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Addendum to CSIRO Submission 19/700

Education in Remote and Complex Environments

Standing Committee on Employment, Education and Training

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This addendum to CSIRO Education and Outreach's submission in February 2020 to the inquiry into Education in Remote and Complex Environments has been prepared to provide evidence about the impacts of the COVID-19 pandemic on teaching and learning.

This addendum includes examples, evidence and insights from our recent experiences in delivering STEM education programs, particularly in remote and complex environments across Australia.

Impact of the COVID-19 pandemic on teaching and learning

Disruption of STEM education programs and activities

CSIRO Education and Outreach (CEdO) normally delivers a number of face-to-face STEM education activities for teachers, students and the community. The physical distancing requirements introduced in response to COVID-19 have led to restrictions on travel, cancellations of school incursions and excursions, and school closures. As a result of these changes, many of our programs have experienced postponements, cancellations and/or other disruptions. These include:

- Postponement of 12 planned work experience placements for Year 11 and 12 Aboriginal and Torres Strait Islander students engaged in CEdO's Aboriginal Summer School for Excellence in Science and Technology (ASSETS) Leadership and Support program.
- Postponement of celebration events for Indigenous STEM Award winners.
- Postponement of community visits to deliver adult learning programs to school staff and facilitate partnerships between school, community and Indigenous ranger groups as part of the Science Pathways for Indigenous Communities program. This program has been particularly impacted by temporary school closures and isolation requirements for remote Indigenous communities.
- Postponement of face-to-face Cluster Collaboration Days in the Inquiry for Indigenous Science Students (I^2S^2) program, which normally involves schools, Elders, community members, and Indigenous organisations coming together to build networks and consolidate learning.
- Disruption to student support activities in CEdO's Young Indigenous Women's STEM Academy (YIWSA) program, including monthly, face-to-face check-ins with students at their schools.
- Postponement of camps for Year 8 students commencing the YIWSA program in 2020.
- Postponement of STEM X Regional teacher professional learning sessions in South Australia to be delivered in partnership with the Australian Science Teachers Association.
- Cancellation of a planned trip to the Regeneron International Science and Engineering Fair in California for BHP Foundation Science and Engineering Award winners (six student winners and one teacher winner).
- Postponement of STEM Professionals in Schools' partnership visits between teachers and STEM professionals, as well as planned regional tours and networking events.
- A reduction in the number of applications from STEM professionals being received to the STEM Professionals in Schools program. This particularly impacts regional and remote areas, as it is generally more challenging to find STEM professional partners for teachers in regional and remote Australia.
- Deferment of the first round of paid student work placements in research organisations as part of the 2020 Undergraduate Research Opportunities Program (UROP).
- Cancellation of teacher professional learning sessions on inquiry-based teaching and learning and the CREST Awards program.
- Temporary closure of CSIRO's Discovery Centres.
- Cancellation of opportunities for teachers and CSIRO researchers to work together on small research projects as part of the Teacher Researcher in Partnership Program (TRiPP). This was

due to a significant reduction in teacher registration numbers and travel restrictions which prevented regional and remote teachers from attending a CSIRO site to participate.

- Disruption to the implementation of a new cyber security competition, CyberTaipan, which aims to engage students in hands-on cyber security experiences.

Access to internet and technology for online learning

In response to the COVID-19 pandemic and associated restrictions, many Australians have had to rapidly shift to working and learning from home, including the teachers, students and communities CEdO supports through our STEM education programs. This shift has created greater demand for technology and high-speed internet, which are not always available to all students, particularly those from low-ICSEA schools and regional and remote communities. This has impacted participants in our programs in various ways, as illustrated in the selection of examples included below.

- An essential part of the YIWSA program is ensuring that participants have the resources they need to continue to engage with their formal education. With students moving to home based, online learning due to COVID-19, several participants were disadvantaged because they did not have access to laptop computers and printers. YIWSA staff members connected several students to philanthropic organisations to access funding support to purchase laptop computers. The program has also used the brokerage fund, which is part of the Academy program, to support students in purchasing essential technology.

- During the implementation of school closures and uncertainty around learning environments in March 2020, the CEdO Digital Careers team delivered the Bebras Australia Computational Thinking Challenge. While the competition has always been delivered online, the uncertainty around school opening and the lack of access to school internet services, resulted in some students not being able to participate in 2020. In addition to this, planned engagement activities with regional and low-ICSEA schools were postponed or cancelled due to COVID-19 disruption. Despite these challenges, the March 2020 Bebras Australia Computational Thinking Challenge recorded the highest student participation rate to date.

Adaptations and solutions to challenges posed by COVID-19

CEdO has rapidly developed solutions to the challenges posed by the COVID-19 pandemic exemplified above. These include adapting existing programs and resources for home-based learning, making substantial adaptations to program delivery methods for programs that had been significantly impacted, and using platforms and learnings from online programs CEdO has been trialling and developing over the past five years.

Adapting existing programs and resources for home-based learning

In response to COVID-19 disruption, many of our planned teacher professional learning and student activities were adapted for home-based learning. These include:

- Adaptation of online delivery platforms in the YIWSA program to organise and conduct monthly student check-ins. This involved ensuring all students had access to the platform at home, including adequate internet access.
- Adaptation of teacher professional learning sessions, participant workshops and meetings and program offerings for delivery via videoconferencing technologies. These have been deployed successfully in the Generation STEM, STEM Professionals in Schools, Bebras Australia Computational Thinking Challenge, BHP Foundation Science and Engineering Awards, CyberTaipan, CREST and UROP programs.
- Creation of new resources, e.g. online inquiry lessons based on the I^2S^2 science inquiries for Year 5 students.
- Opening access to online STEM education experiences, such as our Your Diet and Your DNA virtual laboratory simulation and online lessons based on the I^2S^2 science inquiries.
- Extending the participation window for the Bebras Australia Computational Thinking Challenge, which enabled 1785 additional students to participate.

Substantial program adaptations

To support teachers and students in our significantly impacted programs, substantial adaptations have been made to program delivery. These adaptations are summarised below.

Science Pathways for Indigenous Communities

In response to COVID-19 travel restrictions and temporary school closures in remote Indigenous communities, the Science Pathways team devised a range of new delivery modes to support teachers in the program. These included the development of weekly online workshops for adult learning and regular virtual meetings with school staff to facilitate the development of Two-way Science programs. The Science Pathways team also developed an online collaborative space for program participants to share education resources and build a community of practice. This has required significant investment of staff time to rapidly develop online facilitation skills as well as create new materials.

Recognising that many communities would be able to continue learning on country in their family groups during the COVID-19 disruption, the Science Pathways team developed new support activities. These included setting up closed social media groups to connect and share with local Indigenous families during the COVID-19 disruption, as well as developing packs of printed materials focusing on literacy and numeracy. The packs included activity cards that provide prompts to connect Indigenous knowledge activities of families to the science curriculum and school program. These adaptations support the dual goals of building the capacity of local knowledge holders to contribute to a Two-way Science learning program, and providing guidance to families to connect

learning on country with their children to the curriculum with follow up activities during home learning.

The team also adapted program evaluation activities. As part of the evaluation of the Science Pathways program, CSIRO evaluators visit remote communities in Western Australia and the Northern Territory to listen to the community about the program. Evaluators ordinarily travel back to those communities to present the results. For one community, in response to the COVID-19 travel restrictions, a presentation that summarised the findings of the evaluation was recorded, including images from the original trip. The presentation will be played at a school assembly when this is possible. For another community, the evaluation findings were translated into language and the voice recordings were embedded in a summary document for the community.

Virtual work experience

As reported in CEdO's earlier submission to the inquiry into Education in Remote and Complex Environments, in 2019, CSIRO piloted a virtual work experience program. In response to the suspension of site-based work experience at CSIRO due to COVID-19, CEdO is rolling out a scaled up virtual work experience program. This program will be CSIRO's only available work experience stream for 2020. It is expected that the program will provide virtual work experience to approximately 100 students during 2020, with a focus on ensuring participation from students in regional and remote locations.

The 2020 virtual work experience program will again involve the PULSE@Parkes team who will offer students opportunities in radio astronomy, building on the successful trial of the program in 2019. ASSETS students who were impacted by the deferment of their planned work experience placements will also be offered opportunity to complete virtual work experience. In addition, the TRiPP team is exploring a virtual delivery model based on the virtual work experience program.

PULSE@Parkes

The PULSE@Parkes program, run by CSIRO Astronomy and Space Science (CASS), offers students the opportunity to control the 64 m Parkes radio telescope remotely to observe pulsars and then collect and analyse pulsar data. Traditionally, sessions require students to attend CASS headquarters in Sydney or at another partner location. With student access to sites restricted due to COVID-19, the PULSE@Parkes team collaborated with CEdO staff to establish fully remote PULSE@Parkes sessions. Each session includes both CASS and CEdO staff and to date sessions have involved schools in northern Queensland and southern New South Wales. In early June, a special session was offered specifically for Year 9 girls from northern Queensland in collaboration with the YIWSA team. Future sessions will involve schools in the Australian Capital Territory, Darwin and Queensland. The success of these adapted sessions has led to remote sessions becoming a standard option, significantly increasing the reach of the program across Australia.

Digital Careers/Bebras Australia Computational Thinking Challenge

The Digital Careers program offers a range of resources and experiences to support teachers and encourage students' understanding of digital technologies and skills. In response to COVID-19, the team transformed existing resources to support learning from home. For example, all existing Digital Careers resources that are freely available on CSIRO's website had 'online learning adjustments and recommendations' added to assist teachers, parents and students learning from home. These adjustments included help on how to deliver the resources when teamwork was difficult or suggested modifications when printers were unavailable.

In addition, the Digital Careers team has developed new resources to enable learning in any environment. For example, recently the team launched Bebras Unplugged—a range of physical cards that can be used either as a printable or digital resource for teachers, parents and students to develop problem solving, critical thinking and computational thinking skills. Since they were launched on 30 April 2020, these resources have been downloaded more than 2100 times and are the most accessed resource in the Digital Careers portfolio. Similarly, the team developed mini-Bebras challenges addressing specific Digital Technology/Computational Thinking areas of the Australian Curriculum. These mini challenges have been completed by more than 1100 students since their release on 18 May (Networking) and 1 June 2020 (Coding and Decoding).

STEM Professionals in Schools

In response to COVID-19 restrictions on school visits, the STEM Professionals in Schools team has encouraged and supported participants to engage via video conferencing, phone, email, etc. In March, a Distance Partnership Webinar was conducted to provide support for 44 current participant teachers and STEM professionals, particularly those who reside or engage in regional and remote areas of Australia. In some regions, the team also conducted online catch ups between teachers and STEM professionals to facilitate discussion about current challenges, opportunities and ways to support each other. In addition, the program is currently developing an online video resource to provide advice for effective communication in partnerships when working remotely.

The STEM Professionals in Schools team has also expedited the design and implementation of an online opportunity called *Future of our Oceans* to be delivered by the end of June 2020. *Future of our Oceans* aims to support regional and remote teachers' engagement with STEM professionals around the National Science Week 2020 theme *Deep Blue*. The suite of events includes a short series of webcasts presented by experts in relevant STEM fields, and a series of smaller group webinar sessions with STEM professionals and teachers coming together to exchange ideas arising from the webcasts. These sessions will guide development of activities and resources for teachers to use in face-to-face or home/online learning contexts.