Interdisciplinary collaboration in higher education: Improving end-user experience in children's programs

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While higher educational institutions prize interdisciplinary research collaboration, how it is supported is key to its success. In this discussion paper, we explore the evidence base to support interdisciplinary research collaboration in relation to our team's experiences with our project, output and impact. Project end-users are those who educate and support children from defence, veteran and first responder families (service families), who encounter unique stresses. Our team co-designed and co-created free, online, research-based resources to address these issues. Initially, the accessibility of these online web-based educational resources was found to be inadequate. To improve on the web-based resources housed on a digital learning platform, the team connected with a machine vision digital health researcher to co-create a free, anonymous, personalised program for users. Here, interdisciplinary approaches were essential to help solve problems with end-user experience identified in the initial evaluative feedback about the digital learning platform. To address these, a data retrieval system was generated to create personalised programs. Participants were affected communities and partners, including educators, partner providers, parents and support workers. Preliminary results showed an improvement in program engagement. Additionally, the team has received positive qualitative feedback about the end-user experience showcasing the importance of interdisciplinary approaches in elevating online educational support. These outcomes will be of interest to researchers, management and policymakers.

Introduction

Interdisciplinary approaches are being called for to address complex issues in education, health and mental health, because complex human problems show little regard for disciplinary boundaries (Carr et al., 2018; Muneer, 2023). For example, this includes matters such as Covid-19 related mental health (Przybylko et al., 2021) to deliver the best possible health outcomes. In Australia, the Australian Mental Health Professionals Network (MHPN) provides programs to support and encourage interdisciplinary health

care practice. An evaluation of the sustainability of this program shows that it is beneficial (Fletcher et al., 2014), assuming key criteria are met, such as good leadership, resourcing, and policy context (King et al., 2013). A review of interdisciplinary teams (Ghebrehiwet et al., 2016) suggested that they can improve patient outcomes (e.g., fewer adverse effects, lower mortality rates), staff satisfaction, and lead to cost savings.

A randomised control trial (Przybylkoet al., 2021) showed that an online interdisciplinary intervention was better than waitlist control when it came to mental health and emotional wellness measures, however, a *treatment as normal* control group was not employed. A study using an interdisciplinary program showed improved outcomes for various measures of cardiovascular risk compared with a treatment as normal control group (Goyer et al., 2013).

Despite the clear need for interdisciplinary research, we are still seeing very narrow views of the types of research, as indicated by Viera (2023). Her summary of the main types of research collaboration included intra-institutional, extra-institutional, and collaboration with government, private industry and international researchers. It excluded research with practitioners, those with lived and living experience, and notably, interdisciplinary approaches. Velasco (2023) argued that this type of thinking is systematic, "because of disciplinal divisions within universities, research practices tend to be siloed, fragmented, and, sometimes, inadequate" (p. vii). Conversely, Benz and Rossier (2022) argued interdisciplinary research is so important that it is a "potential mode of distinction" (p. 179) because their study revealed "a real differentiation emanates not from the frequency but from the discipline of collaborations" (p. 202).

Despite this exclusion from lists of research types, it seems clear that interdisciplinary research collaboration offers something new and more than just the sum of its parts. It may offer new ideas, new methods, and new perspectives. Our discussion paper examines what an Australian based interdisciplinary research collaboration group has offered and is offering to support children with education programs from potentially vulnerable families, such as children from military, veteran and first responder families (May, 2023).

Interdisciplinary research collaboration

Given the importance of interdisciplinary collaborations to deliver better outcomes for affected communities and partners, it is not surprising that a research authority such as the Australian Research Council (ARC) has stated a commitment to:

> ... fostering excellence in research that traverses or transcends disciplinary boundaries, and which synthesise or integrate methods and knowledge from multiple disciplinary domains (ARC, 2016, p. 3).

One of the reasons that society needs interdisciplinary collaboration is because the key challenges facing society require complex and sustainable solutions (Eykens, 2022; Nordgreen et al., 2021). According to Cho et al. (2020), such approaches are key to building our combined capacity to improve social wellbeing. These approaches can assist

us when tackling key challenges such as providing educational and mental health support to regional, rural and remote (RRR) communities. Despite major challenges, Nordgreen et al. (2021) identified a lack of understanding about how interdisciplinary teams work and how to be effective and productive within these teams to overcome challenges. Interdisciplinary teams might involve researchers from various disciplines addressing different challenges and employing methods more likely used by one or more disciplines. Interdisciplinary teams are more likely to translate their knowledge using applied or innovative research outcomes from one discipline into another. This can include research-based educational resources, non-traditional research outputs, and research-based news articles (see Rogers, 2024).

Benefits and likelihood of interdisciplinary research collaboration

There are many reported benefits of interdisciplinary research collaboration. This includes nuanced and improved outcomes that are more difficult to achieve using a singular discipline or approach (Lanterman & Blithe, 2019). Additionally, Wen et al. (2020) emphasised this approach "can also reveal robust theoretical frameworks with which to consider institutional, social, environmental, economic, and political trends that affect overall health and well-being" (p. 311). Interdisciplinary teams have the potential to address major societal challenges by including additional perspectives and more affected communities and partners than single disciplinary research teams. As Hytonen-Ng et al. (2022) reflected about their interdisciplinary research collaboration 'this allowed the researchers to … question some of the taken-for-granted views' (p. 1424). Taking this approach further, Hains-Wesson and Ji (2021) revealed the benefits of working in interdisciplinary ways with students as a way to open their minds to new ways of thinking.

Zhang et al. (2023, p. 2095) and colleagues found that "when academics believed that IDRC (interdisciplinary research collaboration) can solve problems, produce innovative results and expand academic fields, their collaborative practices can be significantly promoted". Interestingly, the factors influencing whether an academic is likely to engage in interdisciplinary research collaboration include gender (being female), a higher level of work experience outside of a university or at different universities, higher competency and training in their own discipline, higher levels of generalisability and complexity of the research field, effective leadership skills, an enabling culture and structure, and supportive decisions made at the organisational level of the institution (Friedman & Worden, 2016; Lindvig, 2018; Zhang et al., 2023).

Challenges of interdisciplinary research collaboration

Despite the benefits, the challenges for researchers are many. Interdisciplinary research collaboration requires extra time to ensure team members understand and have time to learn about the different approaches used by various disciplines (Carr et al., 2018; Parti & Szigeti, 2021). Ample time is required to create a shared understanding of the subject and the salient ideas, and this can be challenging due to stretched academic workloads. As Craig et al., (2024) identified, interdisciplinary projects can take longer, and during this time, academic roles and workload can change, meaning the level of commitment to

projects can vary. Conversely, it could be argued that engaging an interdisciplinary team early in the project could make the project more efficient due to the potential earlier detection of necessary improvements in developing resources or procedures, although this is not evident in the literature.

Another challenge facing interdisciplinary teams is that publishing can be challenging due to harsh reviewer criticism from different journals within certain disciplines. Editors might view the article as less pure and, therefore, perhaps less robust, and some editors are not open to mixed-disciplinary approaches (Lanterman & Blithe, 2019). Publishing outside of your own field can be challenging within certain faculties, as there is often an imperative to improve their research rankings within their own discipline. Furthermore, Nordgreen et al. (2021) highlighted other challenges, including involving end-users from different sectors and cross sector collaboration. Data security and ethics protocols across various disciplines might be quite different, and project timing might be challenging due to different academic timetables in different disciplines and across institutions.

This paper contributes to discussions surrounding the need for excellence in research across disciplinary boundaries. As Wen et al. (2020) stated, "a bridge is clearly needed to carry medical knowledge to disciplines such as the social sciences; this connection will benefit the public" (p. 312). There are significant advantages to research projects that take an interdisciplinary approach, that is, including team members from a variety of disciplinary backgrounds. These include the development of more robust outcomes which better accommodate trends across a range of fields. In this way, interdisciplinary teams have greater potential to find innovative solutions to problems. In order to achieve these positive outcomes, however, researchers need to find ways to address and overcome the challenges of working within interdisciplinary teams. "Such endeavours will amplify benefits for researchers, readers, and communities while raising awareness", according to Wen et al. (2020, p. 312).

Aims of the present discussion study

There is a clear need for Australian educational resources grounded in the culture of Australian military families (Johnson & Rogers, 2023) and of first responders. Such educational resources must be accessible and appeal to different age groups. The present study examines different educational resources from an Australian interdisciplinary research collaboration group, including the improvement of these resources.

Research context

Our baseline study revealed that 61% of parents from defence (currently serving military) and veteran (ex-serving) families reported feeling only partially confident about supporting their children in dealing with the stresses of military family life (Rogers et. al., 2023). Over a third of the parents also reported that their children rarely cope well on two wellbeing indicators combined (adapting to new situations and sharing negative emotions with others; Rogers et al., 2023). The parents also expressed their frustrations in accessing

support services that considered the realities of the defence experience, including frequent relocations, regular, prolonged and sometimes unexpected periods where one parent is away for work, and parents who might have service-related physical and/or mental health conditions (May, 2021). Similar experiences are reported by first responders who also manage frequent transitions from a two-parent to one-parent family as one parent leaves for an extended period to go to work (Dittman et al., 2016). These challenges with access to relevant services are exacerbated for families situated in RRR locations who struggle to connect with services due to long waiting lists and the need to travel to access specialist services.

Our team's efforts to address resource gaps

To help address this resource gap (Rogers et al., 2021a; 2021b), our initial *Child and Family Resilience* (CFRP) research team of educational researchers gained philanthropic funding to create free, research-based intervention resources to assist young children (2-8 years) from defence and veteran families. Through the inclusion of affected communities and partners steering committee, our research team expanded to include a military sociologist and an inclusion support worker, both with lived experience in military families. Additionally, a family support worker with both expertise and access to veteran families assisted our team in the co-design and co-creation process. The steering committee also included a social worker and suicidologist, a school chaplain, parents from military families, and an early childhood educator who taught children from these families, all of whom had lived (and living) experience and were able to contribute to the resources. Additionally, the steering committee had family support researchers and psychologists to support the team's efforts in research (Rogers et al., 2021b). Along with the volunteer steering committee, other affected communities and partners volunteered their time to create these educational resources, including academics, volunteers with lived (and living) experience and community members.

These web-based educational resources (see https://ecdefenceprograms.com/modules/) included: (a) twelve research-based children's eStorybooks and interactives featuring lived experience narratives; (b) accompanying downloadable educational activities to accompany these eStorybooks; and (c) multimedia modules for parents, educators and support workers to improve their knowledge, competence and confidence to support these children (Table 1). The resources were designed to support children's knowledge and understanding of what is happening in their families while supporting their educational development. This latter is needed because their education is often disrupted due to the frequent relocation these children experience. The resources also provide a soft landing into mental health support and improve children's psychosocial development and mental health literacy. Resources are still being created with affected communities and partners organisations.

Table 1: Research-based resources in the Child and Family Resilience Programs (CFRP)

| Category of resource	Sub category	Images
Research-based children's e-storybooks based on lived experience narratives	Parents working away	
	Military family life	
	Commemorative services that children from service families often need to attend	

	Parents with service-related physical and mental health conditions or moral injury	
Interactives	Interactive versions of eight of the e-storybooks	
Accompanying educational activities	Accompanying most e-storybooks	
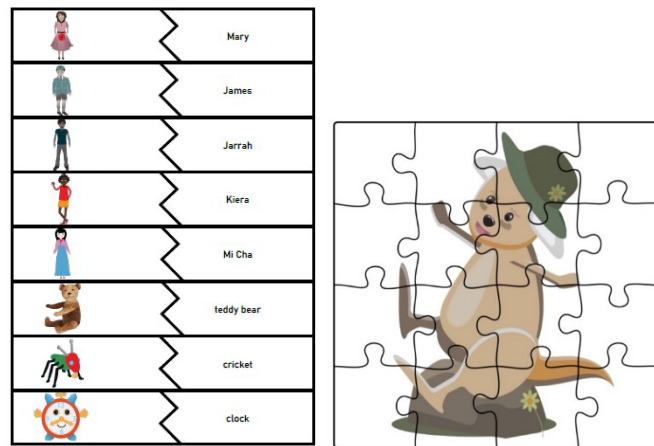
Multimedia adult modules	Parent program	
	Educator program (early childhood educators and schoolteachers)	
	Support worker program (family workers, social workers, clinicians, school counsellors)	

Evaluative feedback on the web-based resources was useful, and we were able to implement most of the suggestions parents, educators and support workers provided within our limited project budget and available resources. Although we provided indexes at the start of each set of resources to address concerns about the end-user experience, we were unable to address the more complex issue of addressing individual needs and the amount of time they needed to spend finding suitable resources for the changing needs of the children they were supporting. The majority of the feedback was positive, and the web-based educational resources were popular with educators, parents and support workers. To this end, the research team and volunteers won the 'Distinctive Work' award from the Australian Council of Humanities Arts and Social Sciences for the e-storybooks and interactives, recognising the uniqueness of the resources that utilised lived experience narratives to support this potentially vulnerable cohort. This acknowledgement acted as an encouragement to find a solution to the more negative end-user feedback we were initially unable to address. This will be discussed in later sections.

Subsequent to when the initial web-based resources were created, tested, improved and released, the team expanded again in 2022 (see Table 2). After the lead author joined the Manna Institute, the research team started to collaborate with other interdisciplinary research collaborators committed to improving the mental health and wellbeing of those

from RRR communities. The Australian Government-funded institute fostered time through funding academic teaching buyouts and nurturing opportunities for interdisciplinary research collaborations to discuss challenges we faced in our research projects, such as implementing aspects of the feedback our CFRP team thought we were unable to address. Working with a machine vision health researcher within the Manna Institute sparked initial solutions to the challenges mentioned and outlined in more detail in the next section.

Table 2: Listing of the different disciplines of the team members
and corresponding roles in the interdisciplinary team from 2022

Discipline(s) of team members	Role
Early childhood; military family researcher	Coordination of the co-design process with affected communities and partners; ensuring the design used language that was assessable and logical to educators and families
Machine vision technologist	Knowledge holder; creating and designing the initial idea; liaison with the full stack developer (technician); explanations to the team about what was possible
Communication; military family sociologist; lived experience	Feedback about the categories, codes and language used in the co-design
Psychology; education PhD student	Administration; feedback, designing the second version of the personalised programs
Education consultant; lived experience	Feedback about the categories, codes and language used in the co-design
Support worker; lived experience	Feedback about the categories, codes and language used in the co-design
Full stack developer	Design; coding; communicating to the team the limitations and possibilities of the solution within budget

Methods

Piloting the resources

After peer and affected communities and partners testing and improvements, the web-based resources were formally piloted and evaluated by parents, educators and support workers. The resources were then improved using this data, then released in 2022. They are used and recommended by Australian Government support agencies and organisations for military and veteran families, along with early childhood services and schools. Due to affected community member's and partner's requests, we are adapting the multimedia modules for first responder and remote worker families with our partners. Also addressing affected community member's and partner's requests, the modules are also being expanded to include activities for 9 to 12-year old children. Affected communities and partners from other countries also asked to have resources created to suit their families. To address this, the Canadian Institute of Military Veteran Health Research (CIMVHR)

and their partners are currently adapting our research-based children's e-storybooks for their families, and as a result of affected community member and partner requests, new resources are being created through partnerships with Australian and international partner organisations.

Feedback related outcome: Static digital learning platform

Overall, the suggestions to improve the resources were useful and applied. This included ways to make the resources more user-friendly, ways to update and adapt terminology and the need for further context or explanation. Participants also said they didn't want to have to log in to the website, so housing the resources on an open access digital learning platform (Moodle) was necessary. It should be noted that the target cohort are reluctant to access services that might identify them. This is due to a military culture that promotes stoicism, stigma and a perceived chance that the information could filter back to their employer, which could potentially reduce their career prospects.

Some end-user feedback was interesting, but at the time, we felt it might be beyond the budget and scope of the research team as academics. For example, some participants asked for us to contact them weekly, highlighting one resource for them to try. They asked for the resources to be housed in an app, with alerts to be sent each week. Others requested a weekly set of resources to work with their child, or the children they supported. We thought this might be best achieved in a service or educational support setting, with educators or practitioners who could work with children individually or in small groups. Several participants highlighted how many resources there were, and that although they were high quality and useful, it took them a long time to find what they needed for their situation, and this was problematic because they were time poor. Additionally, they said the needs of the children changed over time, depending on what was happening in the family.

The static digital learning platform

The legacy system in place was a static digital learning platform with limited user interaction options. Users were directed to this site via our website, social media accounts or research-based media articles. Users could access the platform's content, but there were no features for dynamic data retrieval or user feedback. This presented several limitations, such as difficulty in finding specific information and a lack of user engagement. Users struggled to locate the relevant educational resources they needed, leading to frustration and potential disengagement. Without end-user experience feedback, it's challenging to identify issues with the digital learning platform's navigation, layout, or user experience. The target users may require more engagement and interaction to address their specific challenges adequately.

While a static platform served as a basic online presence, it fell short of meeting the diverse and dynamic needs of families and their educators and support workers. To better support these users, there was a need to invest in a more interactive, user-friendly, and dynamic online platform that allowed for educational resource selection, real-time

updates, user feedback on end-user experience, and engagement features tailored to their unique challenges and requirements.

New resources

One potential solution considered for personalising this site had been the inclusion of user accounts. However, while user accounts and login functionality could offer benefits in certain contexts, several valid reasons existed for not implementing them in this particular project. This encompassed resource constraints, potential user engagement challenges, academic workload limitations, privacy considerations, a user-centric approach, and the paramount need to establish trust with the target audience. Thus, given that the project's primary focus likely revolved around delivering valuable support and educational resources, it had been determined that these objectives could be more effectively achieved without introducing the added complexity of user accounts.

Transformations from the old to the new

Recognising the need for change and improvement, our methodology for transformation involved integrating a data retrieval system and implementing a user feedback mechanism. To engage in this study, ethics approval was gained from the University of New England Human Research Ethics Committee. Drawing inspiration from the principles of user-centred design (Abras et al., 2004) and information retrieval (Vijayarajan et al., 2016), we embarked on a systematic approach. We developed a dynamic digital learning platform integrated with a data retrieval system which we called 'personalised programs' (see http://program.ecdefenceprograms.com/). The personalised program feature brought forth several substantial benefits. This innovative system has proven to be highly advantageous for our project in numerous ways.

Firstly, it significantly enhances efficiency. The structured data retrieval system allows the system to swiftly access vast amounts of data from the internet. This efficiency is particularly critical in our research project, where the collection and analysis of data play fundamental roles.

Secondly, the system ensures a remarkable level of accuracy in information retrieval. It empowers us to retrieve precise and relevant information, a crucial factor in ensuring that our project's resources and support materials are based on the most accurate and up-to-date data available. Furthermore, it saves valuable time by automating the data retrieval process, reducing the need for manual searches. This time-saving benefit enables us to allocate our resources more efficiently, redirecting them towards other pivotal project activities such as content creation and engaging with our user base.

Thirdly, the system allows for the effective organisation of content from various sources, ensuring that the information retrieved can be managed and presented to users coherently. The user-friendly interfaces incorporated into the system make it remarkably accessible and easy to interact with, encouraging more individuals from our target cohort to access and derive benefits from the resources we offer.

Lastly, the system offers a high degree of customisation, allowing users to tailor their searches to specific criteria. This feature ensures that users find information that is most relevant to their unique needs, enhancing their overall experience and the utility of the resources provided by our project. To achieve these ends, we needed a cohesive and effective team that encompassed members with a broad range of skills from a wide variety of disciplines, including machine vision digital health, early childhood education, communication, psychology, support work and sociology.

Navigating multidisciplinary team challenges

Incorporating a data retrieval system and navigating multidisciplinary team challenges required clear communication, collaboration, and a shared commitment to the project's goals. With effective teamwork, a structured system, and a user-centred approach, the project could better serve families from defence, veteran, first responder and remote worker backgrounds who face challenges accessing synchronous supports as they move in and out of RRR communities.

In the context of our project, we encountered various challenges as a multidisciplinary team, and we developed solutions to address them.

Team challenges and solutions

1. Clear vision
One of the initial hurdles we faced was ensuring that every team member had a shared vision for the project. We recognised the importance of aligning this vision with our team's diverse multidisciplinary expertise. To overcome this challenge, we organised meetings and discussions to establish a common understanding and commitment to the project's goals.

2. Shared values
Identifying and promoting shared values proved essential in guiding our team's collaborative efforts. These values encompass research integrity, user-centred design principles, and a commitment to collaboration. By emphasising these shared values, we fostered a cohesive and purpose-driven team.

3. Communication protocols
Effective communication was paramount, especially given our multidisciplinary composition that was also multi-university and virtual. We tackled this challenge by developing clear communication protocols that outlined how team members should communicate, share information, and collaborate. Regular small working group meetings, status updates, and the use of collaborative tools facilitated efficient communication and information sharing.

4. End user engagement
Defining the meaning of "end-user engagement" in the context of our project and establishing ethical guidelines for user interactions presented unique challenges. We

understood the need to respect users' values, traditions, and privacy as integral aspects of our approach. By developing ethical guidelines, we ensured that our engagement with users remained respectful and aligned with our project's goals. For example, we discussed the needs and tradition of service families, their stoicism, and their strong preferences to access resources anonymously, then designed a solution that gave them that level of privacy.

Higher education institutional challenges and solutions

1. Sharing resources
Effectively allocating resources, including workload and budget, to support the project's objectives was a recurring challenge. To address this, we collaborated closely with institutions, exploring opportunities to pool resources when necessary. This collaborative approach allowed us to maximise resource utilisation.

2. Cross-institutional support
Bureaucratic delays posed challenges to institutional processes, such as obtaining ethical approvals, managing data storage, handling agreements, intellectual property (IP) management, promotion, and budget management. We resolved these challenges by establishing cross-institutional support mechanisms, including clear communication with our contractor and streamlining processes. This proactive approach reduced delays and ensured the smooth flow of project activities.

3. Time management
Recognising that multidisciplinary research projects, particularly those involving technology development, could be time-consuming, we allocated sufficient workload for research, development, and engagement activities. This careful workload management ensured that our project remained on track and met its milestones.

4. Flexibility
To accommodate the diverse schedules and commitments of team members, we embraced flexibility in our workload arrangements. This included attending meetings outside regular hours and allowing staff to take time in lieu when needed. This flexibility promoted a more inclusive and supportive working environment.

By addressing these challenges and implementing tailored solutions, our multidisciplinary team successfully navigated the complexities of our project, ultimately delivering support and educational resources to our affected community members and partners.

Results

In this section, we present the results of our survey to test the suitability of the educational resources on the static site, then our preliminary findings to test the suitability of the personalised programs (data retrieval system).

Static digital learning platform

In our initial survey testing the suitability of the resources, we had some questions about the end-user experience of the digital learning platform for our educators, parents and support worker participants (*n* = 16) within our anonymous post intervention survey. There was a low response rate to the mixed methods online questionnaire during the time of rolling lockdowns during the Covid-19 pandemic. While the participants had high praise for the content of the resources, half (*n* = 8) of the participants reported having trouble finding information on the site. The qualitative data also explained this finding in more detail, with participants saying:

> I found there was a lot of resources... perhaps too many... it looked like I'd have to do a lot of work to use these resources efficiently. I found clicking on the links a bit clunky and would have preferred just to flick through digitally or read a webpage rather than save links to my computer to access them (Parent).

> It's a good resource but it needs some refinement on development. An easily accessible app that sends weekly notifications to remind you of its resources would be a lot better for mum's trying to juggle everything in the kids world and full time work (Parent).

> I had a lot of trouble accessing and using the program. I'm usually not too bad with technology but I really struggled and gave up. So, I never got to use the program which was a little disappointing (Educator).

> It's a great concept - just needs some work on usability. Ideally it could be bundled with a family app, as I found the resources helpful for myself as a defence spouse as well as the kids. If there was a way to create a user profile to address each member of the family, … mental health info etc. for the serving member, community resources, mental health tips etc. for spouse and the age appropriate guides for each of the kids (Parent).

> The format of the resources needs refining as it's a bit clunky at the moment. The info is all there but a regular website rather than this style of layout would be easier to follow.

Preliminary results: Data retrieval system

Since launching the personalised programs (data retrieval system), there has been a much higher level of engagement with the digital learning platform resources. While we are waiting for formal feedback about the data retrieval system, we can share preliminary feedback that has been gathered from affected community members and partners and end users during the co-creation process. This has included comments about the usefulness, end-user experience, quality of resource and the design concept as categorised in Table 3.

Additionally, since recently launching the personalised programs, twelve participants (n = 12) have responded to our online feedback form about the personalised programs. Nine participants (75%) reported supporting a child/ren from a defence or veteran family, two (16.7%) supported a child/ren from a first responder family, one (8.3%) supported a child from a remote worker family, and three (25%) indicated they did not fit into these categories. The majority of participants identified as either parents/carers or support

workers (both 41.7%), and the rest identified as educators or that they did not fit into these categories (both 8.1%). Participants were asked to rate their experience using the personalised programs using a four point scale of 'excellent', 'good', 'average' or 'poor'. As depicted in Figure 1, a quarter (25%) reported their experience using the system was excellent, just over two thirds reported their experience was good (66.7%), and less than a twelfth said their experience was average (8.3%), and no participants reported a poor experience. Additionally, participants were asked to rate the relevance and quality of the resources the personalised program recommended using the same scale.

Table 3: Preliminary feedback about the data retrieval system

| Category	Comment	End user
Usefulness	I have visited your website previously (more from a personal than professional point of view) and found there to be so much information it was a little overwhelming. The personalised plan option really helped in prioritising the information and getting what I needed without any frustration! Thank you for this addition, it has made a big difference, and I have suggested that as the starting point for anyone I send the website to. Thanks again for what you have created!	Defence School mentor and military parent
Useability	The website looks lovely and its very user friendly.	Partner organisation
	The retrieval system is looking great and is very easy to use.	Affected community member
Design	I just wanted to reach out to offer congratulations on your recent launch of the CFRP 'Personalised Plan' website!	Partner organisation
	We've taken a look and think your team's site acts as an absolutely fantastic resource for military families. I love that it's simply links and (is) not a "database".	Partner organisation
	I've looked at your form, what a great initiative.	Educator
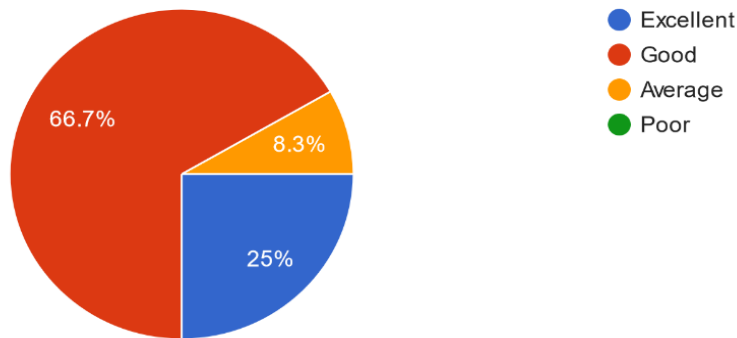
Figure 1: Participants ratings of their experience using the form

The findings revealed that a third (33.3%) reported their experience using the system was excellent, over a half reported their experience was good (58.3%), about a twelfth said their experience was average (8.3%), and no participants reported a poor experience (Figure 2).
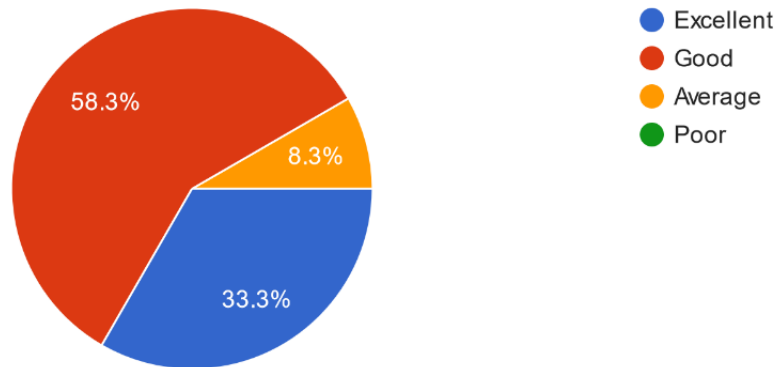

Figure 2: Participants rating of the relevance and quality of the recommended resources

Qualitative feedback from participants varied when asked why they had given these ratings. They included positive comments, such as "love that I can get the resources for myself and my kids through one form"; "ease of use"; "the resources are relevant to our families and zero in on important lived experiences shared in our communities"; and "simple, straight forward, easy to navigate and great resources". One participant had a mixed response about the modules, saying "I do like how there is a mixture of articles and videos within the modules, but it might be a bit of an information overload as I felt a little overwhelmed looking at all. You could narrow it down to a few and then have an area for additional resources should the user want more" and another left useful ideas for other resources rather than a comment about the usability of the system. Another said 'there is always need for improvement'. In the following sections, we discuss the findings in relation to the literature about interdisciplinary research collaboration and suggest areas that need further exploration.

Discussion

Regional Australian universities prioritise research that aims to promote regional connectedness and development and incentivise researchers to have strong and productive research partnerships with industry and community groups. Interdisciplinary research collaboration involving researchers and professionals across different industries and fields of expertise is essential to achieving these goals. Nevertheless, there is very little research evaluating interdisciplinary collaboration within universities or providing effective frameworks for doing so (Bark et al., 2016). In this discussion paper, we provided an exemplar of the design and dissemination of online self-help resources for defence,

veteran, first responder and remote worker families, to examine the challenges and opportunities of interdisciplinary collaboration in RRR contexts.

Importantly, our experience showed that leveraging interdisciplinary insights enabled us to provide an enhanced solution for these families who have limited access to relevant supportive resources. Drawing parallels to culinary artistry, the act of integrating diverse cooking methods, ingredients, and practices can transform a modest meal into a culinary delight – like the fusion of interdisciplinary perspectives in higher education research. As aptly captured by Wen et al. (2020), when supported by thoughtful research design and clearly articulated objectives, the dividends of interdisciplinary research collaboration "surely outweigh the challenges" (p. 312). In this case, the outcome of increasing the reach and positive end-user experience of the CFRP educational resources may help to reduce the burden on developmental and mental health services that are limited and under pressure in RRR regions (Kavanagh et al., 2023).

Overall, our experience on this project emphasised the risks of *not* engaging in interdisciplinary research collaboration that were outlined by Wen et al. (2020), including discounting of different perspectives, a lack of innovation, and missed opportunities for learning. The present project demonstrated the importance of incorporating multiple perspectives to address complex problems. Without interdisciplinary research collaboration, researchers and developers may be less receptive to suggestions to experiment with modifications and adaptations when convinced of a program's benefits. Also, there may be an influence of a hindsight bias – with the original developers of the resource convinced of their ideas about key aspects of a resource that are beneficial – and therefore not to be changed. Without an interdisciplinary lens, the research team's resource developers may even be convinced of the benefits of the resource's original implementation or dissemination, and by the metrics that showcase its positive impact.

In this project, interdisciplinary collaboration enabled us to challenge hindsight bias we held about the CFRP resources, which resulted in significant innovations in program delivery. We found that being open to feedback from other disciplines pushed us as researchers and program developers to consider our program from a fresh perspective, challenging us to revise our conceptions about the quality, end-user experience and impact of the program. We believe this fostered a culture of cross-fertilisation, where ideas from one discipline can inspire and inform research in another and interdisciplinary collaborators can offer unique insights about the potential to improve the impact of a program (González-Piñero et al., 2021).

Similarly, collaborating with those with lived experiences, for example, can introduce unique perspectives, such as family experiences of having children with neurodiversity causing intersectionality could lead to improving the program resources on offer (Hébert et al., 2022). In this study, suggestions from researchers in machine learning, who understood the limited user experience of static self-help websites, led to significant improvements in the delivery and end-user experience of the educational resources available in the CFRP. This receptivity to alternative perspectives and capacity for personal reflectivity is essential for effective interdisciplinary collaboration (Bossio et al.,

2014), particularly when dealing with complex issues, such as improving access to high quality and effective educational resources for families living in RRR communities.

Furthermore, our experience in this project showed us the value of interdisciplinary collaboration for producing innovations in the design and dissemination of the program, as well as the use of different forms of data to inform novel research questions. In this way, the approach 'broadens, deepens, modifies and clarifies the research results' (Palczewska, 2018, p. 69). In our example, site analytics provided the research team with a dynamic view of how users interacted with the site and used the resources. Such data will inform research aimed at further refinements of existing educational resources, and the development of more targeted resources linked to concerns of the target families living in RRR communities. In addition, while our research was embedded within a co-design framework, in which lived experience and affected community member and partner feedback were incorporated into program development, there are opportunities to continue the involvement of these groups to ensure ongoing innovation of the program. This continued process of co-design of the program allows for families and affected community members and partners to take ownership of such programs, while keeping them relevant to the emerging issues of this community.

Finally, engaging in interdisciplinary research collaboration on this project provided many opportunities for professional development and growth that we would not have experienced otherwise. The process of collaboration allowed for the sharing of discipline and domain-specific knowledge while creating a shared language for integrating disparate conceptions or understandings about the research or program development process. For example, this project included the military family researchers sharing their knowledge about the stoic nature of military families and the stigma and perceived career consequences they might face if they access mental health supports. Similarly, the machine vision researcher was able to share the importance of personalising the end-user experience with the resources. The cross-institutional nature of this collaboration involving researchers from several regional Australian universities allowed for capacity building and knowledge sharing among the research team.

This is an important outcome given that regional universities are smaller, less well-resourced and receive less government research funding than their metropolitan counterparts (Heffernan, 2017), which can put constraints on finding appropriate expertise within one's own university to contribute to a project. The involvement of researchers from regional universities also facilitated a shared focus among the collaborators to ensure the research remained grounded in the needs of RRR communities. In this regard, our exemplar highlighted how the cumulation of resources and expertise allowed researchers to produce and publish higher quality research, promote the program among interdisciplinary professionals, and optimise efforts to be competitive in securing further research funding. Ultimately, the two lead researchers received funding that reduced their teaching workload, giving them extra time needed to effectively engage in interdisciplinary research collaboration within their higher educational institutions.

Need for further research

It is clear from our experience that there is a need for more exemplars in delivering effective research within interdisciplinary projects, and in particular, exemplars that discuss how teams overcome the challenges they face when working collaboratively together. The two major discoveries for our interdisciplinary team were the need for respect for each member's knowledge and contribution, and the extra workload required to ensure the team was effective. Specific evaluations that measure the benefits of interdisciplinary projects are needed, particularly to encourage teams to take an interdisciplinary approach when planning their project. There is also a need for more research that evaluates methods for overcoming the associated challenges, which might include the establishment of guides or frameworks for future research teams. Finally, there is a clear benefit to research which explores the longer-term results of successful interdisciplinary teams, including how they maintained team cohesion and a shared vision over longer periods of time. Additional exploration of the types and effectiveness of support given to researchers to engage in interdisciplinary research collaboration within higher educational institutions would be beneficial.

Conclusion

In this paper, we have reviewed the experience of one interdisciplinary team working on a project focused on achieving outcomes for service and remote working families. An interdisciplinary approach offered a novel solution for an ongoing issue for these families, supporting young children in these potentially vulnerable families through the provision of educational resources. The team, which included both academic and lived experience experts, were from a wide range of fields, including early childhood education, sociology, psychology, social work, and digital health. This enabled the development of resources that capitalised on the broad range of expert team skills to deliver a stronger final product, ultimately offering a better solution to the problem we sought to address.

Working in an interdisciplinary team presented challenges, including the need to ensure a shared vision and value systems developed in order to bring the team together. There were communication barriers as different disciplines have varied communication norms and practices. There were also significant larger scale challenges when it came to dealing with cross-institutional needs and structural barriers. Addressing these barriers, although complex at times, ultimately benefited the overall project outcomes, which saw increased engagement with resources and positive preliminary feedback from end users, which will be utilised to improve the personalised programs. In discussing the experiences of one interdisciplinary team as an exemplar, we aim to encourage other researchers to consider engagement over disciplinary boundaries. Ultimately, we hope to encourage management and policymakers within higher educational institutions to better support interdisciplinary research collaboration with workload and resources.

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Declaration of interests statement
All resources in the project are free and published under a Creative Commons License. Therefore, there are no conflicts of interest to report.

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