# Telepresence Robots:

## Building Better Practice for Connecting Students with Serious Illness or Injury to their Classrooms

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MISSING SCHOOL
KEEPING SERIOUSLY SICK KIDS CONNECTED

NSW GOVERNMENT | Education

# The future is now

Australian education in the 21st century has shifted with the advent of innovative technologies for communicating, teaching and learning. We now have access to resources and opportunities which were unimaginable in previous generations, such that schools are no longer constrained by classroom walls, but engage beyond the school gates.

As school horizons have broadened, so have our understandings of diversity and inclusivity. School communities now embrace students with a range of backgrounds, interests, and learning needs, celebrate individual differences, and strive to support all students to reach their potential as lifelong learners.

When schools consider the whole world as their classroom, students who cannot physically attend can "be at school" from wherever they are. Students who miss school often or for long periods because of a serious illness or injury, are one such group.

## Serious illness, injury and missing school

Around Australia, students with serious illness or injury remain at home or in hospital, missing school. Some miss days and weeks, others miss months and even years.

There can be profoundly harmful consequences.

Academic achievement may be hindered, relationships with peers and teachers disrupted, and motivation diminished. Isolation from the school community can put students at risk of disengaging from school and learning, with long-term consequences which persist into adulthood (Dockett, 2004; Donnan & Webster, 2011; Shaw & McCabe, 2008; Shiu, 2001; Whiteford, 2010).

Along with serious injuries, illnesses such as asthma, cancer, cystic fibrosis, diabetes, gastrointestinal/heart/kidney/lung disorders, immunological issues, and epilepsy lead to significant school absence, with the amount of time missing school varying for each illness. This makes it impossible to estimate an 'average' number of days missed. Students with different patterns of absenteeism are also likely to have entirely different educational support needs (Gilmour, Hopkins, Meyers, Nell & Stafford, 2015).

## What happens when students with serious illness miss school?

The experience of approximately 60,000 Australian students with critical or chronic illness or injury is one of isolation and schools face challenges in supporting these students who are absent (Gilmour et al, 2015).

During a hospital admission, a student may have access to the hospital school. The stated mission of most hospital schools is to work with the student's regular school to maintain continuity of learning. In practice, and for a variety of reasons, this is often not successful (Wilkie, 2012). A further complication is that many students, who need specialist medical care for their illness or injury, have treatment interstate and are shuttling between their own education system and the education system that operates in the state in which they are receiving treatment.

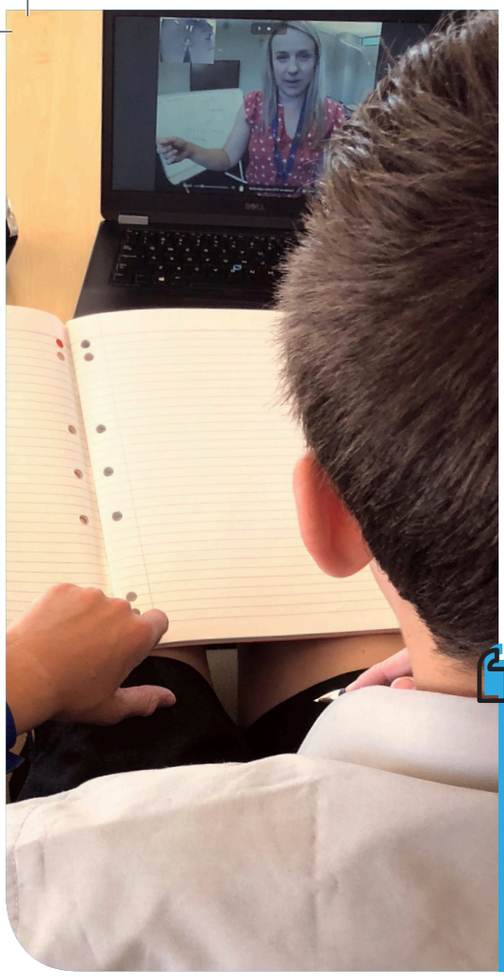
Advances in healthcare also mean that many students requiring medical treatment receive their treatment as outpatients, and may spend significant periods of time recovering at home rather than in hospital. They may be too vulnerable or fragile to attend school, although quite capable of undertaking school work and possibly craving social interaction. During this time, they have access to neither the hospital school nor their regular school (Barnett, Hopkins & Peters, 2014).

> I'd just be in hospital ... with nothing.
>
> **Joshua,**
> **Student**

Frequent or extended school absences, for illness or treatment, can have profound and enduring consequences that present as:

- delays in developmental skills due to missed experiences
- school refusal and absenteeism
- academic under-achievement
- behavioural problems
- increased anxiety
- attention and concentration problems
- reintegration difficulties
- low self-esteem
- disruption of friendships
- difficulties in forming and maintaining relationships
- reduced opportunities for social support
- increased vulnerability to other life stressors or secondary illnesses
- peer rejection

*(Dockett, 2004; Donnan & Webster, 2011; Shaw & McCabe, 2008; Shiu, 2001; Whiteford, 2010).*



## What happens when students with serious illness stay connected?

Maintaining connection keeps students with illness up-to-date socially and academically, helps to normalise a critical period in their life, and gives them a chance to be "just kids" rather than patients. There are positive outcomes for students with illness, support for their siblings and families, and a reduction in the anxiety often experienced by teachers, peers and the broader school communities in this situation (Porter, 2008; Dockett, 2004; Shiu, 2004).

As advances in medical treatment are improving care and sustaining life for children who experience serious illness and injury, there is an emerging need for our education systems to keep pace, work with health systems for comprehensive outcomes and to better equip an estimated one-fifth of students managing significant illness in school (Commissioner for Children and Young People WA, 2018; Legislative Alliance for Students with Health Conditions, 2017).

> I started looking into trying to have that connection between the class and Josh, so that he still felt part of the class.
>
> **Colleen Matthews, Teacher**
> **Bowral Public School**

### How do we keep students with serious illness connected to school?

The Gilmour et al 2015 report described a broad framework for supporting students with serious illness or injury, and identified the following predictors of success:

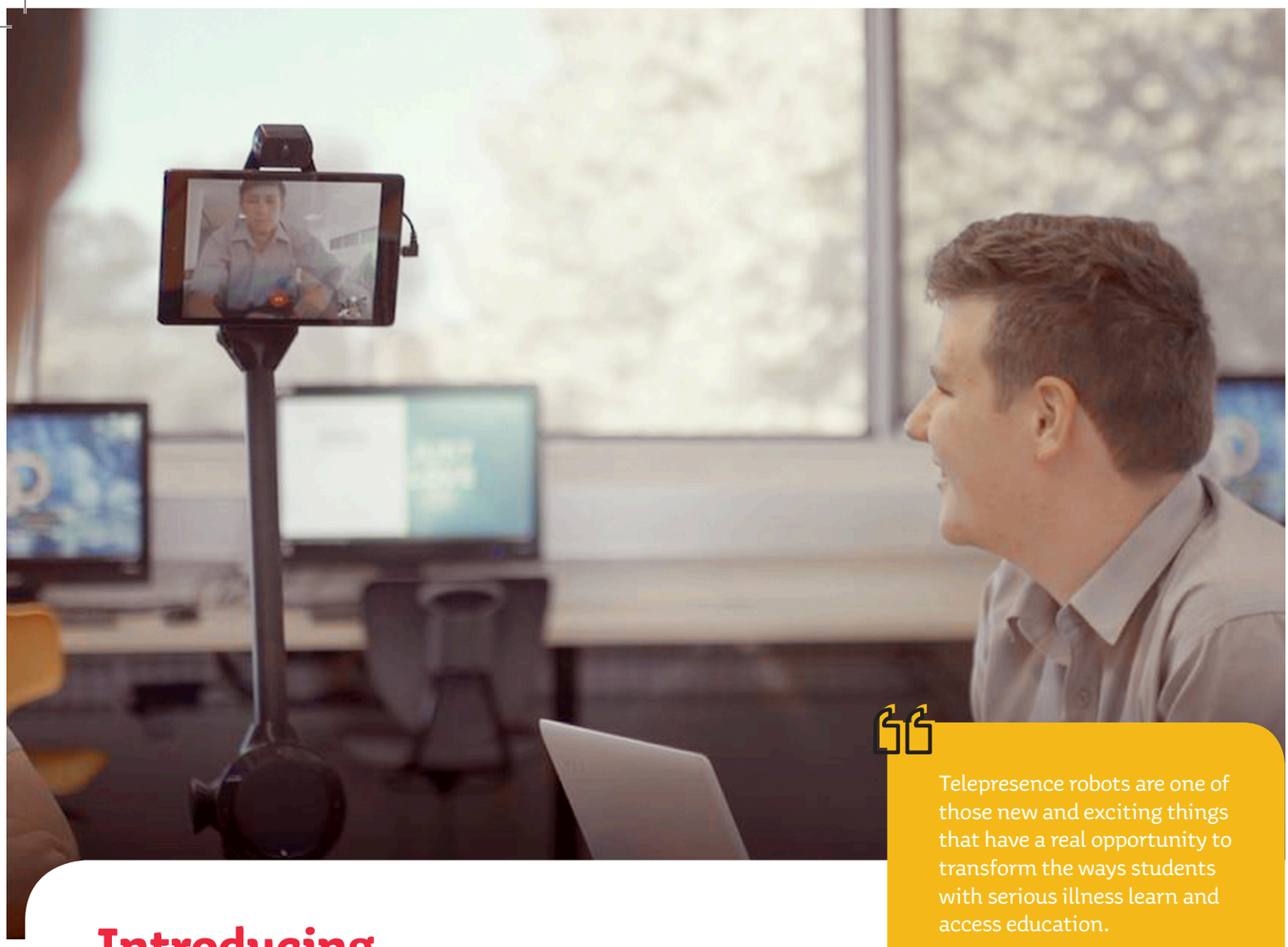
- early intervention and planning,
- individualised and flexible approaches,
- integrated and consistent provision of education across home, school and medical settings,
- collaboration between healthcare and education services,
- meeting the student's social and emotional needs,
- formalised and actionable agreements documenting support for individual students,
- continuous connection between a student and their regular school when absent.

Central to this framework is maintaining communication and connection between students and their schools during any period of absence. Until recently, it has been challenging for schools to maintain continuous two-way connection with students who are absent because of serious illness or injury. Early information and communication technologies (ICT) were used as a communication channel to connect students with their school work (e.g., email, school websites, or online assessment modules), however, new ICT offer promising capabilities for supporting a student's continued participation in education, particularly in a real-time, virtual environment (VGo Whitepaper, 2014).

Various forms of videoconferencing technology have been used to allow remote students to interact with and engage with their teachers and class in a real-time virtual environment. The approach used in the Netherlands (KlasseContact) appears to represent the most advanced and established model in this regard, and a similar initiative is operating at scale in Belgium Flanders (Gilmour, 2018).

Small-scale trials of real time two-way digital communications for students who are absent because of illness suggest that this can be beneficial for the absent student and also for their peers in the classroom (Watts, 2018). Developing, trialling, and further evaluating such approaches for their efficacy in the Australian education context is warranted (Gilmour et al, 2015).

> It means they wouldn't be missing out, and they'd still get a future like all of us.
>
> **Lauren (a peer's perspective)**
> **Student**



> Telepresence robots are one of those new and exciting things that have a real opportunity to transform the ways students with serious illness learn and access education.
>
> **Joachim Cohen, Technology4Learning - NSW Education**

# Introducing telepresence robots

Telepresence robots allow two parties in separate locations to see and hear each other, but – crucially – they also give one user the ability to navigate through the physical space of the other location. This is a potential 'game changer' in how students with significant illness or injury can connect with and participate in their regular school, whilst being physically absent.

Robots live in the regular classrooms of students, and are operated and moved in real-time by the student on their device from the remote location (e.g., home or hospital). The student can see and hear their teachers, be seen and heard, receive the same instruction as their peers, move around/between classrooms, socialise with friends, and participate in as much of the school day as possible with their classmates. This empowers the student with a sense of independence.

Telepresence robots have been trialled in various locations and education settings in Europe and North America. While they have been used in business settings for some time, their application in school settings has only more recently gained traction and there is limited data on how they could or should be used to provide the best support to students with serious illness who are absent.

There is an initiative using "desk bound" robots in Scandinavia (Gilmour, 2018), now starting in the United Kingdom, and another working at scale in Switzerland. Now, across Australia, MissingSchool is placing mobile telepresence robots, through education systems, to support students from K-12 who are living with illness and injury. Earlier telepresence robot trials yield common themes.

> When you get that diagnosis, there're no words that can describe that day ... and then the robot came into play! It's not always seamless, but it's a link, and that's a constant through a very abnormal time ... the social connection can't really be measured, it is fantastic!
>
> **Katie Hammond, Parent**

## Social and emotional learning and virtual inclusion

In many countries, including Australia, professional standards around teaching and education acknowledge the influence of students' social development on their learning, and highlight the importance of building safe and supportive learning environments (AITSL, 2011). In British Columbia, Canada, where early trials of robots were conducted, the standards explicitly require schools and teachers to give evidence that their programs foster a sense of belonging and community for students who are not actually present in the school but who participate in online and "distance" education (Ministry of Education, British Columbia, 2010).

While instructional material can be delivered to remote students by a variety of means, this does little to mitigate the feelings of loneliness, isolation and depression which arise for students who miss school because of serious illness (Newhart, Warschauer & Sender, 2016). Most trials of robot technology have been based on the understanding that social connection is a vital part of learning.

Newhart et al (2016) published the first formal evaluation of creating "virtual inclusion" through the use of telepresence robots in schools. From this qualitative case study of five 6-16-year-olds with chronic illness in rural US public schools, the authors cite three important socio-emotional needs of all students – to feel competent, to feel socially attached, and to have autonomy.

Using telepresence robots, the study showed how students can see and hear what goes on in the classroom, interact by "raising a hand", contribute to classroom conversations, and gain access to any physical location in the school in much the same way as a student using a wheelchair. This is fundamental to supporting the student's active participation in education and the school community, and easing transitions between absence and attendance, and between school years.

> It's basically like I am there, interacting. For them to be able to hear me, and respond, is pretty cool. To be involved in the classroom and have that mobility to move around ... and not having to get people to move me, it gives a sense of freedom.
>
> **Tom,**
> **Student**

## Academic continuity and return-to-school transition

Many students who use the telepresence robots appreciate being able to spend time with their friends (Newhart et al, 2016), however their parents, teachers and administrators often focus on the academic benefits of staying connected to school. Setting aside these differing priorities, when telepresence robots are deployed to meet a student's social and emotional needs, the benefits to their emotional wellbeing usually flow on to support their academic needs as well.

Trials of the telepresence robots in Australia report that parents and teachers alike were surprised by how much energy the students had, and how much schoolwork they undertook, when their engagement with the classroom was mediated through the robot (MissingSchool, 2018). Furthermore, in two-way digital connection students reported working harder and feeling less anxious and less depressed because they were able to maintain conversation and engagement with their peers (Watts, 2018).

The presence of the robot in the classroom also shaped the discourse around the student with illness. Teachers, parents, students and classmates began to refer to the time when the student would be back in school, and the need for all participants to be prepared for this time (Newhart et al, 2016). This appears to have been an important motivator to the absent student, and illustrates Bessell's (2001) observation that students with illness need to believe that they are expected to survive and that they are worth educating.

When the students were well enough to return to school, they and their classmates were already accustomed to seeing each other regularly and interacting over classroom activities, and so the transition back to school was easily managed. Teachers also reported that no particular adjustments were needed to classroom social routines (Newhart et al, 2016).

Most trials to date have focused on the needs of students with acute critical illnesses which lead to long-term absences and, often, involvement with hospitals and hospital schools. Students with chronic "invisible" illnesses – such as diabetes, chronic fatigue, cystic fibrosis, epilepsy, asthma and some autoimmune and gastrointestinal disorders – are likely to experience numerous shorter absences and recurring periods of transition and readjustment. They need long-term tailored support to maintain academic continuity and full participation in education, and there is some evidence that robots facilitate those transitions much more smoothly (MissingSchool, 2018; Newhart et al, 2016; Cha, Chen & Matarić, 2017; Soares, Kay & Craven, 2017).

> When you're lying in a hospital bed, to be able to engage with your peers, to be able to join in with the learning, is what the student wants to be able to do.
>
> **Mercedes Wilkinson, Principal**
> **The Hospital School at Westmead**


## Robot as a supplement, not a solution

Soares et al (2017) conducted a year-long trial on the use of telepresence robots to connect students with illness to their schools during a prolonged hospital stay. They observed that the use of robots supported the work of home/hospital teachers but did not replace them. This was also recognised by the Norwegian Ministry of Education, who stated that education and teaching via the robot "comes in addition to other ways of organising the education" and makes it clear that hospital schools and home tuition were still expected to be part of the educational process. In many countries – including Belgium and Netherlands where two-way digital connection is offered – some home tuition is expected to be provided by the regular schools of students who are absent due to illness, e.g. Canada, Finland, New Zealand, Sweden, and United Kingdom (Gilmour, 2018).

> The robots are … supporting the transitions of students back home, and then into their own school setting, I think that's the most important factor … and being able to support the family holistically around education.
>
> **Mercedes Wilkinson, Principal**
> **The Hospital School at Westmead**

> I took [the robot to assembly] to show the rest of the school, so that if they saw it around, they knew what it was, they knew why we had it at the school … it's been really good for the school community.
>
> **Colleen Matthews, Teacher**
> **Bowral Public School**

One aspect which is universally reported to be critical to the success of the telepresence robot in the school, is how "normal" it becomes in the classroom - once the initial excitement and novelty has worn off (Cha et al, 2017; Watts, 2018).

In the Newhart et al (2016) trial, each robot placed for a student with illness was identified by that student's name, travelled everywhere between classes with the student's classmates, and went to the gym or sang in the music group with everyone else. Teachers noted that classmates came to accept with equanimity the presence of either the student or the robot, and this made lessons, learning, and return-to-school transitions much easier. Cha et al (2017) also note that it is vitally important that the robot be accepted by other students as a normal presence in the school, and suggest using articles of clothing or some other means of identifying the robot as the representative of the student with illness.

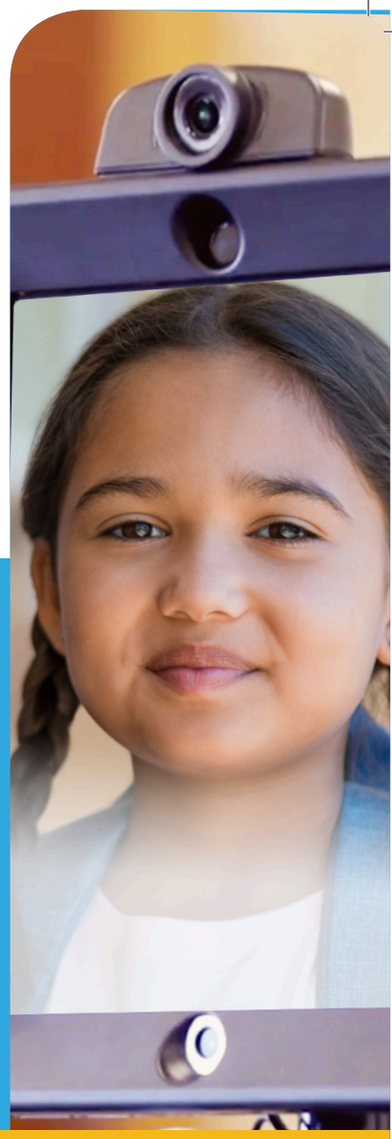
The Newhart trial reported that one student had a less satisfactory experience and described feeling singled out for attention rather than feeling accepted. This student was female, and was the only secondary student in the study. It's not known whether age, gender, or the fact that her classmates were exposed to the robot intermittently for one-hour periods rather than for a whole school day, and were thus less likely to accept it, had any bearing on the experience.

Because the robots travel everywhere in the school with their classes, they can be witness to the usual range of positive and negative behaviours displayed in any school environment. Students have sometimes reported negative experiences, such as other students blocking the robot's view camera, and described these as bullying (Newhart et al, 2016), but were not discouraged by them. Teachers and parents commented that both the good and the bad were "an unfortunate but normal part of the school experience" and it is likely that this in fact contributed to the overall sense of normalcy.

# Planning considerations

The first issue to be raised when planning to deploy a robot is almost always privacy, and this should be addressed as quickly as possible. All users should understand what the robot is and is not capable of doing (for example, it carries no recording capability), and should agree in writing to usage protocols which are consistent with the school's governing privacy policies.

The most important consideration is probably pre-training for school staff, the student, and families. Soares et al (2017) recommend allowing four days to establish a stable connection between the user and the school and to familiarise users with the technology. Cha et al (2017) also allowed the remote user some time to practise navigating the robot through an empty classroom before in-class use began. Some adjustments are likely to be needed to classroom routines and lesson plans.



### Adjustments to classroom routines and lesson plans may include...

- Nominating a "chaperone" or "buddy" to assist the robot with manoeuvring around obstacles in the environment, and making sure the robot is charged and ready.
- Considering where to place the robot in the classroom so that the remote student has a good view of the teacher and instructional materials, without blocking other students' view of the same materials.
- Ensuring that noise levels in the classroom are managed so that conversations between the remote student and classmates can be handled by the robot's microphone and audio system.
- Providing frequent opportunities for students to interact "one-on-one" with the robot, as this appears to encourage students to accept the robot more quickly as a "normal" presence in the classroom and promotes inclusion of the remote student.
- Considering how to manage activities which require physical manipulation of resources – e.g. in a science laboratory – so that the remote student can still participate as fully as possible in the learning experience (robotic "arms" which can be manipulated remotely, are an option which need further feasibility testing).

## Barriers

Soares et al (2017) note that, while there have been a number of isolated trials of robot technologies in North America, there has been no systematic implementation or evaluation of telepresence robots for students with illness, and that there are in fact multiple systemic barriers to their use. This is consistent with Gilmour's observation in 2018 that hospitals schools in Canada appear to be unaware of the technology or that trials had ever taken place.

> Each of them has to have empathy for the other ... to try and make the technology work ... you have to have patience with it ... finding [the robot] made my life easier.
>
> **Colleen Matthews, Teacher**
> **Bowral Public School**

**Barriers to the uptake of the technology fell into three broad categories:**

1. Health and education have traditionally been addressed as completely separate endeavours. This has meant that medical and allied health professionals have focused on medical issues and have been unlikely to prioritise education-related activities, and although not explicitly stated, it can be inferred that educational professionals have been reluctant to engage with a hospital environment. Soares et al (2017) recommend that the initial approach to a school be made by a student's family rather than by hospital staff. It is only recently that social connection and access to education have come to be understood as fundamental aspects of health and wellbeing, and that failure to support these does harm to a student's long-term outlook.
2. Technological barriers, including privacy concerns and lack of policy guidance and trained personnel, as well as aspects such as bandwidth limits and the possibility of electromagnetic interference with hospital equipment.
3. Financial barriers, which encompass the capital cost of equipment as well as maintenance contracts and staffing budgets.

Unsurprisingly, the willingness of all individuals – teachers, school leaders, students, parents and carers – to engage with the technology and work to overcome any perceived barriers is a critical factor in deciding whether a telepresence robot will be effective in maintaining connection between a student with illness and their school. It has been noted elsewhere that schools which take a proactive, inclusive approach to education in general are more likely to engage with technology and to use it effectively to connect with students who are absent due to significant illness and injury (Wilkie & Jones, 2008).

> By using the telepresence robot we're able to connect students with their peers, we're able to give them a reason to be getting up, and to be doing what they normally do ... collaborating with peers is where the learning actually happens.
>
> **Mercedes Wilkinson, Principal**
> **The Hospital School at Westmead**

> Education and social connection between students with serious illness and their schools can continue to happen wherever their school day takes place – at school, in hospital or at home. Their education matters today. Because their future is now.
>
> **Megan Gilmour,**
> **Creator of the National Telepresence Robot Initiative, Co-founder and CEO of Missing School Inc.**

# Telepresence robots in the Australian education context

The feasibility of maintaining connection between schools and students who are absent from their classrooms because of serious illness has been demonstrated across Australia through the telepresence robot pilot launched by MissingSchool in 2017 on funding from the St.George Foundation. While robots have been used around the world in individual schools, there are very few jurisdictions where the technology has been implemented at a systems level as a response to the needs of students with serious illness. The NSW Government's Technology for Learning Team is working with MissingSchool's national telepresence robot initiative. Together we are harnessing the power of telepresence robots for NSW public schools to connect students with serious illness with their learning, teachers, and peers when they miss school.

This is an exciting opportunity for Australian schools and educators to lead the way in building new technology and pedagogical capabilities, and will rely heavily on critical feedback from all schools and students involved. It builds on government commitments to broadening support for disability education, equity and inclusion, digital transformation and STEM in schools. It is expected that the results of the pilot will be shared throughout Australia, and internationally, in order to benefit students with illness everywhere who are missing school (MissingSchool, 2018).

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# References


Australian Institute for Teaching and School Leadership (AITSL), (2011). *Australian Professional Standards for Teachers.* Viewed September 2018 **https://www.aitsl.edu.au/teach/standards**

Barnett, T., Hopkins, L., & Peters, S. (2014). *What happens when they go home? An investigation of education support for students following discharge from the RCH.* Melbourne: The Royal Children's Hospital Education Institute.

Bessell, A. (2001). Children surviving cancer : Psychosocial adjustment, quality of life and school experiences. *Exceptional Children* 67 (3).

Cha, E., Chen, S., Matarić, M. J. (2017). Designing Telepresence for K-12 Education. In *2017 IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN '17)*, Lisbon, Portugal, Aug 2017. IEEE Retrieved August 2017 from **http://robotics.usc.edu/interaction/sponsors/desc.php?name=nrikids**

Commissioner for Children and Young People (2018). *Speaking Out About School and Learning, The views of WA children and young people on factors that support their engagement in school and learning.* Commissioner for Children and Young People WA, Perth.

Dockett, S. (2004). "Everyone was really happy to see me!" – The importance of friendships in the return to school of children with chronic illness. *Early Childhood Australia,* 29(1), 27-32.

Donnan, B. & Webster, T. (2011). *Inquiry into the transition support for students with additional and/or complex needs and their families.* Submission to the NSW Parliament. Ronald McDonald House Charities.

Gilmour, M. (2018). Report to the Winston Churchill Memorial Trust of Australia : *A study on models to enable seriously sick kids to maintain their education connections, conducted in Finland, Sweden, Netherlands, Belgium, United Kingdom and Canada.* Viewed September 2018 at **https://www.churchilltrust.com.au/media/fellows/Gilmour_M_2016_Education_system_models_for_seriously_sick_children.pdf**

Gilmour, M., Hopkins, L., Meyers, G., Nell, C. & Stafford, N. (2015). *School connection for seriously sick kids. Who are they, how do we know what works, and whose job is it?* Canberra, Australia: Australian Research Alliance for Children and Youth. Viewed September 2018 at **https://www.aracy.org.au/publications-resources/command/download_file/id/331/filename/School-connection-for-seriously-sick-kids-full-report-web.pdf**

Legislative Alliance for Students with Health Conditions (2017). "School Success for Children Experiencing Chronic Illness: National Recommendations for Addressing Global Barriers", *Physical Disabilities: Education and Related Services,* 36(2), pp. 8-15. doi: 10.14434/pders.v36i2.24106.

Ministry of Education, British Columbia (2010). *Standards for K-12 Distributed Learning in British Columbia.* Viewed July 2018 at **https://www2.gov.bc.ca/assets/gov/education/administration/kindergarten-to-grade-12/distributed-learning/dl_standards.pdf**

Ministry of Education and Research, Norway (n.d.). *Usage of robot in education.*

Missing School Inc. (2018). *Australian National Telepresence Robot Pilot: Evidence themes captured in practice.* (Unpublished case studies). Canberra, Australia.

Newhart, V.A., Warschauer, M., & Sender, L. (2016). Virtual Inclusion via Telepresence Robots in the Classroom: An Exploratory Case Study. *The International Journal of Technologies in Learning,* 23(4), 9-25. Retrieved in September 2018 from **https://escholarship.org/uc/item/9zm4h7nf**

Porter, L. (2008). *Teacher-parent collaboration.* Melbourne: ACER Press.

Shaw, S.R. & McCabe, P.C. (2008). Hospital-to-school transition for children with chronic illness: Meeting the new challenges of and evolving health care system. *Psychology in the Schools,* 45(1), 74-87.

Shiu, S. (2004). Maintaining the thread : Including young children with chronic illness in the primary classroom. *Early Childhood Australia Inc.* 29 (1).

Shiu, S. (2001). Issues in the education of students with chronic illness. *International Journal of Disability, Development and Education,* 48 (3), 269-281. **http://dx.doi.org/10.1080/10349120120073412**

Soares, N., Kay, J.C., & Craven, G. (2017). Mobile Robotic Telepresence Solutions for the Education of Hospitalized Children. *Perspectives in Health Information Management,* 14(Fall), 1e.

Watts, M. (2018). *Adolescent students with chronic illness: a study of student motivation and engagement and real time two way digital communications.* (Unpublished manuscript). University of Canberra, Australia.

Whiteford, C.M. (2010). *Children with special health care needs: social and learning competence in the early years.* Brisbane: Queensland University of Technology.

Wilkie, K.J. & Jones, A.J. (2008). Link and learn: Students connecting to their schools and studies using ICT despite chronic illness. In P. Jeffrey (Ed.). *AARE Conference Proceedings (2008).* Brisbane: Australian Association for Research in Education.


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