

Education

- 4.1 The Australian Information and Communications Technology in Education Committee (AICTEC), an advisory body consisting of representatives from Australia's education sector at all levels and across all states and territories, submitted that:

In Australia and internationally, reliable and affordable broadband connectivity is recognised as having the capacity to transform the ways in which teachers, students and their families communicate, collaborate and access educational resources across traditional boundaries.¹

- 4.2 The Federal Government has identified expanded online education as one of its key goals in the *National Digital Economy Strategy*:

By 2020, Australian schools, TAFEs, universities and higher education institutions will have the connectivity to develop and collaborate on innovative and flexible educational services and resources to extend online learning resources to the home and workplace; and the facilities to offer students and learners, who cannot access courses via traditional means, the opportunity for online virtual learning.²

- 4.3 The Department of Broadband, Communications and the Digital Economy (DBCDE) told the Committee that ubiquitous, high-speed broadband has the capacity to 'significantly extend the reach, availability and quality of educational services, particularly in regional areas' and enable 'more intensive and immersive online interactions, resulting in higher quality outcomes for students'.³

1 AICTEC, *Submission 124*, p. 4.

2 DBCDE, *National Digital Economy Strategy*, May 2011, p. 36.

3 DBCDE, *Submission 215*, p. 39.

- 4.4 The Department informed the Committee of several overseas studies which show that online learning can actually result in higher rates of learning, rates of course completion and performance in standardised tests for students.⁴ Similarly, Mr Paul Lange, member of the Australian Council of Private Education and Training (ACPET), told the Committee about a study which demonstrated that online delivery of education resulted in significantly better outcomes than face-to-face delivery. However, that study also found that a ‘blended’ mode of education delivery – involving both online and face-to-face delivery – resulted in even better student outcomes.⁵
- 4.5 This chapter will examine the capacity of the NBN to contribute to educational outcomes at all levels. It begins by discussing the ability for high-speed broadband to improve classroom-based education in schools, TAFEs, universities and other institutions; then looks at the range of opportunities presented by the extension of high-speed broadband to homes and businesses. Finally, it discusses the potential for the NBN to contribute to a more efficient and effective education system.

Enhanced classroom-based education

- 4.6 AICTEC’s submission explained that educational institutions have ‘enterprise’ rather than ‘consumer’ requirements,⁶ meaning they need very high quality and scalable connections in order to maximise the potential of broadband for students and teachers:

In general terms educational institutions are not like surrounding residential users. One educational enterprise connection may support 1000 or more users (students, teachers and administrative staff) capable of generating as much traffic as 1000 homes. Educational institutions also have different needs to residential consumers – educational institutions require high symmetry and high bandwidth, they have low latency and peaks in demand. Connectivity between institutions is important, in addition to connectivity to external sources such as the Internet. Educational needs require access to capacity at a reasonable price to enable permanent networks to be created and to cater for the potential

4 DBCDE, *Submission 215*, p. 43.

5 *Committee Hansard*, Canberra, 4 March 2011, p. 38.

6 AICTEC, *Submission 124*, p. 14.

increase in demand which is likely to result as innovations are more widely adopted.⁷

- 4.7 Currently, the quality of data connectivity varies greatly between schools. In 2010, 63.4 per cent of schools reported using fibre for their data connectivity, 32.8 per cent used copper, and the remainder used satellite or wireless. This compares with 2008 figures of 47 per cent fibre and 42.3 per cent copper.⁸ This increase can largely be attributed to the 2010 completion of the NSW Government's rollout of fibre to all public schools and TAFEs.⁹
- 4.8 However, access to fibre connections has not always resulted in fast broadband for schools. Although the majority of schools now have fibre connections, 43.6 per cent of all schools still only receive download speeds of 4 Mbit/s or less, and 52.6 per cent receive 5 to 20 Mbit/s. Furthermore, access to fast download speeds is geographically patchy, with 78.4 per cent schools in remote areas receiving speeds of 4 Mbit/s or less, compared to 33.9 per cent in metropolitan and 51.4 per cent in provincial regions.¹⁰
- 4.9 Connectivity to TAFE institutions is similarly variable. According to a 2010 survey, while around 80 per cent of TAFE institutes had fibre connections, 78.3 per cent received download speeds of less than 20 Mbit/s.¹¹
- 4.10 Given the needs of schools and TAFEs to serve large numbers of users simultaneously, these speeds are clearly not sufficient to maximise the potential of broadband. AICTEC told the Committee that the reasons most schools and TAFEs are unable to maximise the potential of their fibre connections are a lack of affordable prices for data and limitations in state-wide contractual arrangements. Volume-based charging is a common feature of these arrangements, and this is particularly difficult for schools to manage as it 'reduces their ability to control their budgets'.¹²
- 4.11 AICTEC explained that cost is an issue in regional areas more than metropolitan areas, with the cost of broadband connectivity in regional

7 AICTEC, *Submission 124*, p. 6.

8 AICTEC, *Submission 124*, p. 10.

9 The Hon Verity Firth, Minister for Education and Training, 'Schools Benefit From New Broadband Network', *Media Release*, 9 September 2010
<https://www.det.nsw.edu.au/detresources/Broadband_network_zQlzTHKMPO.pdf>
viewed 2 July 2011

10 AICTEC, *Submission 124*, p. 10.

11 AICTEC, *Submission 124*, p. 11.

12 AICTEC, *Submission 124*, pp. 14–15.

Western Australia being up to 220 times that of Perth. As a result, advanced applications, such as real-time video-conferences, ‘lie far beyond what is generally affordable or possible’.¹³

- 4.12 Dr Terry Percival, Director of Broadband and the Digital Economy at National ICT Australia (NICTA), further expressed his disapproval of the current fibre pricing models for schools:

I think all New South Wales high schools now have an optical fibre connection into them – sorry, the public ones, not the private ones – but a lot of them are throttled down to 10 megabits per second because of the cost, which is absolutely insane because it actually costs money to put the box on the end that throttles down the speed.¹⁴

- 4.13 Universities, on the other hand, are generally well-served, with large campuses currently receiving fibre-based connections of up to 10 Gbit/s through AARNet, Australia’s Academic and Research Network. However, many smaller and more remote university campuses, including Charles Darwin University in Darwin, fall outside AARNet’s fast network backbone and therefore are precluded from certain types of data-intensive academic activities.¹⁵ This is further discussed in Chapter 7 on research and innovation.

More educational institutions connected

- 4.14 As discussed in Appendix A, the NBN will provide fibre-optic connections to 93 per cent of Australian premises, primarily in towns and cities with more than 1000 premises. Included in this will be many schools, universities, technical colleges and other educational institutions. The NBN therefore has the potential to connect with fibre a large number of additional educational institutions that previously could not access fast broadband, particularly in regional areas. Furthermore, due to the NBN’s uniform national wholesale pricing structure, institutions in regional areas can expect to be able to connect to fibre at costs comparable to metropolitan areas.
- 4.15 AICTEC explained in its submission that ‘it would be preferable that under the NBN fibre connections to schools (and other educational institutions) are not “shared” with a number of other customers using

13 AICTEC, *Submission 124*, p. 11.

14 *Committee Hansard*, Sydney, 29 April 2011, p. 61.

15 AICTEC, *Submission 124*, pp. 12, 16.

something like Passive Optical Networking (PON)'. Point-to-point (PtP or P2P) fibre connections would provide the optimum level of flexibility and scalability for educational institutions.¹⁶

- 4.16 As also detailed in Appendix A, the remaining seven per cent of premises in Australia will be served by a mix of fixed wireless and satellite broadband services, with initial peak download speeds of 12 Mbit/s and upload speeds of 1 Mbit/s. The Committee notes that although this may represent an upgrade in connectivity in many cases, given the shared-bandwidth nature of these technologies and the requirement of schools to serve many users simultaneously, this amount of bandwidth is not likely to enable the same level of educational services as will be available to schools connected with fibre.
- 4.17 Nonetheless, the Committee considers that the NBN's connection of schools to fibre in a more ubiquitous and affordable way will provide a range of benefits to the delivery of classroom-based education. The remainder of this section examines some of these potential benefits.

Richer online resources available

- 4.18 The Committee heard evidence about the potential for the NBN to enable schools and other educational institutions to access richer, more data-intensive online resources for teaching and learning.
- 4.19 For example, the amount of digitised content available online has increased rapidly in recent years. With improved broadband access, students and teachers will have greater ability to access nationally significant films, music, newspapers, journals, historic documents, oral history interviews and government records from sources such as the National Library of Australia (NLA), the National Film and Sound Archives and the National Archives of Australia.¹⁷ The NLA has developed a popular online archive called *Trove*, which allows members of the public to access a wide range of digitised resources from libraries and other collecting institutions. For further information on Trove refer to Box 4.1.
- 4.20 Similarly, Museums Australia submitted to the Committee:

The most exciting impact of digitisation will be the delivery of new digital content into classrooms and homes through the National Broadband Network. Australia's diverse histories will 'come alive'

16 AICTEC, *Submission 124*, p. 14.

17 NLA, *Submission 106*, pp. 6, 7.

in new ways, with instant access to primary sources such as the voices, images, film clips, sound recordings and documents relating to Australia's history (pre- and post-European settlement), as well as through material relating to Australia's environment, natural history, political development (democratic institutions), geography and the arts.¹⁸

Box 4.1 Trove

The benefits of the NBN are closely related to the content that it will deliver, and a key component of that content is the digital information that is now being collected by Australia's libraries, archives, museums and other collecting institutions. Creative use of this information has the potential to realise a wide set of benefits for the Australian community, including benefits in public information, primary and secondary education, and research.

An example of this potential is the service known as *Trove* which is run by the National Library of Australia (NLA), Australia's largest public research library. *Trove* is a free online service (<http://trove.nla.gov.au>) which allows the public, and researchers, to discover, locate and annotate collection items held by more than 1000 Australian libraries, a wide range of other collecting institutions, and major digitised book, journal and newspaper collections.

Any of the data in *Trove* can be annotated by the users, meaning that citizens are able to engage with a very large range of Australian collection items. This accords with one of the NLA's objectives, to 'explore new models for creating and sharing information and for collecting materials, including supporting the creation of knowledge by our users'.

Access to this content will be facilitated by the reliable and high speed internet access that the NBN will provide. This will benefit students, teachers, researchers and the general public in time saved to access collection material, and in a greater range of collection material being available.

Source: NLA, *Submission 106*.

- 4.21 Screenrights, and its subsidiary Enhance TV, holds an extensive archive of digital broadcast television content that it distributes for educational purposes. Screenrights told the Committee in its submission that the NBN

18 Museums Australia, *Submission 162*, p. 4.

provides 'exciting opportunities to improve access to audiovisual educational resources for all schools, TAFEs and universities'.¹⁹

- 4.22 Dr Jill Abell, Director of Information Technology at The Hutchins School, Tasmania, gave the Committee an example of the way that access to high quality online videos of historical events can transform the learning experience:

... in government schools today you could not put a class on YouTube to be investigating Tiananmen Square history as it happened because they could only really manage one student on YouTube at a time. What high-speed broadband did for our school was allow five labs of students to be on at the same time. That is history as it happened. It is not in the textbooks. The students need to see the video to answer their questions authentically about knowing through good primary sources – through the video captured of that event.²⁰

- 4.23 Professor Adam Shoemaker, Deputy Vice Chancellor of Education at Monash University, told the Committee about the potential to take content from digitised archives one step further using high definition simulations:

If you take that kind of model of education it means that, say, in geology where, let's face it, it used to be pretty much rocks in boxes. Some of those rocks are pretty interesting, but you have to go to the box to get them. Some of them do not exist in nature anymore. They have been mined out. So if you have a digitisation strategy which is able to show this rock that no longer exists out there in the field, fluoresce it, split it apart and look at the colour and everything else, people then learn a lot more about history, archaeology, mining, mining engineering. The same information can be beamed out to people who are looking for deposits in, say, practical ways in the outback. Given the mining industry's importance in Australia, we see that as being pretty significant. That is the kind of simulation model that works at the moment. Schools can do it, universities can do it, TAFEs can do it. Irrespective of the level of education – it is the technology that is important.²¹

19 Screenrights, *Submission 65*, p. [2].

20 *Committee Hansard*, Hobart, 11 March 2011, p. 49.

21 *Committee Hansard*, Melbourne, 18 March 2011, pp. 19–20.

- 4.24 Mr Stuart Hamilton AO, Chief Executive Officer of Open Universities Australia (OUA), told the Committee about a project to develop a 3D animated ‘virtual world’ using real archaeological information:

It is actually a 3D simulation of ancient Kashgar [Western China] to enable students to get a sense of what it was like to be in that city – a sort of second-life approach. To get that to come to life requires that breadth of broadband technology and that quick delivery. It is at the cutting edge of what is now actually being done.²²

- 4.25 Mr Hamilton also told the Committee about the wide use of the ‘Second Life’ 3D virtual world application in the university sector, which already benefits from fast broadband:

We did a survey a couple of years ago, and certainly all of the OUA partner universities have a presence in Second Life. So they will have an island. Some of them are doing different things. For example, Swinburne has a very active teaching island, so they have a whole bunch of classrooms where they will do tutorials, lectures, et cetera. Others have a more showcase kind of island, where they will let some of their engineering students, for example, build buildings as projects in and of themselves to showcase their work. So they are not functional but they are an example of a student producing their project work in a 3D environment.²³

- 4.26 These examples represent just a few of the applications that fast broadband connections to educational institutions will make possible. Over time, it is likely that many more new and innovative educational applications will be developed.

Remote linkage to experts and institutions

- 4.27 Another way the Committee was told educational institutions could benefit from the NBN is through the ability to link up with distant locations using two-way interactive, high definition video and audio. This will enable students to listen to lectures, ask questions, take part in events, and ‘visit’ institutions such as museums and theatres without leaving their classroom.

22 *Committee Hansard*, Melbourne, 18 March 2011, p. 3.

23 *Committee Hansard*, Melbourne, 18 March 2011, p. 8.

- 4.28 The Hutchins School in Hobart is an example of an independent school that already benefits from a high speed fibre broadband connection due to its proximity to the University of Tasmania. As discussed in Box 4.2, the Committee heard that this connectivity allows the schools to link up with experts around the world.

Box 4.2 The Hutchins School

The Hutchins School is a K-12 independent boarding school in Hobart. Dr Jill Abell, Director of Information Technology, told the Committee that the school has invested in a fibre link that allows it to connect to a nearby 1 Gbit/s AARNet service at the University of Tasmania.¹ Dr Abell said that Hutchins regularly uses its connectivity to connect up with experts around the world:

There is so much to learn having a global perspective and striving for a world-class curriculum. The AARNet afforded the access to remote experts and researchers in museums, galleries and cultural institutions around the world. The ability of AARNet to deliver those world experts, scientists and researchers in Australian and international organisations face-to-face through video-conferencing has been a huge bonus to the school, and the students are very, very engaged in it. They love to use the high-definition television video-conferencing to connect with classrooms around the world.

Dr Abell also noted that the affordance of high-speed bandwidth has had significant benefits for students at home. The increased capacity of the NBN will enhance the ability of students to access the school's virtual learning environment after hours and also a range of services provided by the school.

Source: *Committee Hansard*, Hobart, 11 March 2011.

- 4.29 Questacon, the National Science and Technology Centre, is one institution to which The Hutchins School has linked up its classrooms on a number of occasions.²⁴ Questacon delivers science communication programs to schools around Australia, and it expects the NBN will increase the ability of schools to access these programs, particularly in regional and remote communities.²⁵ The Department of Innovation, Industry, Science and Research (DIISR), within which Questacon is administered, stated:

The NBN will allow the delivery of high definition real-time interactions with Questacon presenters, scientists and

²⁴ *Committee Hansard*, Hobart, 11 March 2011, p. 48.

²⁵ DIISR, *Submission 219*, p. 12.

international experts through video-conferencing. The Questacon video-conferencing experience is already far more dynamic than conferencing configurations currently seen within industry, government or education.

Questacon's digital studio supports multiple inputs allowing presenters to appear to be anywhere in the solar system or within the human body to aid the learning experience. Presenters using the studio can vary the way they interact with students. This flexibility can result in a program with a live television look and feel that can also be actively participated in by students.²⁶

- 4.30 Professor Graham Durant, Director of Questacon, told the Committee that Questacon is even exploring the possibility of enabling school groups to connect with surgeons performing live heart operations. The plan is based on a similar program in New Jersey in which high-bandwidth, low-latency connections allow students to talk with the surgeons as they work.²⁷

- 4.31 The Council of Australasian Museum Directors submitted that museums are changing the way they interact with school students:

For generations, museums have played a valuable role in schools education. The traditional school museum excursion has enhanced classroom routine and provided opportunities for new learning experiences for students and teachers alike. Museums take a keen interest in supporting effective pedagogy in the exhibits, experiences and activities that they offer their school visitors. Just as education in schools is undergoing a digital revolution, the school museum visit has also changed into something richer and more interactive and which extends beyond the physical into virtual spaces.²⁸

- 4.32 Museums Australia provided a glimpse of how these new forms of interaction might work:

Educators working in museums and cultural institutions would be able to interact virtually with school and university audiences and cultivate forums for exploring topics in more depth and from varying perspectives. Primary, secondary and tertiary students would be able to ask questions of the educators and receive an immediate response to their questions. Such sessions could be recorded and then downloaded by visitors to museums and

26 DIISR, *Submission 219*, p. 13.

27 *Committee Hansard*, Canberra, 6 July 2011, p. 7.

28 Council of Australasian Museum Directors, *Submission 168*, p. 8.

cultural institutions through on-line access within these institutions.²⁹

- 4.33 The Music Council of Australia told the Committee in its submission that the NBN offers many opportunities for music education, particularly through the use of two-way, high definition video and audio. Examples provided include the ability for students receive lessons from music professionals remotely, to audition online, to view live performances, to take part in interactive workshops and to share and collaborate on performances with other students.³⁰ Refer to Box 4.3 for information on the 2011 'YouTube Symphony Orchestra' event in Sydney, in which some of these possibilities were demonstrated.
- 4.34 NICTA told the Committee that the NBN would enable a new learning paradigm in which, for example, a maestro could deliver a 'master class' to music students across Australia, or similarly, an Academy Award winning actor could provide a master class to drama students in the outback.³¹

Box 4.3 YouTube Symphony Orchestra

The YouTube Symphony Orchestra is one of several collaborative efforts by YouTube to 'push the boundaries of music, art, and film'. YouTube Symphony Orchestra is an example of the convergence of online video with more traditional art forms.

From 14-20 March 2011, Sydney became only the second city in the world to host the international YouTube Symphony Orchestra. The 97 members and four soloists who made up this orchestra in 2011 included amateur and professional musicians, students and teachers and some who had never set foot out of their home country. Auditions were conducted by the musicians posting videos on YouTube.

The performances were streamed live from the Sydney Opera House around the world and the focus of the orchestra was to celebrate musical education, from online master classes with orchestras and leading international musical leaders, to classes and improvised sessions for musicians during the summit week.

Source: Time Out Sydney, 'YouTube Symphony Orchestra', 14-20 March 2011
<<http://www.au.timeout.com/sydney/music/events/23873/youtube-symphony-orchestra>> viewed 9 August 2011.

29 Museums Australia, *Submission 162*, p. 4.

30 Music Council of Australia, *Submission 148*, pp. 4-5.

31 NICTA, *Submission 198*, pp. 16-17.

Sharing and interacting with other schools and campuses

4.35 The improved broadband connectivity provided by the NBN will increase the ability of schools (and other educational institutions) to share resources and interact with each other.

4.36 Professor Ian Atkinson, Director of eResearch at James Cook University (JCU), told the Committee that JCU has been using shared lectures between its two geographically separated main campuses for a long time. As the university's connectivity improved it began to offer better quality video-conferencing, and the level of complaints from students declined. Professor Atkinson told the Committee that it is essential that the lecturer is able to see the students and the students be able to ask questions for the remote lecture to be successful.³²

4.37 Dr Abell told the Committee that, thanks to its superior connectivity, the Hutchins School is already sharing and collaborating with other independent schools, and there is an appetite within the school system for this type of interaction to increase:

We have the capacity now for our school to be connected with other independent schools around Australia to share and have those collaborative classrooms ... The networks have existed in the tertiary education sector for a long time and have had great benefits for economics and commerce in Australia. That is what schools are now asking for. Schools want to be connected.³³

We now have a situation with some of the independent and Catholic schools around Australia where we share a lesson ...

We share those lessons with the independent schools that are also AARNet members around Australia. We have a manager who looks at each education outreach for those schools on AARNet and gives us a heads-up on any cultural or research organisation around Australia like CSIRO, the museums, the universities who are willing to put their experts face-to-face with our students.³⁴

4.38 The NBN will also provide opportunities for schools to increase their links to the tertiary sector. Professor Shoemaker of Monash University told the Committee about some of the benefits for schools who can access university networks:

32 *Committee Hansard*, Townsville, 19 April 2011, pp. 6–7.

33 *Committee Hansard*, Hobart, 11 March 2011, p. 45.

34 *Committee Hansard*, Hobart, 11 March 2011, p. 48.

... we have a secondary school on the Monash Clayton Campus called the John Monash Science School, and another one on our smaller Berwick Campus. In fact, these schools get all the benefit of the superbroadband that the university has at present – all of its material, its laboratories, its students, its connections, even its library and online access. The other schools in the community do not have that access. Even though we would love them to, the actual fact that they are within this, if you like, digital tent makes a huge difference. We would like to see equity in education across the sector ... You can see the potential for those who are able to access it versus those who are not. They are classrooms of the future ...³⁵

Access to more curriculum options

- 4.39 The Committee heard that increasing links between schools campuses and other educational institutions will allow students in smaller institutions, particularly in regional and remote areas, to take part in subjects that were previously unavailable to them. Regional Development Australia (RDA) Far West NSW submitted to the Committee:

Our region wants improved education and training ... but time after time services are unavailable or lost due to lack of critical mass of students or teachers ... Only courses with popular student demand can be offered 'in person'. There are huge possibilities to extend the available courses on offer to any that can be packaged into online, video environments. The NBN potentially could allow students in the region to access any tertiary courses anywhere in the country.³⁶

- 4.40 Language education is one example of a subject area where the range of options for students is currently limited, but could be improved by high speed broadband facilitating interactive video-conferencing and 'virtual classes'. Dr Evan Arthur, Chair of AICTEC, told the Committee:

I note there is an institution starting up now in Australia which is going to exploit the fact that you have a number of people in Australia who are interested in learning a foreign language. We happen to be in the same time zone as large numbers of people who happen to be native speakers of those languages. That is something which becomes possible when you solve a number of

35 *Committee Hansard*, Melbourne, 18 March 2011, pp. 18–19.

36 RDA Far West NSW, *Submission 127*, pp. 3–4.

things of which an appropriate, capable, scalable and affordable telecommunications provision is a very important part.³⁷

- 4.41 The university sector is already benefiting from these types of cross-institutional arrangements, and with the NBN opportunities will increase for students at regional campuses to access more courses. Professor Atkinson of JCU told the Committee:

It may mean that universities can progress down this path of specialisation so that if a particular student in a regional location really does want to study a particular niche area of some discipline that their local university cannot provide they can study that at other universities. In fact, we have courses being delivered now that are being taught from Townsville into Newcastle and Flinders University, I think, and there will be similar reciprocal arrangements.³⁸

- 4.42 Professor Shoemaker told the Committee about how broadband links between Monash's local campuses and its Malaysian campus have created the opportunity for students to undertake courses that are not otherwise available in Victoria:

... the Malaysia site is actually a fully-fledged accredited campus with its own medical school, engineering school and so on. But the key to this is that there is no tropical terrestrial biology in the state of Victoria. There is in Malaysia and it is actually very relevant to future planning in all sorts of things – as you know, we are currently seeing terrible weather events in the world and so on. So this is actually a key. Half the students are from Australia, half are from Malaysia. They work bilingually as well, so there is Malayan English happening. They work in real-time and there is also an on-site visit for them in Malaysia. They are able to use our campus network to make it happen.³⁹

Increasing student and teacher retention in rural areas

- 4.43 A number of submitters told the Committee that the availability of better online education resources could lift school retention rates in rural areas and reduce the need for young people to relocate to cities to access

37 *Committee Hansard*, Canberra, 4 March 2011, pp. 65–66.

38 *Committee Hansard*, Townsville, 19 April 2011, p. 4.

39 *Committee Hansard*, Melbourne, 18 March 2011, p. 19.

education opportunities.⁴⁰ For example, the Committee heard that due to its dispersed population, Tasmania has one of Australia's lowest rates of school student retention after year 10.⁴¹ Ms Melinda King, Research Officer at the Tasmanian Farmers and Graziers Association, told the Committee that better online education could create more opportunities for Tasmanian students to stay in their home communities:

... not many of our high schools go to year 12. With a lot of the rural areas the kids have to come into town to do years 11 and 12—to either Hobart, Launceston, Burnie or Devonport. That is a big move for a 16-year-old child. It is a big expense given the vagaries of farming. Education is such an easy thing to get online now if you have got a good connection and can do it quickly. For that matter, it can keep families together and it takes that pressure off.⁴²

4.44 AgForce Queensland put forward a similar proposition:

AgForce recognises that now, more than ever, there is a need to retain youth in rural areas. By delivering broadband to rural communities, access to education beyond compulsory schooling years may positively counteract the exodus of youth from the bush.⁴³

4.45 The Committee was also told that the NBN could improve the rates of teacher retention in rural areas. The Northern Territory Government submitted:

The virtual class room means that expert teaching skills can be provided to a number of small remote communities simultaneously. In an environment where it is difficult to source teachers and retain them, the NBN offers the potential to reduce turnover in teaching staff in remote communities, where remote won't seem so remote when friends, family and pastoral support are just a video-conference click away.⁴⁴

40 For example: Bass Coast Shire Council, *Submission 130*, p. 2; RDA South West, *Submission 149*, p. 3; Sunshine Coast Regional Council, *Submission 188*, p. [4]; Port Stephens Council, *Submission 223*, p. 3; Mr Daniel Brinkworth, ICT Manager, City of Victor Harbor, *Committee Hansard*, Victor Harbor, 5 April 2011, p. 6.

41 Ms Melinda King, Research Officer, Tasmanian Farmers and Graziers Association, *Committee Hansard*, Launceston, 10 March 2011, p. 44; Mr Robert Wallace, Chief Executive Officer, Tasmanian Chamber of Commerce and Industry, *Committee Hansard*, Hobart, 11 March 2011, p. 16; Dr Abell, The Hutchins School, *Committee Hansard*, Hobart, 11 March 2011, p. 49.

42 *Committee Hansard*, Launceston, 10 March 2011, p. 44.

43 AgForce Queensland, *Submission 24*, p. 8.

44 Northern Territory Government, *Submission 209*, pp. 3–4.

Enhanced education outside the classroom

- 4.46 By making broadband available to all Australian homes and businesses, including high-speed fibre connections to 93 per cent of premises, the benefits of the NBN to education are not limited to classroom-based educational experiences. The Committee was informed about a wide range of educational services that students and teachers will be able to access from their own homes and workplaces. This section will examine some of the general aspects of the increased capacity the NBN will provide, then examine some of the specific types of applications that will be made possible for education in the home, workplace and community.

The benefit of ubiquity

- 4.47 The Committee heard that existing online education services are limited in their availability due to the ‘patchy’ nature of broadband connectivity, particularly outside the major cities. For example, OUA told the Committee it limits its marketing in rural areas because it knows ‘the promise cannot actually be delivered in all cases’.⁴⁵

- 4.48 Professor Shoemaker of Monash University told the Committee that the current lack of ubiquitous fast broadband, even in major cities, results in inequity of opportunities for its students:

Here is the thing. The latest figures we have are that 60 per cent of our students have a device of their own, about 35 per cent of our students share something in the home ... and five per cent of our students have nothing at home ... The ones who come in with a device are on one speed, the ones who only share a device at home are on another speed and the ones who have nothing are on a third speed. We want to find a solution to the problem for everyone.⁴⁶

- 4.49 Education providers are also limited in the services they are able to provide due to the inherent limitations of copper-based infrastructure. Mr Hamilton noted:

We are right now pushing at the limits of what can be delivered, so there is a demand push as well as, if you like, a supply pull operating at the same time. We are a sort of getting to the limits. Right now, anything that can be delivered is probably accessible

45 Mr Hamilton, *Committee Hansard*, Melbourne, 18 March 2011, p. 4.

46 *Committee Hansard*, Melbourne, 18 March 2011, pp. 26–27.

by people in an inner-city situation, but it is much harder in more rural and remote areas.

... the copper network has been exploited beyond its real capacity and indeed its use-by-date. OUA is expecting significant barriers to the expansion of the learning advances of its partnership if the replacement is not planned and implemented soon.⁴⁷

- 4.50 As noted in Chapter 2 on government services, this issue can be described as a 'lowest common denominator approach',⁴⁸ leading to services being restricted in their quality in order to maximise their accessibility. Professor Atkinson of JCU told the Committee that ubiquity of broadband access would enable more innovative online education solutions to be developed:

The point for us is that it will be every student who will have access to this technology. That is really the difference. Some of these things can be done now to different people in particular different locations, but you cannot rely on people having access to that. Without that, it really makes the investment rather more difficult to justify and so on, whereas because of the ubiquity of this we think that it is going to create a lot of commercial opportunities for people to come up with good solutions to those problems that we can then innovate on top of.⁴⁹

Richer, more interactive online educational services

- 4.51 Mr Hamilton told the Committee that faster connections to homes and workplaces would allow more face-to-face interaction to be incorporated into OUA's educational programs. This would not only enhance the quality of course material but, by increasing the social aspect of online learning, could attract a wider range of students with different learning styles:

The key to us is speed of interactivity. It is not just a matter of passively presenting content; it is a matter of providing an environment online which enables real learning – interactive learning – between students and tutors and between students so that there can be chat and engagement in interactive technologies, whether it is virtual reality or responding to things as they are happening ...

47 *Committee Hansard*, Melbourne, 18 March 2011, pp. 3–4.

48 *Adult Learning Australia, Submission 163*, p. [1].

49 *Committee Hansard*, Townsville, 19 April 2011, p. 4.

From our market research into people who are interested in studying ... one of the main things that they talk about when they say that they are not sure that it is for them is that sense that they have to study by themselves without any help from interaction with other students. If we are able to publicise that this is actually a very social experience then ... we can conclude that it is likely to be attractive to a wider range of students.⁵⁰

- 4.52 Similarly, Professor Atkinson told the Committee that high-quality broadband-enabled video-conferencing would enable interactive learning to take place in the form of realistic ‘virtual classes’:

With this high-quality multipoint video-conferencing it is no problem to get 20 people together in a single virtual space. You can see everyone in high quality. You can interact with them just as naturally as we are now face-to-face and you can build these relationships, better support networks, better learning outcomes and better opportunities.⁵¹

- 4.53 Mr Rod Tucker, Director of IBES, advised the Committee that this type of two-way, interactive video service would require as much upload speed as it would download speed. Speeds of up to 20 Mbit/s would be required in both directions for homes to take part in high quality video-conferences.⁵²
- 4.54 IBES also submitted that 3D virtual reality simulations with ‘haptic’ (sense of touch) feedback could be incorporated into education to teach students complex skills, including surgical procedures.⁵³
- 4.55 Conversely, Mr Hamilton told the Committee about ‘augmented reality’, which is a type of educational technology that is ‘basically the other way around’ from simulated virtual reality. In augmented reality, the real world is supplemented with additional educational information from the virtual world. For example, students walking around a real environment would be fed a stream of information through a mobile device as they look at things like historical buildings.⁵⁴ CSIRO advised that augmented reality systems typically require data rates of 20 to 100 Mbit/s.⁵⁵

50 *Committee Hansard*, Melbourne, 18 March 2011, pp. 2, 6.

51 *Committee Hansard*, Townsville, 19 April 2011, p. 4.

52 *Committee Hansard*, Melbourne, 18 March 2011, p. 33.

53 IBES, *Submission 84*, p. 5; University of Melbourne, *Submission 120*, p. 5.

54 *Committee Hansard*, Melbourne, 18 March 2011, p. 7.

55 CSIRO, *Submission 171*, p. 10.

- 4.56 Another new mode of teaching that will become increasingly available online with the NBN is game-based learning. OUA explained in its submission:

Game-based learning has grown in recent years as research continues to demonstrate its effectiveness for learning for students of all ages. Games for education span the range from single-player or small-group card and board games all the way to massively multiplayer online games and alternate reality games.⁵⁶

- 4.57 The Committee was also made aware of video game technology being applied in the defence sector, with a local company having developed 'virtual ship' simulations that replicate real naval vessels for training purposes. Up to 100 personnel at any one time are able to participate in simulated training exercises on the ship using 3D animated avatars, from anywhere in the country.⁵⁷

- 4.58 A number of witnesses and submitters noted that the NBN will provide opportunities for Australia to develop broadband-enabled educational tools that could be exported to other parts of the world.⁵⁸ Moreover, Dr Kate Cornick, Executive Director of IBES, told the Committee that such education models as the University of Melbourne's UniTV could help improve Australia's standing as a destination for international students:

... I think those sorts of models have the potential to improve Australia's international competitiveness because it is not just about the individual productivity of a student and their experience; it is also positioning Australia as an education centre for other countries to seriously consider sending their children and students and potentially keeping them at their homes in China or wherever else they may be located. So there are real opportunities that broadband could offer in that area.⁵⁹

56 OUA, *Submission 183*, p. 6.

57 DIISR, *Committee Hansard*, Canberra, 6 July 2011, p. 10; See also The Hon Jason Clare MP, Minister for Defence Material, 'Avatars train on Navy's future ship', *Media Release (MIN56/11)*, 11 June 2011.

58 TAFE NSW North Coast Institute, *Submission 59*, p. [2]; Communications Alliance, *Submission 185*, p. 15; Professor Atkinson, JCU, *Committee Hansard*, Townsville, 19 April 2011, p. 4.

59 *Committee Hansard*, Melbourne, 18 March 2011, p. 32.

Education at home

- 4.59 The Committee heard that the NBN will enable a variety of educational activities to take place in the homes of students, leading to wide-ranging benefits. Some of these activities are discussed below.

After hours home education

- 4.60 With high-speed broadband available in homes across Australia, the Committee heard that students and teachers will be able to access online school resources outside normal contact hours, supporting their classroom-based education. SAIC Pty Ltd observed that:

Connecting schools and classrooms are important, but student learning and creativity needs to be supported at home. Students need access not only to the same resources they have at school, but they need to be able to ‘pick up where they left off’ in the learning process when they get home. That means that computers in the home need to meet the same technical specifications as the computers in the school.⁶⁰

- 4.61 In its submission, the ACT Government told the Committee about its innovative ‘connected learning community’ (cLc) program which enables students to participate in a range of school-based activities from home:

The cLc system delivered from ACT schools' high-speed fibre infrastructure is a safe online learning community for students to interact with their school and one another. The cLc system allows students to replay a lesson at home via podcast, use video links to practice speaking a language with a student at another school and have the option of completing their maths homework online. Students will also be able to log in from home to double check their homework requirements and create online portfolios of work. Video-conferencing amongst students and teachers is also currently being integrated into the cLc. Without optical fibre based broadband – the fastest, most effective way for schools to access online content functionality – access to the cLc would be limited.⁶¹

- 4.62 Ms Aisha Trueman, a year 11 student in Canberra, expressed support for the NBN’s role in increasing the ability of students to access resources from home in light of increasing expectations from schools:

60 SAIC Pty Ltd, *Submission 35*, p. 8.

61 ACT Government, *Submission 227*, p. 7.

School students are more and more frequently being given homework assignments with the assumption that they have internet access of a reasonable speed so that they can do effective internet research, but not all students have internet like this, if any. This makes the assignments difficult for them, but it is also difficult for the schools to compensate for students like this. The NBN means that students will have fast internet and thus school and teachers can set assignments with this in mind, making for faster, more up-to-date education.⁶²

- 4.63 DBCDE told the Committee about some other innovative ways in which the NBN could transform home-based education, including enabling commercial tutoring providers to deliver live tutoring online to students at home and high level 'virtual classes' for gifted and talented students to supplement their school studies.⁶³

Involvement of parents in children's education

- 4.64 Broadband internet provides an opportunity for parents to be more involved in the education of their children. Dr Arthur of AICTEC told the Committee that a fibre network would enable the interaction between parents and schools to develop further:

More detailed interactions involving parents, where parents could be aware of some of the experiences via particular educational activities that students are engaged in and the family can be also involved in those things, do require levels of connection. In particular, if you are having educational experiences involving parents and doing things generally outside the institution, one of the key aspects of fibre that is relevant is its symmetrical nature. If you have people at home doing a lot of applications which require them to interact with the institution, then the same or similar amounts of traffic need to move interactively between the two. At the moment fibre is the technology you would choose to enable that.⁶⁴

- 4.65 Dr Abell told the Committee that The Hutchins School already conducts parent-teacher meetings using video-conferencing, including with parents overseas.⁶⁵ Dr Abell also said:

62 Ms Aisha Trueman, *Submission 88*, p. 2.

63 DBCDE, *Submission 215*, p. 49.

64 *Committee Hansard*, Canberra, 4 March 2011, p. 58.

65 *Committee Hansard*, Hobart, 11 March 2011, p. 47.

Typically of independent schools, we place great importance on a parent portal, so the parents are able at any time to connect to the school to see their children's timetable, their children's performance, ongoing formative assessment, the celebration of their work through their e-portfolios, or just to make a time with the teachers to go to a parent-teacher meeting, et cetera. It is the ability of the school to have fast, secure, reliable communications to allow the home to connect.⁶⁶

Participation by students who can't make it to class

4.66 The ability of the NBN to supplement school-based education has been discussed; however, for many students, attending school in person is not possible for a range of temporary and permanent reasons, such as work responsibilities, illness, disability, or being located in a remote area. The Committee received evidence that the NBN may be able to help such students keep up with their studies and maintain contact with their teachers and fellow students from home, for example, by enabling them to view missed lectures online or attend virtual classes. The potential would be equally as great for parents who choose to home-school their children.

4.67 The Australian Information Industry Association (AIIA) advised the Committee that the benefits of NBN-enabled educational services for people who are not able to attend classes in person are vast:

The ability to facilitate virtual classrooms and even virtual schools provides unimaginable opportunities for students otherwise excluded from the physical school community. This includes those in isolated geographic locations but also those otherwise socially isolated by way of disability or circumstance (e.g. carers of people with disability, seniors, mature aged workers, migrants, stay at home parents etc). For some of these groups the ability to participate in education and training has not been an option. For others their specialist teaching needs have simply not been able to be met ... Ultimately the payoff is improved workforce opportunities and participation – and in turn increased productivity.⁶⁷

4.68 Professor Atkinson from JCU told the Committee that students who both work and study are increasingly expecting to be able to interact with universities online:

66 *Committee Hansard*, Hobart, 11 March 2011, p. 41.

67 *AIIA, Submission 184*, p. 13.

Most people in this room, or many of us, when we went to university we would probably have attended full time. That is now becoming the exception rather than the norm. Students are working part time ...

To have the NBN reticulated into these businesses where students in their breaks and so forth can interconnect with material and content from the universities is I think going to provide better mechanisms for those students to interact electronically with the university ...

... where I think it is going to impact is that students will be able to access those lecturers more or less from wherever they are ... You have students out on particular placements or they are working for a business and the business has particular demands on them. They can actually just beam in from that business or from home, or if they are in a different city, an interconnect to those lectures in that fairly natural way through desktop video-conferencing tools that are now becoming of course almost free.⁶⁸

- 4.69 Similarly, the NBN will enable students who cannot attend classes because they are ill to be able to continue their education. Mr Gary Ballantyne, Account Director NBN at Huawei, gave the Committee an example of how the NBN would enable students to keep up with their studies during an epidemic:

There was a very good example a couple of years ago where all the schools in France were closed for about three weeks because of a swine flu epidemic. The government there was very keen to find some way to continue the education of the French students during that period while the schools were closed and they were looking for some ubiquitous network that would enable them to be able to reach the vast majority of kids. They just did not have it and ended up doing some classes over cable TV.⁶⁹

- 4.70 In its 2008 report, the Rural Telecommunications Independent Review Committee (RTIRC) noted that 'distance, population size and resource constraints require some curricula to be delivered remotely rather than face-to-face' in many rural areas. It went on to say that 'the provision of adequate telecommunications services can change the way people learn and provide the flexibility required to accommodate different needs,

68 *Committee Hansard*, Townsville, 19 April 2011, pp. 3, 6.

69 *Committee Hansard*, Sydney, 29 April 2011, p. 14.

preferences and constraints'.⁷⁰ Students in remote areas who are not within practical distance of a school have relied on distance education programs such as School of the Air for their education needs for many decades. The opportunities for students in remote areas could be considerably enhanced by the NBN.⁷¹ AgForce Queensland submitted:

Broadband is desirable for remote/distance education as it allows for fast download times and enables participation in interactive programs. Its efficacy for self-directed learning is unrivalled, with many part-time and external students at tertiary institutions reliant upon internet access for their studies.⁷²

- 4.71 McKinlay Shire Council submitted that the NBN could, by improving the quality of distance education, decrease the need for families in remote areas to send their children to boarding school:

Access to the NBN will provide students with web based interactive lessons involving real-time voice and data transmission. With the NBN it is a possibility that secondary education via the internet could be reintroduced as an educational alternative for parents preferring to home-school, rather than having their children attend boarding school. With the ever advancing online applications and web sites, the NBN will be imperative for education and skill building as we move further into the technological age.⁷³

- 4.72 Physical Disability Australia advised the Committee about the potential of the NBN to improve access to education for people with disabilities who would otherwise have difficulty attending school:

Many people with disability experience discrimination at learning institutions such as lack of accessible premises, not being able to travel to and from learning institutions because of costs and lack of accessible public transport as well as time factors.

Learning online has become the way of the future, and through the Internet, people with disabilities are able to access education and

70 Regional Telecommunications Independent Review Committee, *Framework for the Future*, September 2008, p. 32.

71 See Mr Daniel Bryar, *Submission 96*, p. [3]; Optus, *Submission 179*, p. 8; DBCDE, *Submission 215*, p. 47.

72 AgForce Queensland, *Submission 24*, p. 8.

73 McKinlay Shire Council, *Submission 31*, p. [2].

vocational opportunities that would otherwise not be available, therefore increasing employment opportunities for the future.⁷⁴

- 4.73 The Music Council of Australia told the Committee that disability services are specialised and only available from a small number of locations, so the disabled community could particularly benefit from NBN-enabled services being delivered directly to the home.⁷⁵ For example, the Australian Federation of Deaf Societies (AFDS) submitted that the deaf community would benefit greatly if educational services incorporating live captioning and video relay interpreting could be delivered to the home rather than requiring students to travel to designated locations, as occurs currently.⁷⁶

Education in the workplace

- 4.74 The National Centre for Vocational Education Research (NCVER) provided data to the Committee showing that the proportion of Vocational Education and Training (VET) subjects delivered mainly online or remotely increased from 3.8 per cent in 2007 to 5.4 per cent in 2009, with the highest rates of usage in agriculture, environmental and education related fields and lowest rates in architecture and building.⁷⁷ However, the rate of VET sector usage is significantly lower than the higher education sector. NCVER suggests this is because VET courses tend to rely on delivery of training in the field or as part of work experience compared to higher education courses. The current limitation in bandwidth outside educational institutions is therefore limiting the capacity for VET to take place online:

VET generally relies on more experiential methods of delivery, often delivered on-the-job. The remote nature of the internet, at least in its current technological incarnation, struggles to provide an adequate replacement for the benefits of proximity-based learning.⁷⁸

- 4.75 By increasing bandwidth to workplaces, the NBN has the potential to enhance VET to at least the same degree as other forms of education. AICTEC told the Committee that this will have wide-ranging benefits for the Australian economy:

74 Physical Disability Australia, *Submission 164*, p. 4.

75 Music Council of Australia, *Supplementary Submission 148.1*, p. 8.

76 AFDS, *Submission 119*, p. [6].

77 NCVER, *Submission 131*, pp. 2–3.

78 NCVER, *Submission 131*, p. 3.

The Australian Flexible Learning Framework ... has acknowledged, as a fundamental principle, the importance of a cost effective, high speed broadband that supports flexibility in the delivery of education and training to the VET sector ... its introduction is expected to deliver social and economic benefits and drive Australia's productivity competitiveness and that for Australian business, it represents an unprecedented opportunity for innovation and radical changes to the way learning and training is conducted.⁷⁹

- 4.76 Townsville City Council submitted to the Committee that the NBN would improve the accessibility of vocational training to people in regional areas and increase the amount of time they are able to spend in their own workplaces:

As a key regional centre serving a large regional catchment, Townsville is host to a number of vocational training providers. Students are often required to travel to Townsville to undertake classroom training to supplement their on-the-job learning. Increased broadband capacity, particularly in regional and remote communities, will revolutionise the way in which training is delivered and potentially allow trainees to spend more time in the workplace and less in classrooms.⁸⁰

- 4.77 North Coast (NSW) TAFE told the Committee that the NBN will greatly change the way they are able to deliver training across the full range of vocations by allowing staff and students to transmit detailed images in real time, interactive video:

Being able to view 'rich media' will provide students with a greater appreciation of what is being described or demonstrated and allow them to capture assessment tasks in the workplace. Students completing complex physical tasks as part of an assessment in their work place will be able to share their work with their teacher or project team and receive real time feedback. Examples include but are by no means limited to:

- A hairdressing student (with the client's permission) will be able to make a video recording of their initial fact finding interview, then record and appraise their practical skills and conclude with an exit interview or client satisfaction assessment.

79 AICTEC, *Submission 124*, p. 5.

80 Townsville City Council, *Submission 199*, p. 3.

- In horticulture the same technology will give us good resolution to assess the potting of nursery stock. As well, the teacher can demonstrate the skill to a remote student. Different tools such as camera glasses used in conjunction with the improved bandwidth will help the teacher to see fine detail.
- Commercial cookery students can demonstrate knife skills as they use them in their workplace. Assessors will be able to review safety, speed and the quality of the product.⁸¹

4.78 Other forms of advanced online learning are also particularly applicable to vocational contexts. For example, North Coast TAFE submitted that simulated, virtual environments could be used to teach skills for complex, hazardous or capital intensive vocations, such as fire-fighting or the operation of large machinery.⁸² CSIRO advised that it is working on advanced training systems for aviation and mining companies that consist of augmented reality with haptic feedback.⁸³ Ms Sally Thompson, Chief Executive Officer of Adult Learning Australia (ALA), told the Committee about 'point-of-view' glasses that are worn by training participants and allow the trainer to remotely see the participant's point of view as they repair a car, for example.⁸⁴

4.79 Professor Atkinson from JCU advised that the NBN will also be a support for universities as they progressively restructure their teaching and assessments towards more 'work integrated learning', in which components of a student's degree are spent embedded in a workplace:

We just do not want to throw students out into that workplace with a few pieces of paper, a couple of downloads on a DVD and let them go. Students need to be scaffolded. They need to be supported and you need to be interacting with those students in those workplaces.⁸⁵

4.80 Mr Ben Vivekanandan, National Manager for Policy and Research at ACPET, told the Committee that 74 per cent of Australian VET is delivered by private institutions.⁸⁶ ACPET member, Mr Paul Lange, informed the Committee about his company, Accredited Online Training, which delivers vocational training around Australia using online video-conferences. Mr Lange said that two-way video is necessary for skills training in order to ensure that skills can be demonstrated, however, this

81 TAFE NSW – North Coast Institute, *Submission 59*, p. [1].

82 TAFE NSW – North Coast Institute, *Submission 59*, p. [2].

83 CSIRO, *Submission 171*, p. 10.

84 *Committee Hansard*, Canberra, 4 March 2011, pp. 53–54.

85 *Committee Hansard*, Townsville, 19 April 2011, pp. 2–3.

86 *Committee Hansard*, Canberra, 4 March 2011, p. 37.

requires broadband connectivity at a sufficient level to prevent participants from dropping out. Mr Lange expects that the NBN will enable more participants to take place in a training video-conference at the same time, increasing the economic viability of this type of training.⁸⁷

4.81 The Committee heard that the NBN will provide opportunities to enhance professional development in regional areas, including in the field of medicine.⁸⁸ Ms Meredith Feist, Manager of Operations and Community Engagement at Flinders University Rural Clinical School, told the Committee that the School currently uses multi-point video-conferencing for the administration and delivery of its programs in rural South Australia, however, there is a need for greater bandwidth and stability of network to enable these interactions to improve in quality.⁸⁹ See Chapter 3 for further information on the NBN's ability to enhance medical education.

4.82 In its recent report, the Broadband Commission for Digital Development identified that the way teaching takes place will change greatly, and a focus on teacher support is critical to ensure that the benefits of broadband for education are realised:

One of the most critical issues will be to ensure that the education system is capable of leading this revolutionary change. This will necessitate very significant professional development. Often a great deal of attention and money goes into the technology but very few resources, if any, are available to ensure that those who will have to make it work are equipped to implement and guide that process. Teachers and other staff will need significant support – without this, despite the enormous investment by the government, the project could fail.

Teaching as a profession will also change radically, as not all teachers will need to be school-based. For example, teachers who leave the formal system when they start their own families could be easily retained within a far more flexible work structure complemented by e-education.⁹⁰

87 *Committee Hansard*, Canberra, 4 March 2011, pp. 39–40.

88 Rural Health Education Foundation, *Submission 87*; OUA, *Submission 183*, p. 3.

89 *Committee Hansard*, Victor Harbor, 5 April 2011, pp. 19, 23–24.

90 Broadband Commission for International Development, *Broadband: A Platform for Progress*, June 2011, p. 112.

- 4.83 Several inquiry participants told the committee that the NBN will enable greater opportunities for access to professional development by teachers, particularly those living in rural areas.⁹¹ The AIIA submitted:

The quality of educators and the opportunities available for them to access and share resources and participate in professional development activities (which ultimately make their jobs more interesting and fulfilling) are enhanced. This is particularly critical to schools and teachers that are geographically isolated who have limited access to, or flexibility to access, peer support and professional development networks. Access to such networks and to rich educational resources also provides an important incentive for teachers otherwise disinclined to seek out rural and even some regional teaching positions.⁹²

- 4.84 Similarly, NICTA told the Committee:

It is important to ensure that teachers at all levels are able to upgrade their own skills and keep up with the latest in the education system. Using online tools and social networking, teachers are already starting to share content and teaching techniques with peers around the world. Given unfettered broadband access they will also have access to a huge variety of online learning tools and technologies.⁹³

- 4.85 As an example of the new types of resources that could be made available to teachers in Australia, Huawei told the Committee about an online service in the United Kingdom called ‘Teachers TV’ (recently re-launched as SchoolsWorld.tv).⁹⁴ This service consists of thousands of free, high quality educational videos showing teachers how to improve their teaching skills, deliver lessons across the curriculum and deal with issues such as bullying and conflict.⁹⁵

Education in the community

- 4.86 In addition to extending education to the homes and workplaces of enrolled students, the Committee heard that the NBN could enable high

91 For example: Huawei, *Submission 105*, p. 8; RDA Townsville and North West Queensland, *Submission 202*, p. 2; AICTEC, *Submission 124*, p. 24; DBCDE, *Submission 215*, p. 42; Music Council of Australia, *Supplementary Submission 148.1*, pp. 9–10.

92 AIIA, *Submission 184*, p. 13.

93 NICTA, *Submission 198*, p. 17.

94 Huawei, *Submission 105*, p. 8.

95 See SchoolsWorld.tv <www.schoolsworld.tv/videos/> viewed 5 July 2011.

quality online education to be made more accessible to the general public in a less formal way.

- 4.87 Adult Learning Australia (ALA) explained that its vision is for all citizens to have access to both lifelong and ‘lifewide’ learning:

By ‘lifelong learning’ we mean learning beyond school throughout the adult years via the formal education system, in workplaces and through community participation. By ‘lifewide learning’ we mean developing the skills and knowledge required to engage in meaningful work, to participate fully as a citizen in a vibrant democracy, to live in harmony in a diverse, multicultural and rapidly changing society and to manage ones health and personal wellbeing, particularly in the senior years.⁹⁶

- 4.88 Organisations such as the University of the Third Age aim to make education accessible to older people, and online courses are now available that are particularly aimed at people who are physically, geographically or socially isolated.⁹⁷ During the Committee’s visit to Melbourne, IBES told the Committee about the University of Melbourne’s development of Uni TV, an IPTV service which will be capable of sharing the university’s lectures and other content with audiences anywhere (see Box 4.4 for further information). Dr Cornick told the Committee:

Uni TV does not just offer degrees to regional areas. For example, a family in a regional area or an elderly person who is interested in microbiology could see a pre-eminent academic who might be visiting Melbourne University give a public presentation at the university which they would otherwise be unable to see. But they could tune in and see that presentation for themselves through Uni TV ...

It is the community engagement, the knowledge transfer aspects of the university that could be opened up to a broader community.⁹⁸

96 ALA, *Submission 163*, p. [1].

97 See U3A Online <<http://www3.griffith.edu.au/03/u3a/>> viewed 4 July 2011.

98 *Committee Hansard*, Melbourne, 18 March 2011, p. 32.

Box 4.4 Uni TV

Uni TV is an innovative new technology platform developed by the Institute for a Broadband-Enabled Society (IBES) in collaboration with Ericsson and The University of Melbourne. It aims to harness the potential of broadband in delivering tertiary education services.

Uni TV brings together a wide variety of both existing and newly created customised content from across the University of Melbourne and combines them with interactive applications such as shared learning environments and virtual workspaces. New content development can harness the potential of 3D technology in learning through the visualisation of molecular structures, artefacts and designs. End users could be educators, learners, researchers or the general public.

Platforms such as Uni TV also have the potential to improve Australia's international competitiveness by positioning Australia as an education centre for other countries.

Source: IBES, *Submission 84*; Dr Cornick, *Committee Hansard*, Melbourne, 18 March 2011.

- 4.89 Professor Atkinson of JCU told the Committee that there is a high level of demand in the community for this type of service:

There is a lot of fantastic material that is already recorded. iTunes University, an Apple product [which] has fascinating lectures, and the TED Talk series, are really popular. There is actually a demand for this sort of thing. I think you are quite right; in the University of the Third Age there are really fascinating opportunities as we engage with the ageing population. I know this from just personal experience with older people I know in my own suburb and my own parents about people wanting to keep engaged. It is harder for people to get out and so forth, but these technologies will just let them engage.⁹⁹

- 4.90 Ms Thompson of ALA told the Committee that high bandwidth is essential for this type of education in order to replicate face-to-face interaction as closely as possible:

99 *Committee Hansard*, Townsville, 19 April 2011, p. 10.

For all of those activities what people really need is face-to-face interaction with other human beings, whether it is through learning, through engaging with health services or through other sorts of peer-to-peer sharing. What you find at the moment is that some people who live in remote areas or people who are confined for other reasons will persist with the technology we have; they will actually push on ... But a certain group of people just do not; they do not push past that initial point of resistance. They are the people for whom an NBN will really open up the world.¹⁰⁰

- 4.91 ALA submitted to the Committee that social inclusion programs, such as the Federal Government's Broadband for Seniors program which funds kiosks that provide free broadband access and deliver training in basic computer and internet skills, will benefit greatly and be more attractive to participants when applications are made available that more closely mimic face-to-face interaction.¹⁰¹

A more efficient education system

- 4.92 In addition to delivering better and more accessible education outcomes, several inquiry participants advised the Committee that ubiquitous, fast broadband has the capacity to enable education to be delivered more efficiently.

- 4.93 For example, Mr Paul Nicholls, Director of Strategic Projects, Office of Research and Development at Curtin University, told the Committee that the NBN could help to reduce pressures on physical infrastructure at university campuses such as lecture theatres, computer laboratories, parking lots and other student facilities:

Broadband services for university students will reduce the need for regular on-campus student attendance at peak times and allow the use of these resources to be targeted for specialist functions such as visiting specialists, workshops and laboratories.¹⁰²

- 4.94 NICTA submitted that by using cloud services, education providers could substantially reduce their costs while providing better collaborative ICT services:

100 *Committee Hansard*, Canberra, 4 March 2011, p. 51.

101 *ALA, Submission 163*, p. [2].

102 *Committee Hansard*, Perth, 5 May 2011, p. 19.

In 2010, Google reported that 1.2 million NSW school students' emails had been migrated to a Google App for Education, reducing total costs by 66 per cent. Other benefits were that students email quotas were increased from 35MB to 7000MB, meaning students do not need to delete emails and all email became easily searchable. Furthermore, attachments of up to 20MB can be sent on each email, making collaboration much richer.¹⁰³

- 4.95 The Committee was also told about the potential for 'e-portfolios' to streamline record-keeping and provide a detailed and media-rich archive of each student's achievements:

Students will develop e-portfolios from the point of initial enrolment, improving and transferring them throughout their career. Staff will develop e-portfolios to meet AQTF guidelines and record career highlights. For example a video receiving an award or a recording of them demonstrating a task. This will enable educational institutions (with the student's/staff member's permission) to contribute to the national archive. For example the early work of an artist will be archived for posterity.¹⁰⁴

- 4.96 It is less clear whether there are significant cost savings to be obtained by institutions delivering educational courses online instead of (or as well as) in person. DBCDE told the Committee about a study in the United States which found that colleges implementing online learning programs saved 20 to 71 per cent of their cost of serving students, while at the same time improving educational outcomes.¹⁰⁵ However, Mr Lange from ACPET told the Committee that 'online training is not a cheaper option for delivery' because to be done properly it requires one-on-one support mechanisms.¹⁰⁶ Similarly, Mr Hamilton from OUA told the Committee that the cost savings from online education should not be overstated:

People say that doing it online is cheaper. Yes, in relation to not having to have the physical infrastructure. But the basic labour costs are still there ... You still need to have real people there, but not necessarily in the same ratios. We have done quite a lot of work on establishing what the best numbers of staff per students are so that we can find the most cost-effective way of delivering these courses.¹⁰⁷

103 NICTA, *Submission 198*, p. 15.

104 TAFE NSW – North Coast Institute, *Submission 59*, p. [2].

105 DBCDE, *Submission 215*, p. 44.

106 *Committee Hansard*, Canberra, 4 March 2011, pp. 38–39.

107 *Committee Hansard*, Melbourne, 18 March 2011, p. 7.

- 4.97 Copyright Agency Limited, which manages the statutory licence in the Copyright Act for educational use of text and images, warned against the misconception that digital content is cheaper and easier to produce than content in other formats, and argued that greater appreciation of the value of quality Australian digital content is required.¹⁰⁸
- 4.98 Mr Tom Worthington, an independent IT consultant and computer scientist based in Canberra, stated in his submission to the Committee that governments are paying for ‘unnecessary duplication’ across education sectors in both online learning and physical infrastructure. Mr Worthington wrote that substantial savings could be obtained through the creation of an ‘Australian Learning Commons’ consisting of multi-use school buildings and free sharing of teaching materials throughout Australia:
- Despite work on a national curriculum ... individual teachers have to find materials to teach. Sharing of materials can be facilitated by the use of Creative Commons licensing, which allows any teacher to use the materials produced by any Australian educator, without the need for separate permission or payment of fees.¹⁰⁹
- 4.99 Mr Worthington noted that the long term restructuring of the education systems towards a more efficient and effective ‘blended’ mode of education will require ‘retraining of teachers, restructuring of courses and the remodelling of buildings’ at a cost ‘far higher than for the implementation of the NBN itself’.¹¹⁰ However, he also noted that due to the relative size of Australia’s expenditure on education, if the NBN can enable a 10 per cent reduction in the cost of education it would be enough to pay for the entire network within eight years.¹¹¹

Committee conclusions

- 4.100 The NBN will provide the speed and ubiquity of broadband connections that are required to revolutionise the way education takes place in Australia, leading to both more efficient delivery of services and more effective outcomes.

108 Copyright Agency Limited, *Submission 92*, p. 3.

109 Mr Tom Worthington, *Submission 17*, p. 6.

110 Mr Tom Worthington, *Submission 17*, p. 5.

111 Mr Tom Worthington, *Submission 17*, p. 1.

- 4.101 As detailed in this chapter, the NBN will enable a host of new educational tools and services to be developed and delivered not only to traditional classrooms, but also to students in their homes, their workplaces and to the broader community. In particular, it will enable rich and interactive education and training to be delivered to people who have historically been isolated from educational opportunities, such as those who are ill, disabled, elderly, located in a remote area or who simply cannot attend classes because they have to work. It will enable a more flexible and efficient education system to be developed, in which students and teachers are no longer necessarily required to travel to the classroom and can access training and professional development material from their own homes and workplaces.
- 4.102 The Committee notes that many innovative educational tools and services are already being developed around Australia to take advantage of broadband, and the NBN will enable these applications to become more advanced and more accessible to students and teachers in all parts of Australia. The ongoing development of these products could provide significant export opportunities for Australia as other countries upgrade their broadband networks into the future.
- 4.103 Although the majority of schools and TAFEs around Australia are already connected to fibre, for the most part it is not currently being used to its potential. Most schools are still connecting their students and teachers with collective download speeds of less than 20 Mbit/s, and often much lower than that.
- 4.104 According to evidence received by the Committee, the main barriers to bandwidth usage are restrictive pricing structures and contractual arrangements in which schools, particularly in rural areas, are required to pay high rates for the volume of data that they use. While the Government's commitment to uniform national wholesale pricing for the NBN is likely to remove the disadvantage that rural schools face in this area, the nature of educational institutions is that they need to provide connectivity to many users simultaneously. Educational institutions therefore need access to high bandwidth connections within a pricing structure that allows for large volumes of data. Close attention will be required from the Federal Government and NBN Co during the NBN's design and implementation to ensure educational institutions are able to access high capacity and highly scalable connections that meet their enterprise needs at affordable, predictable prices.
- 4.105 The Committee also notes that as educational institutions need to share their connections between many simultaneous users, the limitations of

wireless and satellite services mean that schools in small communities outside the NBN's fibre footprint will not be able to benefit from all of the educational services discussed in this chapter. Remote schools in some parts of Australia have already been connected to fibre under state and territory government programs. The long term goal of governments at all levels should be to ensure that all schools and other educational institutions in Australia are connected to the type of scalable, high-capacity broadband services that will enable transformative educational outcomes to be delivered. The NBN's fibre extension program may have a role to play in achieving this goal. This issue will be discussed further in Chapter 11, where some of the overriding themes of the inquiry are explored.

- 4.106 The Committee received evidence that significant investment in training teachers in online educational skills and designing new educational models will be required to leverage the full benefits of the NBN. The Committee welcomes the Federal Government's recently announced 'NBN-enabled Education and Skills Services' program, which will fund projects that demonstrate the potential of the NBN for education in first release sites, and the 'NBN-enabled tele-education project' to deliver high-tech interactive training facilities in Armidale, NSW. These projects are indicative of the leadership role the Federal Government can play in promoting the utilisation of broadband technologies in education. The Committee notes that ongoing investment in such programs will be required across the country as the NBN rollout continues.