

'Hear' to Help Chatbot

Co-development of a chatbot to facilitate participation in tertiary education for students on the autism spectrum and those with related conditions

FINAL REPORT

Dr DanaKai Bradford Dr David Ireland Dr Jasmine McDonald Dr Tele Tan Mrs Elaine Hatfield-White Ms Tracy Regan Dr Theresa Kidd Dr Geremy Farr-Wharton

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DanaKai Bradford	Jasmine McDonald
CSIRO Autism CRC	Curtin University I Autism CRC
David Ireland	Tele Tan
CSIRO Autism CRC	Curtin University I Autism CRC
Geremy Farr-Wharton	Elaine Hatfield-White Curtin
CSIRO	University Autism CRC
Tracy Regan	Theresa Kidd
Community Advisor	Curtin University Autism CRC

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The Cooperative Research Centre for Living with Autism (Autism CRC)

The Cooperative Research Centre for Living with Autism (Autism CRC) is the world's first national, cooperative research effort focused on autism. Taking a whole-of-life approach to autism focusing on diagnosis, education and adult life, Autism CRC researchers are working with end-users to provide evidence-based outcomes which can be translated into practical solutions for governments, service providers, education and health professionals, families and people on the autism spectrum.

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A note on terminology

We recognise that when referring to individuals on the autism spectrum, there is no one term that suits all people. In our published material and other work, when speaking of adults we use the terms 'autistic person', 'person on the autism spectrum' or 'person on the spectrum'. The term 'autistic person' uses identity first language, which reflects the belief that being autistic is a core part of a person's identity.

Autism Spectrum Disorder (ASD) is diagnostic terminology used by the healthcare sector, and is used in the context of a person being 'diagnosed with Autism Spectrum Disorder'.

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Executive summary

There are an increasing number of university students who identify as being on the autism spectrum or having a related condition. This increase reflects aspirations often expressed by autistic adolescents to continue their education post-secondary school, and there is evidence to suggest that those that do have better life outcomes. While students on the spectrum who used support systems had a better overall university experience, these systems tend to be underutilised. One way of making the support systems more accessible to students is to provide the available resources through a chatbot. A chatbot is a natural language processing program that takes utterances and applies a set of rules to compile an appropriate response. The response is drawn from a 'brain' which is developed to contain information relevant to the population in which the chatbot is deployed through an app on a smart device or through a webpage. A chatbot would allow the student to explore a range of support resources from the comfort of their own phone and thus enhance use of available support systems, without increasing the workload of the staff providing support services.

In this project, through a co-design and collaborative approach with individuals on the autism spectrum and key stakeholders, we aimed to develop the content of an appropriate chatbot brain to support those who are undertaking higher education. The chatbot allows users to navigate social, physical and environmental cues associated with higher education, as well as providing information on anxiety and depression, and university counselling services. The chatbot is available for smart phone or web use and provides relevant resources sourced from student support services and health services. Additionally, the chatbot can provide communication strategies for various scenarios, such as asking for an extension or understanding legal rights.

The success of this project is largely due to collaboration with the Curtin Specialist Mentoring Program. Other key opinion holders involved in the development of the chatbot's digital brain and its validation were recruited through the Autism Academy for Software Quality Assurance, Autism Spectrum Australia and the Autism Hub (Department of Education Queensland). A Community Advisor oversaw participant engagement. The project was generously funded under Program 3 of the Autism CRC.

1. Introduction

In the UK and the US, there is an increasing number of university students who identify as being autistic or having a related condition, with US estimates of up to ~2% of university students meeting the criteria for an Autism Spectrum Disorder (ASD) diagnosis (Gurbuz et al. 2019, White et al. 2011). A recent Australian survey found that students on the autism spectrum who used support systems had a better overall university experience, but that there was low usage of the support systems available (Anderson et al., 2017). Challenges faced by those students were found to include both academic and non-academic factors; and the reluctance to use support systems was reported as being related to previous bad experiences (lack of follow up, or delays between asking for and receiving support) or poor self-advocacy skills (including discomfort in disclosure).

The increasing number of university students reflects aspirations often expressed by adolescents on the spectrum to continue their education post-secondary school (Camarena & Sarigiani, 2009), and there is evidence to suggest that those that do have better life outcomes (Hendrikson et al., 2013). One way of making the support systems more accessible to students is to provide the available resources through a chatbot. A chatbot is a natural language processing program that takes utterances and applies a set of rules to derive an appropriate response. The response is drawn from a 'brain', which is developed to contain information relevant to a specific population group. The chatbot is deployed through an app on a smart device or through the Internet via a web page. A chatbot would allow the student to explore a range of support resources from the comfort of their own phone and thus enhance use of available support systems, without increasing the workload of the staff providing support services.

This project aimed to develop a chatbot prototype by building a 'brain' using existing resources and refined through conversations with, and feedback from, young adults on the spectrum, their peers and advocates.

Benefits of facilitating tertiary participation

Individuals on the autism spectrum face challenges completing higher education study and obtaining employment. The labour force rate of participation is only 42% of autistic individuals in Australia compared to 53% of individuals with other disabilities and 83% of the typical population (Scott et.al, 2017). Many individuals face difficulties transitioning to a new environment or routine, and aptly promoting themselves during job interviews; many also report experiencing anxiety with co-workers or with peer social interaction.

Some organisations, such as Microsoft, are coming to realise the benefits of employing autistic individuals, as their cognitive style can lead to higher productivity and performance. Moreover, recent research in Australia has suggested employing an autistic adult not only has performance benefits but generally incurs no additional cost in supporting that individual (Scott et.al 2017).

Of greatest impact, enhanced participation and recognition of value added by autistic employees has the potential to create a fundamental shift in the way people on the spectrum are viewed – from those with a disability to those with a unique cognitive style capable of significant community contribution.

Using technology to facilitate tertiary participation

There is a strong need to target and foster learning, communication and social interaction in autistic individuals, as the value they offer organisations, communities and indeed the world, is currently largely underestimated. Empirical based evidence from research, as well as anecdotal evidence from parental blogs, has consistently showed individuals on the autism spectrum gravitate towards technology for learning and entertainment (Ennis-Cole 2015). This is widely contributed to having an internal locus of control.

In this project, through a co-design and collaborative approach with individuals on the autism spectrum and key stakeholders, we aimed to develop the content of an appropriate chatbot brain to support those who are undertaking higher education. The chatbot allows users to navigate social, physical and environmental cues associated with higher education, as well as providing information on anxiety and depression, and university counselling services. The chatbot is available for smart phone or web use and provides relevant resources sourced from student support services and health services. Additionally, the chatbot can provide communication strategies for various scenarios, such as asking for an extension or understanding legal rights.

Collaboration is key to success

The success of this project is largely due to collaboration with the Curtin Specialist Mentoring Program (CSMP). In 2014, inspired by the success of a small number of recent, promising peer-topeer tertiary mentoring programs operating internationally, Curtin University implemented one of the first specialist peer mentoring programs for students on the autism spectrum (and related conditions) in Australia. This was in line with federal disability discrimination legislation (Disability Discrimination Act, 1992, Disability Standards for Education 2005) and Curtin University's Disability, Access and Inclusion Plan (2012–2017) which states a commitment to provide 'equitable and inclusive access for people with a disability to its facilities, services, events and academic programs' (p.7). In 2019, 48 postgraduate mentors provided mentoring services to 77 mentees on the autism spectrum (and related conditions) and two program evaluations have been conducted indicating the efficacy of the program (Hamilton, Stevens & Girdler, 2016; Siew, Mazzucchelli, Rooney & Girdler, 2017).

Other key opinion holders involved in the development of the chatbot's digital brain and its validation were recruited through the Autism Academy for Software Quality Assurance (AASQA), Autism Spectrum Australia (Aspect) and the Autism Hub (Department of Education Queensland). A Community Advisor oversaw participant engagement.

2. Project proposal

2.1 Original proposal plan

In the 2018 Autism CRC funding round, CSIRO expressed interest in applying for funding to develop a prototype chatbot to facilitate participation in tertiary education by young adults on the spectrum and related conditions. It was proposed that CSIRO work with CSMP for chatbot development and evaluation. Working together, a proposal was submitted, and funding granted from the 2018 round. Throughout the project CSIRO would be guided by regular meetings with a community advisor.

2.1.1 Initial development plan

Existing material developed by CSMP would be programmed into the brain to provide a working prototype for demonstration and use in focus groups and workshops. CSMP were to provide CSIRO with digital copies of student material for programming by a CSIRO researcher. This component requires no participants.

2.1.2 User Needs Analysis plan

Initial focus groups would be facilitated by CSIRO with all relevant stakeholders identified by Curtin University (CU) to determine further content for the brain. Invited attendees would include student services, disability services, lecturers, CSMP staff, mentors, and mentees. The prototype would be used to demonstrate the chatbot and mechanisms of information and resource delivery to obtain feedback on content and usability. Further content identified through focus groups was envisaged to include available resources, navigational guides, health and wellbeing tips, FAQs. Content would be designed to be delivered in such a way that the user has both a level of control and an element of discovery (eg. User: I'm feeling stressed; Chatbot: would you like to try a mindfulness technique?).

2.1.3 Iterative development of prototype plan

Workshops would be held with AASQA, facilitated by CSIRO, to program content for the chatbot brain. Programming would continue over several sessions. Opportunities to remotely contribute to programming through a portal developed by CSIRO would be offered to participants through interest groups recruited through Aspect, Autism Hub and AASQA.

2.1.4 Prototype testing plan

The first iteration of the prototype would be made available to interested testers recruited through Aspect, Autism Hub, AASQA and CSMP. Testers would be provided with the chatbot and an assessment pack. A second round of programming would be undertaken by AASQA and other interested parties to incorporate feedback.

2.1.5 Trial design

The revised prototype was expected to be ready to trial during the second half of Semester 1, 2019. CSMP mentees (N=10-50, as available) and mentors would be invited to participate to trial the chatbot, with an option of withdrawal at any point. For those interested, the chatbot would be made available on their android device, or through a web page for those with an apple device, no smart device or a preference for web-based interaction. Log usage data would be analysed to determine popular and unpopular aspects of the technology. The assessment pack would be redistributed at the end of the trial.

2.2 Project implementation

In general, the first stages of the project (Sections 2.1.1–2.1.4) proceeded according to plan, with existing material programmed, a focus group held to determine content, a workshop held, remote portal developed for programming and testing undertaken. Modifications to the first stages of the original plan were primarily in the timeline due to unavoidable delays at project commencement. Due to low levels of recruitment for the trial, alternative arrangements were made. Detailed methodology is provided in Section 3, contributions toward co-development of the chatbot are described in Section 4, and results summarised and discussed in light of limitations in Section 5.

3. Methodology

This project was approved by the CSIRO Social Science Human Research Ethics Committee (CSSHREC) approval number 124/18, with reciprocal approval from Curtin University HREC HRE2019-0054.

3.1 Focus group

The aim of the focus group was to cover the following topics – understanding the challenges facing tertiary students on the autism spectrum or with related conditions; perceptions of a basic chatbot technology; preferences for interacting with the chatbot; and ideas for additional content for the chatbot.

3.1.1 Focus group participants

The focus group was held between 12.15 and 1.45pm on Wednesday the 10th of April, 2019 at the CSMP Common Room, a time when mentees and mentors usually attended the CSMP Social Group. Participants were recruited through emails sent by CSMP, with a number of 'drop ins' on the day who, on invitation, expressed interest in participating.

Focus group participants included mentees (n=13, 4 female) and mentors (n=6, 5 female). Two CU research team members also participated. Two mentees (both male) were interested but could not attend the focus group. They were forwarded the focus group workbook, which they submitted electronically. In total, 23 participants contributed to this initial data collection.

3.1.2 Focus group procedure

All participants were provided with a workbook which contained an information sheet and consent form (Appendix B). The participants worked through the book together, however, there was the freedom to work ahead if desired. Each section was introduced by the facilitator and discussed by the group, with individuals encouraged to make notes in their book. Sections included Participant demographics, Positive experiences with University, Advice for access and locating support, Experiences accessing and locating support, Needs for accessing and locating support, and Additional ideas. With unanimous permission, the focus group was audio recorded for transcription and reference purposes to help ensure accuracy of the data. The duration of the recorded session was 1hr 15min. Snacks were provided during the focus group, and lunch was provided afterwards. Participants were provided with a \$20 JB HiFi gift voucher on receipt of their completed workbooks.

3.1.3 Focus group data analysis

A CSIRO member of the research team compiled the responses from all participants for each section, highlighting popular themes and trends. Information directly related to the chatbot development was used by a second CSIRO research team member to populate the chatbot brain, where feasible.

3.2 Hackathon workshop

The Hackathon workshop aimed to begin programming the information provided by focus group participants, along with any other information deemed relevant by the Hackathon participants.

3.2.1 Hackathon participants

The Hackathon was held at AASQA, on Friday, 26th of April, a day that members would normally convene for program activities. Participants were recruited through Eventbrite invitation, with 16 RSVPs, some of whom had attended the focus group. Of these, eight participants (two female) attended on the day, none of whom had attended the focus group.

3.2.2 Hackathon procedure

Participants were provided with a PowerPoint overview of the project, chatbot and programming instructions, prior to the programming session. Hard copies of CSIRO's guide to using the programming portal were made available to participants. Frequent breaks were offered, and morning tea and lunch were provided. All input was logged and later checked by a CSIRO research team member for relevance and redundancy.

3.3 Remote programming

The aim of the remote programming component was to provide previous participants, and the wider Autism community, with an opportunity to co-create the chatbot. The portal allowed review of the current material and the ability to add additional content.

3.3.1 Remote programming participants

Participants were recruited through Aspect and Autism Hub using flyers posted on websites and social media and forwarded by email. Due to a communication misunderstanding, flyers were not forwarded to prospective participants by CSMP. Because of the nature of remote programming, it is not possible to tell which participants were recruited through which organisation, nor did we record participant demographics. Some participants, however, engaged in email conversations in

which they articulated their programming contributions. Participants accessed the portal from four computers, suggesting there were four individual participants, however, it is possible that one person used more than one computer.

3.3.2 Remote programming procedure

Participants were forwarded a link to the programming portal (<u>http://www.heartohelp.online</u>) where log in was contingent on consent to participate. The portal was open from the 27th of May 2019 to the 10th of June 2019, to allow plenty of time for participation. There were no geographical constraints, however participants required access to a computer and network in order to log in. Once logged in, participants were provided with an electronic version of the same programming guide used for the Hackathon. All input was logged and later checked by a CSIRO research team member for relevance and redundancy.

3.4 Chatbot Testing

The aim of the testing component was to provide new and previous participants, including the wider Autism community, an opportunity to find any bugs or missing information in the chatbot. In addition to testing the chatbot with phrases and questions, the portal still allowed review of material and the provision to add novel content. Testing was also conducted face-to-face.

3.4.1 Chatbot testing participants

Participants were recruited through CSMP, Aspect and Autism Hub using flyers posted on websites and social media and forwarded by email. AASQA research team members were encouraged to comprehensively test the chatbot. As with the remote programming, it is not possible to tell which participants were recruited through which organisation, nor did we record participant demographics. Some participants, however, engaged in email conversations in which they articulated their testing contributions. The portal was accessed by 12 individuals for testing.

Face to face testing by CSMP mentees (n=17, 5 female) and mentors (n=1 female) was held at CU, between 12-2pm on 10 September 2019, facilitated by two CU research team members and an additional student mentor. Of these participants, seven mentees and the student mentor had attended the focus group.

3.4.2 Chatbot testing procedure

Participants were forwarded a link to the programming portal where log in was contingent on consent to participate. The portal was open from the 24th of June 2019 to the 19th of July 2019, to allow plenty of time for participation. Again, there were no geographical constraints, however

participants required access to a computer and network in order to log in. All input was logged and later checked by a CSIRO research team member who fixed any identified bugs and updated the brain in response to feedback on usability.

For the face-to-face testing, participants downloaded the chatbot to their own laptops or mobile phones, navigating through the various content. Participants asked the chatbot questions they would want their chatbot to be able to answer. A paragraph summarising feedback about the functionality of the chatbot was forwarded to a CSIRO research team member.

3.5 Autism Hub workshop

Once the chatbot brain had been developed and tested the intention was to trial it with university students at CU. Low recruitment, however, meant that this was not feasible. As an alternative, CSIRO approached Autism Hub and asked if we could hold a workshop with young adults on the spectrum who either were considering, or had attended, tertiary education to get their thoughts on the usability and applicability of the chatbot.

3.5.1 Autism Hub workshop participants

Participants were recruited through Autism Hub, with 13 attending (11 male, two female) on Friday the 11th of October 2019 from 10am to 2pm. Demographics were not collected for this cohort. Participants were provided with a \$100 voucher at the completion of the day. Two participants declined the incentive due to the nature of their role (one was a mentor and tutor, the other an Autism CRC staff member).

3.5.2 Autism Hub workshop procedure

The workshop was facilitated by two CSIRO team members and attended by a third. The day began with a PowerPoint overview of the project, chatbots in general and development to date. Semi structured conversations were then held, with participants guiding the flow and content. Hand written notes were recorded by a CSIRO team member and a PhD student. The participants were free to move around the room if they chose, and refreshments were available throughout the day. Lunch was an opportunity for more social engagement around the chatbot.

3.5.3 Autism Hub workshop data analysis

Recorded notes underwent thematic analysis by a CSIRO team member and compared with themes arising in the initial focus group by a second CSIRO team member. Where relevant, content in the chatbot brain was revised or updated accordingly by a third CSIRO team member.

4. Chatbot co-development

4.1 Resources uploaded

The brain was initially populated with existing information available in pdf form. A CU research team member forwarded the CSMP Peer mentoring - Module Specialist Mentor Toolkit.

A CSIRO team member (DI) sourced other relevant electronic resources including:

- Disability Discrimination Act
- Curtin University, Counselling and Disability Services: Counselling Services
- Curtin University, Counselling and Disability Services: Student Support and Outreach
- 'Solve Method' in The Hidden Curriculum (Myles, Trautman, & Schelvan, 2004).

4.2 Understanding the university experience

Having populated the chatbot brain with readily available resources, the next step was to talk directly with students themselves. To explore which aspects of university life to include in the chatbot, students were provided two identical checklists of activities associated with their studies and asked to indicate which aspects they enjoyed in the first list, and those that provided a challenge in the second. The lists were not mutually exclusive – a student could indicate that they enjoyed an activity, and that they found it challenging.

This exercise revealed some surprising results (Table 1). For example, equal numbers of mentors and mentees found transport challenging, but five (33%) of mentees actually enjoyed their travel to and from university, compared to none of the mentors. We expected some of the social aspects of university would be challenging for mentees, and while 'meeting people' and 'talking to people' was difficult for some (2, 30%; 6, 40% respectively) the majority of mentees indicated they enjoyed these activities (9, 60%; 11, 73% respectively). Group class work, undertaking assignments and managing study loads were more challenging for the majority of mentees (8-10, 53-67%), while 1-2 (17-33%) mentors also struggled. Managing semester and exam stress was a further differentiating factor. Not surprisingly, no students indicated they enjoyed this aspect of university life, but it was more difficult for mentees (12-13, 80-87%) than for mentors (3, 50%). Potentially related to these academic aspects, 11 (73%) of mentees found managing their time difficult (Figure 1). Conversely, only one mentor indicated they found this challenging, while three (50%) enjoyed this experience. When it came to looking after themselves, no mentors found this a challenge, compared to approximately half the mentees (8, 53%).

Table 1: Positive and challenging aspects associated with university life experienced by students^a (n=21^b)

	Positive experiences		Challenging experiences	
Aspect of university life	Mentor (n=6)	Mentee (n=15)	Mentor (n=6)	Mentee (n=15)
Travel to and from university	0	5 (33%)	3 (50%)	3 (20%)
Navigating the campus	3 (50%)	6 (40%)	1 (17%)	5 (33%)
Meeting people	5 (83%)	9 (60%)	1 (17%)	3 (20%)
Talking to people (social)	4 (67%)	11 (73%)	1 (17%)	6 (40%)
Talking to people (course work)	2 (33%)	8 (53%)	0	2 (13%)
Individual class work	2 (33%)	8 (53%)	0	3 (20%)
Group class work	1 (17%)	6 (40%)	2 (33%)	8 (53%)
Attending classes	1 (17%)	7 (47%)	0	3 (20%)
Undertaking assignments and out of class work	1 (17%)	4 (27%)	1 (17%)	8 (53%)
Tutorials	0	5 (33%)	1 (17%)	3 (20%)
Managing study loads	1 (17%)	0	2 (33%)	10 (67%)
Managing stress (semester)	0	0	3 (50%)	13 (87%)
Managing stress (exam)	0	0	3 (50%)	12 (80%)
Studying for exams	0	0	3 (50%)	9 (60%)
Looking after myself	3 (50%)	3 (20%)	0	8 (53%)
Eating well	3 (50%)	4 (27%)	0	7 (47%)
Sleeping well	2 (33%)	5 (33%)	0	7 (47%)
Managing my time	3 (50%)	0	1 (17%)	11 (73%)

^a Experiences could be both positive and challenging.

^b CSMP staff excluded from table as low N would identify respondents.

Are there any other aspects of campus life that you find challenging? (in the space below, write or draw anything you can think of that you find hard about Uni life). assign ment

Figure 1: Time management was a challenge identified by 73% (11 of 15) of mentees and 17% (1 of 6) mentors (Art by participant FGPe017).

One mentee (FGPe013) did not indicate any areas of university life that they enjoyed, even going so far as to write 'none', in the space below, and going on to indicate every area as challenging. In contrast, another mentee participant indicated no areas of university life as challenging, however, as there are several blank pages in this workbook, especially immediately preceding and following the 'challenging experiences' list; this could simply represent being unsure of how to answer, response fatigue or disinterest.

Free text reveals additional positive and challenging experiences

Using free text, participants indicated a number of other areas of campus life that they enjoyed. Support, social life and extracurricular activities were mentioned most (Figure 2), but also the physical environment, library and opportunities for self-development – learning independence and achieving goals. The most salient of these was the mention of support, which took various forms – CSMP, disability services, support services, counselling, mentoring and workshops – most of which was incorporated into the chatbot from the resources sourced from CU and CSMP.

After indicating every area as challenging, participant (FGPe013) wrote at length that this came down quite simply to an inability to make friends. Friendships were a recurring theme in the free text, with participants reporting that they found social clubs unfriendly, they felt left out, and that it was hard to navigate breaks – not knowing where to go, who to talk to or what to talk about. The other main theme in free text focussed on time and workload management.



Figure 2: Positive experiences with university life identified by mentors and mentees.

For the most part this exercise validated what we already know, there is great diversity in the type of experiences found either positive or challenging, and hence a one size fits all approach to providing university support is unlikely to meet the needs of all students. The next part of the focus group examined the strategies and tools used by mentors and mentees alike that made these aspects of university life enjoyable.

4.3 Strategies and tools for making university life easier

Participants reported a range of strategies and tools that they already use to make aspects of university life easier for them to navigate (Table 2). Participants also suggested a number of ideas that could potentially assist them with various aspects of university life (Table 3). For this latter exercise, some participants included strategies or tools that were already available (but perhaps not used by them). For the purposes of this report, these were included in Table 2, while Table 3 lists ideas that could potentially be implemented.

Table 2: Strategies and tools used to make aspects of university life easier

Aspect of university	Strategy or tool
Travel to and from university	TransPerth, Smart Rider, Google maps, Journey planner Reminder 10 mins before need to leave home Have pictures of bus timetables in phone Catch an earlier bus Countdown until the train leaves Walk, cycle, drive or car pool
Navigating campus	Take classes with a friend, walk with classmates/friends Look for classes before uni starts Walk to each class before uni starts, park as close possible Find out of the way places to study or relax Explore new buildings and campus – find favourite places Use LOST on campus app Put room numbers on timetable Do a campus tour, using map on phone
Classwork	Ask a friend to motivate me Use unit outline, show up to classes Time classes well when picking them Make lists using Notes on phone Apple calendar with different colours Gantt chart for each semester Written schedule, start assignments early Create word doc for upcoming work with date Ask my mum if I'm having trouble, talk to counsellors
Study and exam stress	Plan out schedule for next 1-2 weeks Break down what I have to do, manage my time Having everything in order before exams (CAP) Use check lists Go over content well in advance, then distract myself Study before exams, but not night before Study in manageable chunks, with an alarm, at city library Do the practice tests Take breaks, something to take my mind off it for 10 mins Watch calming videos, you tube videos Get good sleep Use face mask, do mediations, cook exciting meal Walk on campus or in park, go to cat and dog parks Take day off to rest my mind Do some drawing, listen to music, watch a movie, read a book, mindfulness, attend social clubs, write anything Practice hobbies 30 mins before exam I like smashing stuff in my backyard, and splitting logs Ask for help, CAP and extensions Learning plan from accessibility services Meet with mentor, talk to significant others Being excited about graduating and leaving Perth Drink water in the exam

Aspect of university	Strategy or Tool
Social life	Have a small circle, hide behind my friend and listen in Use Uni run activities, join clubs, volunteer, Yoga Have a group of friends, study together, sports games, drinks Friends help mental health, talk about worries and stresses Met groups of friends Introduce myself (to small number of people) Meet up with old friends Practice by watching other people and mimic Friend people on Facebook Perform jouska [hypothetical conversation] in my head if nervous. Find a point of interest (book they are holding) to start conversation, something meaningful – not the weather. Play pool, so try to make friends there as have common topic
Looking after myself	Restrict work to day hours only, have nights off Go to bed at reasonable time – 7 hours sleep Use Melatonin (prescription) for sleep No coffee after 2.30pm Use air con for white noise while sleeping Mindfulness, mediation music, guided meditation Yoga as exercise and stress relief Walk for an hour a day or go to gym Cook, looking up recipe, buying ingredients, cook for friends Save money by making my own food Include greens in grocery shopping Buy campus food at main café and basement favourite (but can get boring, food trucks are exciting) Buy food from Simply Delicious (low fat low oil) Balanced diet, healthy meals with unhealthy snacks Healthy lunches and snacks, bring to uni Special meal every Friday to celebrate end of study week
Study resources	Get a Uni pass if offered Use Google calendar/online calendar with reminders Gantt charts, plan busy weeks Organise folders on laptop Try for the Curtin employability award Join groups - social groups, Facebook groups, toil groups, course groups, psyc groups, study groups Use apps – LOST on campus, Smiling mind Use Library online resources Text help read and write, Dragen, Sononcert note taker (available through accessibility services) Ask for help when needed Use Google scholar Read unit outlines Talk to lecturers and fellow students Have pens, a computer, messenger to connect, USBs Keep a portfolio/notebook for feeling productive

Table 3: Ideas suggested for making university life easier

Aspect of university	Participant suggestions
Travel to and from university	A button to connect with TransPerth transit officers if needed OrienTrip when it comes out Something to alert people that I'm smoke sensitive or anxious Live closer to campus Map changes for events, using both names for buildings Augmented reality Entertainment on bus Free bus connecting to city
Navigating campus	Easier way to put in places like 'building 100' Better GPS so don't get lost User friendly interactive campus map in app, fire escape maps 'Street view' option – 2D maps can be hard Information on shortcuts, map brochure Detailed guide for architecture building
Managing study	Something to help with gaining motivation Reward system like habitica, single player habitica Time management training and mentoring from experts, including how to do study planners, set reminders, study group planners, Gantt charts, risk management plans, timetables, weekly planners and prioritising competing deadlines or assignments that take longer to complete Know which buildings have after hours access and how to get it Have a better idea of what is involved before you start Microwave and oven in library so don't have to worry about getting food at night Mentors, study buddies Create a Facebook group to study with friends 'Curtin study buddies' – post for silent study company
Managing timetables	App notifications of where class is and how long to walk there. Screen shot timetable for phone Make timetables easily accessible Write notes of what you are studying and what you do in your spare time (hobbies)
Managing exam stress	Exam timetable with easy exam study planner Some form of psychological support – relaxation sessions, mindfulness training, exam support and preparation sessions Food trucks that open late A listener and a venting spot Do exam at time of day that suits you Organise support groups with people doing the same major More shower facilities available 24/7 so don't have to stress about keeping clean
Managing health	Flexible programs with different hours Exercise programs. A lot of exercises are dangerous to uncoordinated people with autism Discounts in wellness programs Something that shuts off my phone when I'm meant to be asleep Tracking diet and sleep More napping spots (napping spot in library is always occupied) Pop up question – how many hours did you sleep? have you eaten any fruit today? Reminders to drink water, eat fruit, breathe, sleep, move Recipe links A way to 'favourite' locations so can choose private places and not share with others

4.4 Role plays, resources and recipes – what works for you?

Future versions of the chatbot have the potential to have additional functions such as role playing scenarios, provision of external resources and recipes. Participants were asked if these functions would be useful and what they would like included.

Role Playing – this allows you to practise scenarios like meeting your mentor; or talking to other students or university lecturers or staff; or even job interviews. You can try different conversations and see what kind of responses you might get. Is this something you might use? What sort of scenarios would you like to practise?

Some of the scenarios envisaged were directly related to study, for example, talking to unit coordinator or lecturers (asking for extra time; help with assignments), uni dictionary (trying out uni terminology), public speaking and presentations (Q&A especially); or employment, such as job interviews or speaking with prospective employers or supervisors.

Other scenarios were more social, particularly for sensitive or daunting topics, for example, practising conversation, emotional recognition, relationship advice, telling people you aren't interested in relationships, LGTBI issues, where you are on the spectrum, friends on the spectrum, talking to parents, meeting people, talking about feelings, talk about what I do for a living, how to confront people (family), or for when a bad choice has been made – where communication leads to an instant 'game over'.

Two participants felt they would not use the role playing scenarios. "For some reason the concept fills me with dread, this means it would probably be effective but difficult to get people to do" (FGPe003). "Personally, it's not for me as I can't take myself seriously. I know it works for others though" (FGPe014).

Resources – we can put in links to services like university support, mental health, legal rights and public transport. Are you likely to use these? Can you think of any others?

Suggested internal and external resources included:

- Health direct, search symptoms and tells if you need GP.
- Disability employment and NDIS
- Navigation around campus
- Parking vacancies
- Links to different apps (LOST, CABs timetable, Elsie, blackboard, TransPerth, mental health, mindfulness, calendar, YouTube)
- Links to sites that help with day-to-day things

- Legal rights and navigating legal jargon
- Mental health as episodes are often unsuspected

Recipes – simple, cheap, easy to prepare meals. Would you use this? What recipes would you like to see included? What do you like to eat?

Participants indicated what functions they would like this section of the chatbot to have:

- Putting an option for vegan/veg/food allergies/food preferences
- Ability to browse recipes
- Printer friendly so can share and have in kitchen
- Variety of recipes

They also mentioned general recipe characteristics:

- 5 step recipes
- 15 minute recipes
- Low FODMAPS, low fat healthy food
- Freezable left overs, date/reminders when goes off
- Foods considered essential for a healthy diet
- Easy, healthy, cheap
- Meal preparation information

As well as specific recipes:

- Make up a batch of vegetable mince (recipe provided) then put serves in Tupperware in fridge, can have with rice or pasta, just heat one serve
- Spaghetti bolognaise with capsicum or spinach
- Japanese bento food
- Stir fries, curries, salads, tangines, ramen, slow cooker meals, burgers, one pot wonders

And one participant who clearly was not keen on cooking:

• Affordable food places on campus

4.5 Final contributions

Participants felt it should include a CU dictionary for 'local lingo' and use consistent language. While some participants felt it should include humour, others felt it should not be too friendly. Two names were suggested, both already in use either for a chatbot, or chatbot developer:

- AURA Autism University Resource (or Robot) Assistant
- AURICLE Autism University Resource Incorporated Chatbot for Learning and Education.

Using these extensive participant contributions, the chatbot was developed (Figure 3).

4.6 Programming and testing

While the program and testing were open to a wide population, few people chose to participate. None-the-less, a number of issues were identified including missing information, spelling and grammatical errors, as well as a few 'bugs' in conversation flow. One of the most helpful contributions during this phase was from a teacher, recruited through Aspect, who went right through the brain and corrected all literacy errors.

During the Hackathon, the decision-making module of the Chatbot was extensively tested with testers navigating the content and topics related to counselling services, depression, legal rights, mental health Information for first year students, perfectionism and suicide responses. Participants created their own user stories and develop the test cases around each story. The success/failure of each test cases were reported back to the developer. The interactive session facilitated the reporting of software bugs which were collated to improve the chatbot at the next development iteration.

In the two hour testing session with CSMP, participants reported that they enjoyed the session. Some participants became frustrated as the chatbot did crash at some points (potentially due to the higher level of volume of people using the website at the same time). Some participants were also frustrated that the chatbot was not replying to them properly, however, were reassured when helpers reiterated that this is what the chatbot is supposed to be doing at the moment (due to being in the initial stages of development). A couple of participants mentioned the website was hard to navigate, but were shown how to access the section they needed to be on.



Figure 3: Screenshots showing various interactions with the 'Hear' to Help chatbot, including introduction, provision of mental health information for depression and anxiety, asking for an extension and understanding legal rights.

4.7 Initial validation with the wider autism community

The workshop at Autism Hub was well attended with participants positive and enthusiastic about the potential of the chatbot. For the most part, they reiterated the needs identified by CSMP focus group participants, validating the chatbot development to date. Discussions included themes directly relating to tertiary participation, as well as employment, privacy and preferences for interaction. A summary of discussions is provided below.

4.7.1 Chatbot as a facilitator for tertiary studies

Assistance in university

Participants felt it would be useful for the chatbot to locate classes and have it linked to timetable so that the user does not have to enter details every time.

Participants liked the provision of advice around asking for an extension including the sample email. They said that there might be protocols specific to the user's university for assignment extensions and that extensions should be linked to service plans. Having the opportunity to email/communicate with tutor/lecturer through the chatbot would be useful for those who have difficulty talking to people, particularly when meeting them for the first time. It would be good to have chatbot templates for different issues.

They also felt the chatbot could potentially be used during exams to help students with disabilities and remotely to help with adjusting to working/studying in different states.

Daily activities

The need for help with micromanaging daily activities was emphasised. A participant had difficulty doing this with Siri as it had trouble recognising his speech. Other participants said this function would be helpful for remembering plans and events set up for a particular week, or for regular weekly goals and tasks, and a necessity for assignment planning. Study tips and ways to deal with procrastination, such as prompts, could be delivered by the chatbot.

Transport

Participants talked about their issues and anxieties when using public transport. This was mainly due to unexpected delays and changes in schedule. Having to talk to people in the station was also a point of anxiety for some. They would like the chatbot to help deal with this sudden change in plans. For example, when the user tells the chatbot he is late, the chatbot can send an email or message to their lecturer/boss to inform that the user is held up due to delays in public transport. The chatbot can help with travel training for younger users. One participant mentioned that music

helps him deal with change and anxiety when public transport is delayed, he felt that simulation (through role play) to help prepare for this situation would be too unrealistic.

Social connections

Links to special interest groups at university and tips on how to approach these groups was seen as a valuable function of the chatbot to provide support for making friends and social connections, particularly for new students. Providing verifiable advice on how to deal with bullying would be beneficial as it is difficult to talk to teachers about the topic. It was felt that it would be useful for the chatbot to remember names and interests of the new people the user meets, as this would facilitate conversations when they meet again.

Mental health

The chatbot could be used to keep track of how often the user has mental health issues in a given period, e.g. a week, and help direct students during times of distress. When counsellors are too busy during semester the chatbot can help students until they are able to get an appointment. This could be done using resources such as mindfulness practices and ways to cope with anxiety, including both internal chatbot information and links to external sources.

One participant mentioned that he had difficulty remembering what his counsellor tells him so it would be helpful if the chatbot could remember the advice they give him, however this brings up ethical concerns of the bot always listening to conversations. One participant suggested that the chatbot should have the ability to make emergency calls.

Food

Many participants were interested in how the chatbot could help them regarding food preparation. One participant stated that he would like the chatbot to give him step-by-step instructions with images and video. Dietary requirements could be added and the chatbot can then provide an appropriate shopping list. There was concern about the extent to which the resources would be verified to ensure that incorrect dietary advice was not given. A common problem for university students is budgeting for food. They want to be able to ask the chatbot questions like 'What can I get for \$10?' The shopping list should also match the availability of food in local outlets and only have locally available ingredients.

Healthy eating was another important point for the participants, they mentioned that healthy food can help with mood and concentration. Some of them had a perception that eating healthy was expensive. The chatbot could provide suggestions for healthy meals or provide break downs of the calories and nutritional facts of the recipes it suggests.

4.7.2 Additional themes

Employment

The participants wanted the chatbot to provide tips for successful job interviews and career path advice, including conducting mock interviews or directing students to university career services.

The importance of mentors for people at the beginning of their careers was discussed. Some participants mentioned that the chatbot could direct users to mentors and provide relevant information about the mentors so that the user can contact them.

Concerns about privacy

Participants were concerned about where their data would be saved. They wanted to know what kind of permissions would be requested by the app, what data will be stored and if the app would access their personal data, for example images. A participant suggested that transparency around data storage will help many users increase their trust in the chatbot and be more willing to use it.

Participants also wanted to know if law enforcement would have access to their conversations with the chatbot. There was a debate on whether authorities should be notified if the user is about to harm themselves or others. It was mentioned that the chatbot cannot understand humour or sarcasm and so might mistake a dark joke for something serious. Some participants suggested that Artificial Intelligence (AI) must make the judgement call on whether the situation is serious.

Chatbot preferences

Participants felt that while the chatbot needs to be platform agnostic, portability is important, and robots did not seem like a practical option as they are big and expensive.

Most participants said they preferred text as their primary form of input and one participant stated that voice input was his preferred. Output can be text, image or audio depending on the user's preference. Combination of text and images similar to Google assistant are preferred in some situations. One participant stated that he would feel self-conscious talking to the chatbot in public but audio output would be fine because he always has his headphones on. It was suggested that history of chats be stored depending on context; and solutions to previous queries can be bookmarked to avoid repetition. It might be useful to include an option to share solutions with other chatbots to help users with similar problems.

One participant mentioned that he is not comfortable speaking to AI about his problems and would rather have the chatbot direct him to resources where he can speak to people. Another participant said he 'would trust AI'.

5. Discussion and conclusion

This project produced a working chatbot that can be used by students and the spectrum and those with related conditions to facilitate participation in tertiary education. The chatbot allows users to navigate social, physical and environmental cues associated with higher education, as well as providing information on anxiety and depression, and university counselling services. The chatbot is available for smart phone or web use and provides relevant resources sourced from student support services and health services. Additionally, the chatbot can provide communication strategies for various scenarios, such as asking for an extension or understanding legal rights.

5.1 Challenges and limitations

The greatest challenge with this project was participation. With the exception of the focus group with CSMP and workshop with Autism Hub, low recruitment limited the scope and depth of information added to the brain; and meant a trial was not feasible. Only three mentees offered to trial to chatbot, however, on the training day, 18 attended, allowing the chatbot to be tested by the population for which it was designed. For the programming component, surprisingly few people got involved. This may have been due to the perceived complexity of programming, although this is a population known for being partial toward coding. The portal ran an extremely simple programming tool, however few people even got as far as the instructions. Future flyers could potentially provide examples of programming steps, or recruitment could directly target coding clubs.

There is a heavy research load on autistic individuals and expecting students to take on a research project involving a trial over half a semester on top of their study load may have been optimistic. While every effort was made to accommodate the academic calendar, the number of intensive weeks, and holidays, left little time for project participation. Given we received feedback from those at the Autism Hub workshop describing how much they felt valued and enjoyed the day, future studies might consider recruiting people who have completed, or be considering, study to circumvent this issue with current students.

5.2 Applicability of the chatbot for this population

The favourable responses to the chatbot verbalised in the focus group and workshops suggest that this technology is applicable and useful for facilitating participation in tertiary education. As chatbot technology is still quite new, participation may increase as students' understanding contributes to a more refined and evolved product. Broader applicability to assist people on the autism spectrum (and related conditions) in transitioning to post graduate education or employment has been suggested, with strong synergies with the *myWAY Employability* project currently being undertaken by Autism CRC. This suggests that future endeavours may require the chatbot to be highly personalised, and continuously adapting to the user's circumstances and environment.

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Appendix A: Participant report – Curtin University

Curtin University

"Hear to Help" Project - Participation Report

Investigators : Prof Tele Tan, Dr Jasmine McDonald, Dr Theresa Kidd and Elaine Hatfield-White

Curtin, through the members of the Autism Academy for Software Quality Assurance (AASQA) and the Curtin Specialist Mentoring Program (CSMP) participated in the focus group, testing and evaluation of the Chatbot.

Focus Group

The focus Group took place at Curtin University on 10 April 2019 and was facilitated by Dr Dana Bradford and co-investigator Dr Jasmine McDonald and Elaine Hatfield-White. A total of 13 mentees from CSMP attended together with 6 mentors.

Chatbot Testing

As part of the Chatbot development iteration, a software testing Hackathon was organised to test the earlier prototype of the Chatbot. The Hackathon which took place on 26 April 2019 were attended by 8 student members of AASQA and facilitated by Dr David Ireland and Prof Tele Tan. The decision-making module of the Chatbot was extensively tested with testers navigating the content and topics related to counselling services, depression, legal rights, mental health Information for first year students, perfectionism and suicide responses. Participants created their own user stories and develop the test cases around each story. The success/failure of each test cases were reported back to the developer. The interactive session facilitated the reporting of software bugs which were collated to improve the Chatbot at the next development iteration.

Pilot Evaluation

The pilot evaluation of the Chatbot was held on 10 September 2019 at Curtin University. This was attended by 18 mentees of CSMP and facilitated by Dr Theresa Kidd, Elaine Hatfield-White and Mollie Coles. The participants tested the Chatbot using their own laptops or mobile phones, navigating through the various content. Participants asked the Chatbot questions they would want their Chatbot to be able to answer. Feedback about the functionality of the Chatbot were collated and forwarded to Dr David Ireland at the end of the trial. Participants reported that they enjoyed the session. Some participants became frustrated as the Chatbot did crash at some points (potentially due to the higher level of volume of people using the website at the same time). Some participants were also frustrated that the Chatbot was not replying to them properly, however, were reassured when helpers reiterated that this is what the Chatbot is supposed to be doing at the moment (due to being in the initial stages of development). A couple of participants mentioned the website was hard to navigate, but were shown how to access the section they needed to be on.

Appendix B: Focus Group Workbook

HEALTH & BIOSECURITY www.csiro.au

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Hear to Help: Chat-bot Technology Focus Group

Participant Booklet



Dr <u>DanaKai</u> Bradford Project Leader CSIRO Email: Dana.Bradford@csiro.au Dr Jasmine McDonald Program Manager Curtin Specialist Mentoring Program Email: jasmine.mcdonald@curtin.edu.au

10 April 2019

How to Complete this Booklet

This Participant Booklet has been developed to assist interested participants in answering questions related to the *Hear to Help: Chat-bot Technology Focus Group* session.

The Focus Group session aims to develop the content of an appropriate chat-bot brain to support individuals on the autism spectrum, and those with related conditions, who are undertaking higher education.

Instructions

- We recommend that you read the Participant Information Sheet available on **Page 5, 6 and 7**. This will answer typical questions about the project and what it aims to achieve.
- To be involved in the Focus Group, you will need to provide your consent for us to use your information for research purposes. To provide consent, please read and complete **Page 8**.
- We request that you complete several Participant Details questions that are on **Page 9**. These are basic questions about you.
- If you are interested, we provide some figures demonstrating the chat-bot. These are available on **Page 10 and 11**.
- We also request that you share with us your knowledge, experiences and tips in navigating university life. To do this, please answer the questions on **Page 12 19**.
- We would like your feedback on some ideas. These are on Page 20.
- We would like to hear some of your ideas. There is space for this on Page 21.
- When you have completed the Participant Booklet, we would appreciate it if you could return it to Dana Bradford. This can be submitted directly to Dana Bradford if you have participated in the Focus Group or returned via email to Dana at Dana.Bradford@csiro.au if completed away from the Focus Group. Please keep a copy if you wish.

Research Participant Information Sheet

Project overview

The CSIRO and Curtin University invite you to take part in a project designing and developing a new chat-bot technology for use by tertiary students to facilitate participation in university education.

A chat-bot is a natural language processing program that takes utterances and applies a set of rules to compile an appropriate response. The response is drawn from a 'brain' which is developed to contain information relevant to the population in which the chat-bot is deployed through an app on a smart device or through a webpage.

In this project we aim to develop the content of an appropriate chat-bot brain to support individuals on the autism spectrum, and those with related conditions, who are undertaking higher education. The brain will also include information to promote mental and physical health autonomy while studying. The chat-bot will provide relevant resources sourced from student support services and health services. Additionally, the chat-bot could serve as a personal conversation partner for users to practice interaction techniques and communication strategies for various social scenarios, such as: talking to a stranger or course coordinator, engagement with a health professional or getting lost on campus.

What does participation involve?

There are four components to this project, we invite you to participate in which ever of these components interest you. You can participate in any or all as much as you like. Initially, participation in this study will involve partaking in a focus group that will take approximately 90 minutes. All focus groups will be conducted by CSIRO researchers and Curtin University staff and will take place at a time and venue that is convenient to you. The focus group will cover the following topics:

- 1. Your understanding of the challenges facing tertiary students with ASD or related conditions
- 2. Your perceptions of a basic chat-bot technology
- 3. Your preferences for interacting with the chat-bot
- 4. Your ideas for additional content for the chat-bot

We will also gather some demographic information about the people who participate in the study (e.g. gender, course). This information will remain anonymous. With your permission, the focus groups will be audio recorded for transcription and reference purposes to help ensure accuracy of the data.

Secondly, participation will involve programming content into the chat-bot brain. This can be done either through a workshop organised by the Autism Academy of Software Quality Assurance, or remotely through a portal. If you chose to enter content remotely, we will provide you with a tutorial and ongoing support.

Thirdly, we need people to test the chat-bot. This involves using the chat-bot and making note of any issues you come across, or any gaps in content that you think should be included.

Finally, we will trial the chat-bot technology with a group of Curtin Specialist Mentoring Program (CSMP) mentees and mentors. To be eligible for the trial, you need to be eligible for the CSMP.

Risk and benefits

Aside from giving up your time, there are no foreseeable risks associated with participating in this study. If you do decide to participate in either the focus group study or the chat-bot workshop you will receive a \$20 JB Hi-Fi gift voucher on the day.

Withdrawal from the research project

Participation in this study is completely voluntary and you do not have to take part. Your decision whether to participate will not affect your current or future relationship with the researchers or anyone else at CSIRO, nor will it affect your ongoing relationship with CSMP. If any topic is raised during the focus group or workshop that you prefer not to discuss, you only need to tell the facilitator and the topic will not be pursued. Similarly, you are free to leave the focus group or workshop at any time. We would like to keep information you have provided to contribute to the chat-bot brain. You may withdraw from this study at any time.

Confidentiality

All information provided by you will be treated confidentially. Your name, or any other personal information will not be included in any publications resulting from the study. All data collected in this study will be coded in a de-identified manner and subsequently analysed and reported in such a way that responses will not be able to be linked to any individuals. Although interviews may be recorded and analysed by a researcher, the recordings will only be available to our research team. De-identified, non-sensitive data collected by the project may be shared with other researchers for the purposes of verifying published results or advancing other research on this topic. Any data collected as part of this study will be securely stored as per CSIRO's Recordkeeping Procedure.

How will my information be used?

It is anticipated that the information obtained through the focus groups and workshops will be published and/or presented in a variety of forums. This includes scientific journal publications and

conference presentations. The chat-bot brain may be made available to other universities in the future. Data collected through the focus groups and workshops may also be used in future research being undertaken by CSIRO or Curtin University in developing technologies for people with Autism and related conditions.

Ethical clearance and contacts

This study has been approved by CSIRO's Social Science Human Research Ethics Committee in accordance with the *National Statement on Ethical Conduct in Human Research (2007)*. If you have any questions concerning your participation in the study please contact the researchers via their contact details below. Alternatively any concerns or complaints about the conduct of this study can be raised with the Manager of Social Responsibility and Ethics on (07) 3833 5693 or by email at csshrec@csiro.au.

Dr Dana Bradford Project Leader CSIRO 1 Technology Court Pullenvale QLD 4000 Ph: (07) 3327 4404 Email: Dana.Bradford@csiro.au Dr Jasmine McDonald Program Manager Curtin Specialist Mentoring Program Curtin University, Hayman Road, Bentley WA Ph: 08 9266 7303 Email: jasmine.mcdonald@curtin.edu.au

Thank you for taking the time to help with this research project. Please keep this sheet for your information.



'Hear to help' chat-bot technology consent form

- I understand that I can choose whether to take part in this study or not.
- I understand that if I change my mind and no longer want to be in the study, I can stop. I do not have to give a reason.
- I understand that I will be required to provide information via an online portal regarding the tertiary experience for students with Autism and related conditions.
- I understand that I may be asked to also attend a focus group regarding the information needed for the development of the chat-bot.
- I understand that all information about me will be kept private.
- My name will not be mentioned if the research is published.
- I understand that information to do with the study will be in locked storage for up to 5 years after the study.
- I understand that if I stop taking part in the study, information I have provided will be destroyed if I ask for it to be.
- I have read and understood the information sheet.
- I have been able to ask any questions about the study and these have been answered.
- I understand I will be provided with a \$20 JB Hi-Fi gift voucher for participating in this study that is unconditional of my level of involvement.

Name:

Signature: _____

Date:

Contact Telephone Number: _____

Participant Details

This information allows us to see what information in the following pages has been provided by the different people we to whom we have spoken. It will allow us to develop content that meets the needs of various users.

- 1. What age are you?
- 2. What gender do you identify as?
 - a. female
 - b. male
 - c. other, willing to specify _____
 - d. Prefer not to say
- 3. To which sector of the wider Autism community do you belong?
 - a. Mentee
 - b. Mentor
 - c. Advocate
 - d. Staff member
 - e. Family member
 - f. Other (please specify) _____
- 4. Are you enrolled in university? If so, which year (please circle)
 - a. First year of university
 - b. Later years of university
- 5. If at University, what degree are you enrolled in?

Chat-Bots At Work

The Chat-bot in Action

Illustrated in Figure 1 is an example of the chat-bot being used in practise.



Figure 1: Illustrates the homepage of the original chat-bot in action.

The Brain Map

The content map illustrated in Figure 2 demonstrates how the brain of the chat-bot identifies, stores and locates information about specific areas.



Figure 2: A content map illustrating the brain of the chat-bot

Your Positive Experiences with University (1)

This section is for people that are currently attending University, or who have attended University in the past

Which areas of University life do/did you most enjoy? (indicate all that apply)

□Travel to and from University
□Navigating the campus
□Meeting people
□Talking to people socially
□Talking to people about course work
□Individual class work
□Group class work
□Attending classes
□Undertaking assignments and out of class work
□Tutorials
□Managing study loads
□Managing stress during semester
□Managing stress during exam
□Studying for exams
□Looking after myself
□Eating well
□Sleeping well
□Managing my time

Are there any other aspects of campus life that you really like? (in the space below, write or draw anything you can think of that you enjoy about Uni life).

Your Advice for Accessing and Locating Support (1)

This section is for all participants

Thinking about the things you really like or liked about University, or the idea of going to University, what are some of the strategies and tools you use to make it easier for you?

Travel to and from University (do you use OrienTrip? Use your own transport? Do you keep the bus timetable with you? Do you come in with a friend?)

Navigating the campus (do you mark your classes on a campus map? Did you do a campus tour? Do you travel to classes with a friend or mentor?)

Classwork (what works for you with organising your class work? Do you make lists of things to do? Use a calendar?)

Meeting people and talking to people (Do you introduce yourself to people? Do you practice talking to people before coming to Uni? Do you have a small social circle of people you can trust?)

Study and exam stress (what really helps you when you are stressed about study load, assignments and exams?)

Looking after myself (do you make special meals? Where on campus can you get healthy food? Do you include healthy food in your shopping? What techniques do you use to get a good night's sleep? Do you meditate? Do you practice mindfulness? Do you use a calendar to manage your time?)

What resources do you use or recommend to help others with their studies?

Your Experiences Accessing and Locating Support (1)

This section is for people that are currently attending University, or who have attended University in the past

Which areas of University life do/did you find challenging?

□Travel to and from University □Navigating the campus □ Meeting people □Talking to people socially □Talking to people about course work □Individual class work □Group class work □Attending classes Undertaking assignments and out of class work □Tutorials □ Managing study loads □ Managing stress □ Managing stress during semester □Managing stress during exam □Studying for exams □Looking after myself □Eating well □Sleeping well

□ Managing my time

Are there any other aspects of campus life that you find challenging? (in the space below, write or draw anything you can think of that you find hard about Uni life).

Your Needs for Accessing and Locating Support (1)

Can you think of anything that would help you travel to and from Uni? Can you think of anything that would help you navigate campus? What would help you to manage study commitments and workloads? What would help you to manage timetables? Can you think of anything that might help you with exam stress? What would help you to look after your health while studying?

Some of our ideas

We have had some ideas for things we would like to include. Could you please tell us if you would find these helpful and make comments and suggestions below:

Role Playing – this allows you to practise scenarios like meeting your mentor; or talking to other students or university lecturers or staff; or even job interviews. You can try different conversations and see what kind of responses you might get. Is this something you might use? What sort of scenarios would you like to practise?

Resources – we can put in links to services like university support, mental health, legal rights and public transport. Are you likely to use these? Can you think of any others?

Recipes – simple, cheap, easy to prepare meals. Would you use this? What recipes would you like to see included? What do you like to eat?

What do you NOT like to eat?

Some of your ideas

This page is blank for you to add any further comments, or to use if you ran out of room earlier.



Autism CRC

The University of Queensland Long Pocket Precinct Level 3, Foxtail Building 80 Meiers Road Indooroopilly Qld 4068 **T** +617 3377 0600 **E** info@autismcrc.com.au **W** autismcrc.com.au



@autismcrc

Our values



Inclusion

Working together with those with the lived experience of autism in all we do



Innovation

New solutions for long term challenges



Independence

Guided by evidence based research, integrity and peer review



Cooperation

Bringing benefits to our partners; capturing opportunities they cannot capture alone



Australian Government Department of Industry, Science, Energy and Resources Business Cooperative Research Centres Program