better communication and teamwork, culminating in better outcomes and software that can meet a more diverse range of users' needs [10].

The lack of diversity in RSE roles has resulted in a lack of knowledge on why underrepresented groups are not pursuing, aligning, or obtaining positions in this field, which itself then perpetuates the lack of ability to address the diversity issue [7]. This is especially the case for those with intersectional identities, whose experiences often remain underexplored. Without a comprehensive understanding of the perspectives and experiences of underrepresented groups, it is challenging to pinpoint root causes and develop effective

strategies for increasing diversity and inclusivity. This reinforces the cycle of limited diversity. Breaking this negative feedback cycle requires concerted efforts to collect data on underrepresentation and improve policies and practices to address ongoing challenges.

Yet identity-based research, where the work is focused on one or a combination of personal characteristics such as gender and race, can place an emotional and psychological burden on research participants [6] as they are expected to share sensitive and emotional information about their lived experiences. Participants may also feel a pressure to represent their entire group, even though their experiences may not be universal, and there may be deep rooted issues around power balances between the researcher and participant [5]. Additionally, individuals may experience fatigue from being involved in previous identity-based research projects, particularly if these have not led to a tangible positive impact for themselves or their identity group [6]. They may also be concerned about how the experiences they have shared are being used [5].

Identity-based research is a valuable tool that needs to be utilised within the RSE context, however steps need to be taken to minimise the burden placed on participants whilst ensuring effective outcomes. In this paper, we will explore responsible research methods that account for the emotional burden and power dynamics within research and suggest actionable steps that can be made in the first instance.

Research design

Our diverse six-member research team was comprised of underrepresented individuals with varied personal and academic backgrounds and included both activist and academic perspectives. Two team members had RSE experience (AB, CJ), four had experience of social-science methods (AB, CJ, AA, MT) and four had experience of running inclusivity initiatives (AB, AO, CJ, RM).

The team encompassed Asian, Black, White, and multiple racial groups. All team members identified as female, and the team included neurodivergent individuals, different nationalities and religions. Sexual orientation was not disclosed. A breadth of age-related views was present in the team, however none of the team members were over the age of 50. Four of the team were students (undergraduate and postgraduate) and two were members of staff at post-doctoral and professorial level. Including both insider and outsider perspectives within the team aided this work's validity, allowing for more nuanced and in-depth understanding of the topic. Insider perspectives came from shared

experiences with our interviewees, such as race, ethnicity, or culture, while outsider perspectives came from differences in social class, background, or power dynamics created by the research process.

Despite the diverse composition of our research team, there are notable gaps in representation for example, physical disabilities, age, and availability (e.g. due to caring duties). While it would be practically difficult to include all marginalised groups within a team, the lack of diversity in some dimensions may limit this papers applicability for those groups not represented. In particular, this paper has a strong focus on gendered and race related perspectives. However, it still seeks to be relevant to all underrepresented groups by providing guidelines that are broadly applicable.

Our research team also does not include anyone who has experienced being fully excluded from the RSE community. This introduces the risk of survivorship bias in our findings whereby the views and experiences of those who are from the most marginalised groups are not represented. However, all team members had experience of discrimination and being in a minoritised setting, and two team members have experienced this within professional RSE-related spaces. Even given our team make-up, there is still the need for further research that actively includes highly marginalised voices to build a more comprehensive understanding of the issues at hand.

The data collection followed an iterative approach with ongoing peer reviews and weekly team discussions, ensuring reliability and validity despite the small sample size. As part of this approach, it was important to co-create an open team space for shared learning, regardless of level of research experience or qualification [6]. This included us collaboratively designing and embracing a team ethos that exemplified our desired RSE culture, aiming to co-create an inclusive and creative environment.

We used semi-structured interviewing, rather than a survey, to allow for in-depth knowledge and lived experiences to emerge. Targeted sampling yielded eight higher education professionals within our home institute with knowledge and experience of engaging with underrepresented communities. We sought perspectives from experts in different research fields and those with responsibility for EDIA in the Higher Education Institute, with varied experiences and backgrounds to provide more in-depth, information-rich findings that enhanced generalisability, especially considering the small sample. 3 of the participants were early career researchers; 3 were senior academics; 1 participant had a strong research background and was also responsible for EDIA in their faculty; and the final partici-

part worked in the institute-wide EDIA team. For ease, we will refer to these professionals as ‘experts’ within this paper.

It was important that we did not replicate any barriers that are present for underrepresented groups in the RSE community within our own research. As such, we took steps to reduce the research fatigue potentially experienced by any of the expert-participants from underrepresented groups and the research team itself. First, all the questions in the interviews remained strictly within professional boundaries. Second, the participant information sheet, consent form, and pre-interview preamble served as an important mechanism for building rapport and trust with the expert-participants. Third, members of the research team debriefed with the research lead (AB) after each interview to provide socio-emotional support. The research lead, herself, was supported by an external coach.

The interviews lasted around sixty minutes, and the audio recordings and transcripts were subsequently analysed. Each interview was analysed by multiple researchers and the team collaboratively discussed key themes and findings. Peer-reviewed analysis ensured multiple perspectives and the opportunity for reflexivity (exploring how each researcher’s identity impacts the analysis process) leading to greater understanding of the findings.

Research findings and RSE recommendations

In the following sections we discuss the research findings and transpose them into an RSE context to offer related recommendations. We start by presenting a brief introduction to co-production, the recommended over-arching research paradigm, and then offer ten guidelines for engaging with underrepresented groups in RSE. The first four guidelines discuss trustworthy communication and long-term relationships, and they contain the most RSE-specific actionable recommendations. Guidelines 5 and 6 reflect on culturally sensitive research practices; guidelines 7 to 9 explore positionality, mindfulness and researcher training; and finally, guideline 10 looks at equitable relationships. In guidelines 5 to 10, the actionable recommendations are generally applicable but are nonetheless of importance to the RSE context. The guidelines can be read consecutively, or the reader can jump to those that look most relevant to their work or interests.

Co-production and participatory action research

All eight of our interview participants, regardless of professional level or background, emphasised the importance of approaches aligned with co-production. Co-production involves participants, professionals, and academics working together in equal partnership and sharing responsibility for knowledge and outcomes. It sits within the Participatory Action Research paradigm - a cyclical approach that is rooted in activism and has four principles: cooperation, participation, equality, and co-production [5]. For ease we will use the term co-production in the remaining of this paper to also encompass the wider Participatory Action Research approach.

Co-production is well suited for identity-based research in the RSE community as it seeks to promote actionable social change through building trust and empowering RSEs from underrepresented groups to guide research goals and outcomes, thereby elevating their voices and experiences and making their needs central to the process. Instead of those who face challenges to inclusion being passive subjects from whom information is extracted, they become active collaborators. In this way they can contribute to the identification and reduction of the barriers that perpetuate their underrepresentation [6]. Co-production also places an emphasis on avoiding duplication of external power imbalances within the research process that would further marginalise underrepresented RSEs [5].

Guideline 1: Develop strong community partner collaborations

One of the key findings from our research was the importance of open and ongoing communication with those from the underrepresented groups that the research aims to serve. The experts we interviewed recommended engaging with community partners to achieve this. Community partners are involved in all stages of the research process, including giving input and guidance to the research goals and methods [6]. This allows the most appropriate and meaningful research questions to be asked and helps maintain ongoing engagement. Community partners are also often trained to run interviews and focus groups, supporting participant engagement through reducing formal boundaries and power dynamics. Additionally, they can support participant recruitment through their already established networks. This is particularly important within an RSE context as potential participants are likely to be distributed across a range of disciplines,

and there are currently no formal training programmes through which to gain reach. There are also likely to be researchers who do not yet identify with the RSE community but who write software for research purposes. Discussions with community partners can help identify mechanisms for reaching this group.

In RSE terms, community partners would share characteristics (race, gender, or sexual orientation, for example) with underrepresented groups in RSE and already be embedded within RSE networks. Alternatively, they could be researchers or research related professionals who write software for research purposes and have connections to research societies or networks for underrepresented groups. RSE-specific implementations of this guideline are employing RSEs from underrepresented groups as part of the research team or collaborating with organisations such as R Ladies or Women in High Performance Computing to co-host focus groups.

Guideline 2: Take time to build trust

Building trust was identified as vital for ensuring engagement with underrepresented groups for positive outcomes. One of the experts coined this process as 'tea and biscuit time' referring to the time spent getting to know the people that the research wishes to serve. This both improves the researchers understanding of the wider context and ensures that the participants hold realistic expectations of what the research project can achieve, reducing the likelihood of a loss of trust later in the process. This is in-line with previous research that indicates it is vital to take the time to show respect, have authentic conversations and treat participants as equals [6].

Within an RSE context, attending RSE-related conferences and workshops would give researchers informal opportunities at break-times to gain an understanding of RSE culture, and allow the researcher to become known by the RSE community. Alternatively, conversations with individual members of the RSE community could be initiated through organisations such as the Software Sustainability Institute, Society of RSE or Institutional RSE groups leads. Complementing this, time can be allocated within research interviews and focus groups for more informal discussions to engender familiarity and understanding between researchers and RSE professionals.

Guideline 3: Provide transparency of information and process

Strongly related to trust is clarity and transparency of information and process. This involves setting realistic expectations in terms of impact, resources, and a timeline of the research with community partners and participants. This is important as participants are often unaware of the challenges in transferring research knowledge into policy and practice [5]. Moreover, individuals may be at risk of experiencing research fatigue due to multiple requests from different research teams, particularly when they perceive a lack of tangible impact from their participation. Identification of practical elements relating to timescales can help manage expectations and maintain individual willingness to participate [6].

A participant information sheet, made available prior to participants engaging, is the commonly used mechanism for ensuring participants understand objectives and outputs, alongside data protection requirements, and will likely be required for ethical approval of the research project. Even though RSEs are familiar with research processes they may not have experience of social science methods. Therefore, it is still important to make time for open discussions, such as the 'tea and biscuit time' mentioned above, to address any misunderstandings. An additional actionable example is to provide a video prior to any engagement, explaining the objectives, methods, timeline, and expected outcomes of the study. Online platforms used by RSE networks could be used to promote the video and allow potential participants to ask any questions and gain a clear and realistic understanding of the research process, promoting transparency and clarity from the very start.

Guideline 4: Develop long-term initiatives

Establishing long-term strategies in identity-based research can enable sustainable impact and greater ownership for underrepresented groups. The experts we interviewed discussed working in collaboration with relevant third-party institutes to honour the relationships built during the research beyond the restrictions of grant-based funding. These collaborations can also enable more balanced power dynamics and wider dissemination of the research, as well as providing a launch pad for maintaining ongoing initiatives after the research phase itself has completed. In a UK RSE context this could include working with the Software Sustainability Institute or the Society of RSE.

This approach could, in particular, benefit the often-scattered RSEs and computational researchers by linking them into networks, thereby giving them a space to discuss issues and shared experiences beyond the research. The literature [7] also recommends engaging with community leaders to gain support for inclusivity values and principles as required to ensure effective and sustainable change within their community. An example application of this guideline could include working with the Society of RSE to support a mentorship programme and understand the benefits for underrepresented groups.

The experts also highlighted the benefits taking part in a range of networks and awards that recognise inclusivity efforts and provide a framework for improving inclusivity within institutions (for instance, Athena Swan or the Race Equality Charter in the UK). These awards engender a commitment to work towards change that might otherwise not be present. Engagement with external organisations can also support sustainable change beyond the project itself, by connecting individuals to the broader system, such as policy makers [6]. Crucially, this involvement has no definite end and provides a fluid space for ongoing feedback into the wider system, and a forum for the approach itself to be discussed.

Guideline 5: Co-design a code of conduct

A code of conduct is a set of rules that encompass organisational values and behaviour guidelines related to inclusivity. Codes of conduct are already used at RSE events to protect marginalised individuals at risk of discrimination and should include an understanding of intersectionality. Codes of conduct can be co-designed by the research team and community partners at the start of the project and then returned to within each meeting. A tried and tested code of conduct, such as that developed by the Software Carpenters, could be used as a starting point whilst ensuring that it is tailored to be specific to both the study and the demographics of the individuals in the project. Thought also needs to be given on how to manage reported breaches of the code of conduct appropriately for all parties involved. An example of a code of conduct item is stating that harassment and exclusionary jokes are not appropriate.

The equivalent mechanism within participant engagement activities are the guidelines discussed at the start of focus groups, which are often co-created by participants and researchers at the start of the activity. Examples of common guidelines are encouraging

participants to give space for all voices to be heard and giving permission for participants to choose to not answer questions.

Guideline 6: Create culturally responsive practices

Finding culturally sensitive venues demonstrates to participants that researchers are open to hearing their lived-experience and will give validity to their viewpoints. Within a research institute, RSEs are likely to be reminded of and constrained by institutional power dynamics, including the historical contexts of those institutions. Instead, identifying alternative venues may provide a more open space for them to share their experiences.

Culturally responsive practices also include avoiding conducting research during specific times of the year that fall on cultural/religious or other community celebrations, or when they may exclude those with parenting responsibilities [6]. There is also a need to consider the cultural beliefs, values, and norms of the participants within the choice of wording and phrasing used in the research. These cultural considerations can strongly influence a person's sense of inclusion and belonging [1]. Following from this, it is important to develop cultural humility, with researchers acknowledging their commitment to ongoing learning about best practice and allowing participants to recommend improvements through effective feedback mechanisms.

Additionally, the question of whether the research process is valuable to the participant should be kept in mind throughout the research by considering whether the participant is benefiting from the experience, and organising activities that are influenced by the backgrounds, history, or identity of the group. This can equally apply to participant groups based on race or ethnicity as to respecting the culture and history of LGBTQ+ or disabled people. For RSEs, incorporating preferred social media networks or collaboration tools, alongside more conventional mechanisms could allow the participants to contribute through platforms with which they already have familiarity.

Guideline 7: Understand positionality and challenge assumptions

Positionality – understanding how the researcher's identity, experiences and perspectives influence their research - is central to identity-based research [6]. The experts we interviewed emphasised the importance of

acknowledging positionality and challenging biases to produce findings that are grounded in the participants' lived-experience. Positionality is influenced by factors such as gender, sexual orientation, ethnicity, race, religion, socioeconomic status, disability status, political beliefs and more. Within RSE culture, aspects such as career stage and contract precarity should also be considered. Often, socio-cultural influences have been under-acknowledged in software engineering, with the development of computer science as a discipline being seen more as deterministic than due to contextual factors [11]. This can lead to the view that software engineering is outside the bounds of equity-based values.

However, research software tasks are embedded in socio-cultural prejudices and as a central asset in academic research, are influenced by large institutional structures in which research is embedded in [8]. Examples of this socio-economic influence include funding bodies in high income countries having more power to shape global research agendas; reviewer biases towards first author characteristics such as gender; and the use artificial intelligence in healthcare perpetuating health inequalities [12]. Research software also has epistemic dimensions, that is, the validity and scope of knowledge produced in academia using software is reliant on characteristics of that software such as its robustness, reproducibility and dissemination [2]. Who is writing the software and within what cultural environment, i.e. their positionality, then becomes a pertinent issue.

Common ways of approaching positionality, which are also relevant to the RSE context, are engaging in a reflexivity practice during the research process, such as using a diary; acknowledging the expertise of the participants and avoiding any condescension [6]; asking open questions; actively listening to participants; and including a positionality statement at the beginning of publications and other outputs. These practices can mitigate against researchers adopting a deficit mindset towards RSEs from underrepresented groups, incorrectly believing that they are lacking in skills or professional know-how [6]. Instead, exploring positionality encourages an understanding of the systemic barriers and behaviours that negatively impact the professional lives of underrepresented RSEs.

An additional suggestion from the experts we spoke to was for researchers to explicitly discuss their positionality and power dynamics with the participants during focus groups. Further to this, one expert recommended that researchers are also open about their own emotional responses within the research process to validate and show sensitivity towards the partici-

pants' lived experience and create an authentic space. Considering positionality should also extend beyond the data collection methods and include analysis and dissemination of findings.

Guideline 8: Cultivate a mindful research space

Historically, researchers have emphasised data gathering techniques without fully acknowledging the intricate relationship between these methods, the researchers' perspectives, and their learning processes, and this equally applies to computer science [11]. When research includes engagement with individuals from marginalised groups, this approach has the potential to become extractive and, in the worst cases, exploitative [5]. Co-production provides an alternative research paradigm that can lead to mutual benefits for participants, researchers, and wider society.

Co-production requires researchers to be aware of the power dynamic between researchers, community partners and research participants in all communications between these groups, whether in project meetings, focus groups or otherwise. Mindfulness, which can be described as a non-judgemental awareness of the present moment, can enable researchers to develop the sensitivity needed in these communications to foster a research space where all involved feel safe, dignified and valued. A mindful approach to participant engagement can also disrupt barriers to inclusion such as the sense of urgency, insularity, and the power imbalances that RSEs from underrepresented groups are likely to experience in the academic setting. Importantly, mindfulness fosters ethical decision making and a deeper understanding of identity-based research.

For example, the experts we interviewed who shared identity characteristics with their participant group found it easier to build rapport with participants but harder to define their professional boundaries. In this case, mindfulness can support researchers to respond appropriately to participants. Some of the experts also noted, contrarily, how their identity as someone from a marginalised group was challenged when they were viewed by the participants as the representative of a large institution with, sometimes incorrectly, assumed privileges. Here mindfulness can support researchers to understand when they need to provide clarity to participants or would themselves benefit from support.

Participants can also be encouraged to be mindful of their own needs and those of other participants', such as ensuring space for all participants to speak and share their perspectives. They can also be empow-

ered to define their own social norms, such as moving or sitting as they wish, which can provide a sense of freedom of expression and ownership of the space. It is also important for participants and researchers to be mindful that multiple viewpoints will often exist within the group and within individuals themselves. This can support participants' identities as both successful professionals and members of an underrepresented group. To put this guideline into practice, either within the research team or with participants, a mindfulness exercise, such as a 3-minute guided meditation, can be included at the start of any research activity.

Guideline 9: Provide broad training opportunities

Co-production requires ongoing learning at multiple levels of professional skills, and personal development. Cultural humility and cultural awareness training are essential for researchers engaging with underrepresented RSEs. Cultural humility entails an ongoing process of self-examination of one's cultural beliefs and identities whilst simultaneously learning about another culture [6]. It supports the addressing of historical biases in research and recognises importance of multiple perspectives. Additionally, unconscious bias training, if suitably well engaged with, can educate researchers on how their assumptions can manifest in exclusionary behaviours towards those from underrepresented groups involved in the research process [8]. This training should vividly illustrate the real-world impacts of being underrepresented and associated discrimination, marginalisation, and challenges on individuals' everyday lives and interpersonal relationships.

The experts we interviewed also suggested that conflict resolution training could provide essential skills training for researchers conducting identity-based research for understanding the dynamics of identity-based conflict, fostering empathy and understanding, de-escalating tensions, and promoting constructive dialogue. By gaining competences in these areas, researchers can navigate complex situations that may arise when working with underrepresented groups. Finally, the experts we spoke to also emphasised the value of mentorship from researchers with more experience of working with marginalised communities.

Guideline 10: Ensure an equitable research process

During the interviews with experts, a clear consensus emerged that it is crucial that individuals from

underrepresented groups are recognised for their contribution through professional opportunities and crediting, well-being support, financial remuneration, and responsible disengagement mechanisms.

Remuneration is particularly important when working with those from underrepresented groups as these individuals are often expected to take on inclusivity work without compensation. Offering well-being support, such as signposting to peer-support groups and counselling services, acknowledges that sharing lived experiences may have an emotional impact on participants' emotional health. However, it is important for the researcher to do the work of finding support options that are appropriate for the background and characteristics of the participant groups, with the guidance of community partners.

The experts we spoke to emphasised the importance of defining a disengagement plan early in the process. For example, initiatives that involved underrepresented individuals sharing their experiences through creative methods, such as blog writing, offer participants a continued mechanism through which to raise awareness of the research and its findings. Creative outputs also present opportunity for expression outside of the constraints of western dominated academic practices and can allow engagement with a broader audience. Additionally, ongoing communication of opportunities could be offered as part of the disengagement plan, such as creating a mailing list to share professional training opportunities in RSE, RSE roles or mentorship programmes [7].

Conclusion

In this paper, we have presented ten guidelines to support responsible research methods for developing evidence-based inclusivity initiatives in the research software community. Our approach demonstrates the benefits of a cross-disciplinary project, bringing social science expertise into the research software engineering context, and of working within a diverse research team. This resulted in a shared learning environment where the multiple perspectives revealed a deeper understanding of what responsible research looks like when working with underrepresented groups. Future work will involve applying these guidelines to explore the barriers and enablers to underrepresented groups utilising good research software practices. We recommend engaging a growth mindset when working these guidelines, i.e., continually evolving an understanding of how to work responsibly with different underrepresented groups in research software.

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