Chapter 10
Cultivating Learner Experiences: Using Information and Communication Technology to Counter Locational Disadvantage

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Abstract In contemporary times, there are children who suffer from limited access to resources, even in some developed countries. In Australia, because of its vast landscape, students in rural and remote locations suffer from a variety of disadvantages. Due to limited resources available in their local environment, students in remote locations do not achieve to their best potential. This chapter illustrates how information and communication technology (ICT) may enable educators to engage students in interactive learning activities online. The study is part of a collaborative research project known as *Ngara Wumara* in Aboriginal language, which means "cultivating capabilities" in English, funded by the Australian Research Council (LP140100481). As part of the research project, interviews were conducted with children who worked in a circus, their parents, and other adults, who traveled with the circus from place to place. As their special circumstances prevented them from attending school on a regular basis, the children attended a virtual project-based learning program via Google Classroom. Interview data showed that ICT can expand accessibility to collaborative learning for students who have limited opportunities in a traditional classroom. However, effective virtual classroom environments require adequate technical and infrastructure support, which should be the government's priority in distance education.

Keywords Locational disadvantage · ICT · Interactive online activities · Virtual project-based learning · Google Classroom · Collaborative learning · Distance education

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10.1 Introduction

In contemporary times, despite an array of technological innovations, there are children in developing countries who continue to suffer from limited access to resources. Due to Australia's vast landscape, students in rural and remote locations suffer from a variety of disadvantages. Limited access to resources and educational opportunities undermines the ability of students in remote locations to achieve their full potential. This pattern is further reflected among gifted and talented students who tend to perform far below their counterparts in urban locations where resources are more readily accessible. Such locational disadvantage may also disproportionately impact on Aboriginal students, who continue to suffer from a broad range of disadvantages resulting from the repercussions of the British colonization over the last two centuries (Mooney, Seaton, Kaur, Marsh, & Yeung, 2016). This chapter illustrates how, in a distance education context, ICT can effectively enable the delivery of project-based learning via Google Classroom to students whose special circumstances may have prevented them from attending school on a regular basis.

Specifically, in this chapter, we attempt to illustrate how student-centered project-based learning (PBL) can be successfully delivered through digital technologies to accommodate the learning potential and diverse interests of students who are disadvantaged in terms of location. Based on the findings, recommendations are provided to assist educators, researchers, and administrators in meeting the diverse needs of learners from disadvantaged backgrounds and environments.

10.2 The Need for Information and Communication Technology

Information and communication technology (ICT) has become an almost indispensable part of our daily life. However, whether ICT is indispensable in all the learning processes of a student may be arbitrary (Pena & Yeung, 2009, 2010). Although there is increasing advocacy for ICT in the classroom, pedagogical and technological approaches may not always align with, and complement each other for the best learning results. For certain student populations, however, ICT may serve as a solution to some basic issues of schooling. A relevant example is the potential of ICT in bringing together students from diverse backgrounds and remote communities hundreds of kilometers apart.

In Australia, 31.5% of the Australian population live outside metropolitan locations, covering the majority of the nation's land area (Australian Bureau of Statistics, 2020). Remoteness is categorized by the Australian Bureau of Statistics as Major Cities, Inner Regional, Outer Regional, Remote Areas, and Very Remote Areas. The classification is based on access to services as measured by the Accessibility and Remoteness Index of Australia (see Australian Government Department of Health, 2011). Of these, 29.3% of students are enrolled in schools outside of major cities

(Halsey, 2018). Such geographical dispersion makes it almost impossible for students in rural and remote locations to engage in collaborative face-to-face PBL activities. This basic issue related to location has disadvantaged rural and remote student populations for many decades.

One potential solution that has received increasing attention in recent years is the use of ICT to support the learning experiences of students in diverse settings including those in rural and remote locations (Nielsen, Miller, & Hoban, 2014). However, innovative ICT provisions do not necessarily align with innovative teaching and learning processes. Learning activities that are essential for building twenty-first-century skills (Moyle, 2010) may not always be effectively delivered through ICT applications. Personal and contextual factors (Goodwin, Low, Ng, Yeung, & Cai, 2015; Lee, Chung, & Yeung, 2019; Lee, Ip, & Yeung, 2016; Lee, Yeung, & Ip, 2017; Yeung, Tay, Hui, Lin, & Low, 2014) may play varying roles in making ICT effective as a tool for program delivery (Yeung, Lim, Tay, Lam-Chiang, & Hui, 2012a; Yeung, Taylor, Hui, Lam-Chiang, & Low, 2012b). How ICT is able to facilitate various pedagogical approaches (e.g., student-centered pedagogies, collaborative learning, individualized instruction, etc.) is yet to be explored. Among personal factors, there may be significant cultural, linguistic, and structural barriers faced by students. For some, however, ICT may be the best, if not the only, solution as their individual circumstances may prevent them from regularly attending school. These include those students who are geographically isolated or whose families may be regularly moving from one place to another. In this chapter, we attempt to illustrate how student-centered PBL can be successfully delivered through digital technologies to accommodate the learning potential and diverse interests of students who are disadvantaged in terms of location.

10.3 Connected Learning for an Effective Educational Program

While ICT has the potential of virtually bringing students together from locations far apart, successful learning ultimately depends on the instructional program and pedagogy. In the present study, the project-based learning (PBL) program implementation was partly guided by the Larmer, Mergendoller, and Boss (2015) Gold Standard PBL model. The model integrates student learning goals, essential project design elements, and project-based teaching practices. In a project-based classroom, students actively participate from the very beginning. Students work together with their teachers to formulate a research question about a topic, followed by processes of planning and researching to create new knowledge. They then reflect on their understandings and improve and present their findings. In our case, Fig. 10.1 illustrates a modified version of this model to demonstrate how technology can be integrated in a connected learning model to support the PBL process. As seen in Fig. 10.1, the learning process is directed and controlled by the student, whereas the teacher serves

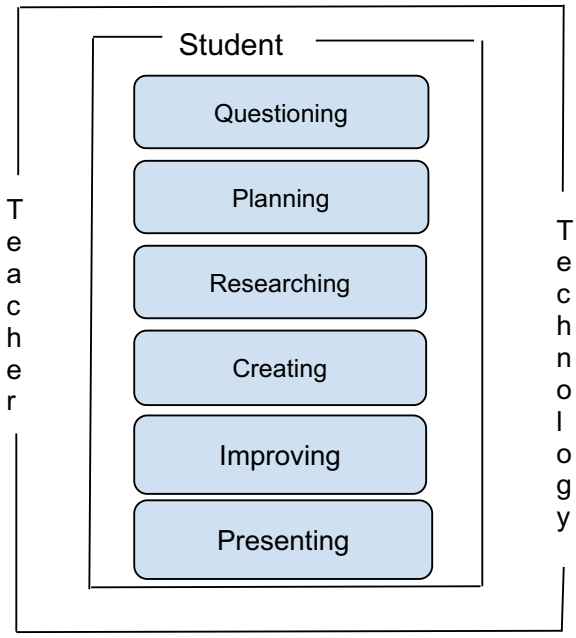

Fig. 10.1 Innovative technology application in assisting project-based learning

as a facilitator of the learning activities. Technology is used to assist and complement the delivery of PBL.

The benefits of a virtual learning platform to facilitate student learning have been demonstrated by other researchers (e.g., Cheung & Vogel, 2013; Colazzo, Molinari, & Villa, 2013; Davis, Chen, Hauff, & Houben, 2018; Kuo, Chu, & Huang, 2015; Schipke, 2018). Like these previous studies, the benefits for our case would include the opportunity to engage in collaborative learning (Kuo et al., 2015), gains in both social and cognitive outcomes (Schipke, 2018), and networking with others (Colazzo et al., 2013; Davis et al., 2018). Specific to the current approach is the self-directed nature of the learning activities. However, for these students, the acceptance of the virtual learning environment could be a challenge (Cheung & Vogel, 2013).

10.4 Case Study: Google Classroom for Circus Kids

To illustrate the contribution of ICT to facilitate students' engagement in PBL activities, we report a case study on the perceptions of stakeholders, especially students from a special sample—circus children. In Australia, circus communities play an important role in the live performance industry. The industry reported a contribution of $1.41 billion to the Australian economy with significant growth in revenue from the Circus & Physical Theatre category (Live Performance Australia, 2015). Due to the growing number of traveling circus families who spend most of the year

on the road, it is challenging to provide quality education for the circus children. This is a major challenge for the nation's education authority as school education is compulsory for children from the age of six until they are at least seventeen (NSW Department of Education, 2018), and yet these children are unable to stay in a regular school setting. In the face of this challenge, the government has promoted distance education as a possible solution. For example, the National School for Traveling Show Children (NSTSC) under the Distance Education program was introduced to cater to the needs of traveling students who are unable to attend regular school for at least one term (i.e., 50 school days or more).

Mostly from rural, and some from very remote, locations, these students who are always on the move do not have a chance to stay in the same school for education. Hence, they need a distance education provision that is of high quality. The online distance learning program described here capitalizes on virtual classroom technology that expands educational access and provides specialized learning opportunities for this special student population. Such an approach is believed to enable students' academic achievement, improve their web-based skills, enhance student satisfaction and consequently course retention, and provide students in remote areas, in particular, with viable educational choices (Barbour & Reeves, 2009; Natale & Cook, 2012; Rice, 2006). In this study, the delivery of PBL via Google Classroom was expected to benefit these children who are disadvantaged in terms of location. To understand the impact of a virtual classroom in project-based learning, we conducted a case study with a sample of such students, along with their teachers and parents.

10.5 Methods

10.5.1 Research Questions

The research questions (RQs) of this study are

RQ1: What are the impacts of project-based learning on students through Google Classroom delivery?

RQ2: What are the barriers (perceived by students, parents, and teachers) that affect the success of the virtual project-based learning?

10.5.2 Participants

This study explores the experiences of three children who travel with a circus, four teachers, and three parents through semi-structured in-depth interviews. The students were enrolled in a distance education program in New South Wales, Australia. They were identified as Aboriginal students (although circus children are not necessarily

Aboriginal) who worked as circus performers alongside their families who were also employed by the circus. The students and their parents were interviewed in separate sessions. Three teachers of the distance education program and a tutor who traveled with the circus were also interviewed.

10.5.3 Processes

The interviews consisted of guiding questions on the stakeholders' perceptions, focusing on the impact and challenges of using Google Classroom in PBL. The participants were also asked to comment on ways to improve the learning experience.

10.5.4 Analysis

Transcripts were coded according to participants' responses to the questions. Thematic analysis was conducted following Braun and Clarke's (2006) framework that includes (1) getting familiar with the data, (2) generating initial codes, (3) identifying themes, (4) reviewing themes, (5) defining themes, and (6) writing up. Qualitative data analysis software NVivo was used to assist in the analysis. The interpretative analysis firstly considered the impact of Google Classroom on student learning experiences. The transcripts were further explored with a focus on the perceptions of participants about any challenges in the uptake of digital education. The response to the challenges gave background themes on the barriers to using Google Classroom to support PBL.

During the data analysis process, meaning units were highlighted and extracted from the participants' responses. Themes emerging across the set of interviews were identified. Initial ideas were discussed, and broader themes were recorded. As we worked through the coding process, meaning units associated with each theme were grouped and repeated revisions were carried out to refine the themes and their grouping. Themes and subthemes were further explored to see if they related to each other. To ensure reliability of the result, the themes and sub-themes were regularly discussed among the project manager, the analyst, and the investigator team. A thematic map that illustrates the themes and subthemes was constructed after the final refinement of the themes.

10.6 Results

Figure 10.2 summarizes the themes elicited from the interviews and the related sub-themes. Overall, Google Classroom was perceived in terms of six themes: (1) learning diversity, (2) personal development, (3) connectedness, (4) adaptability,

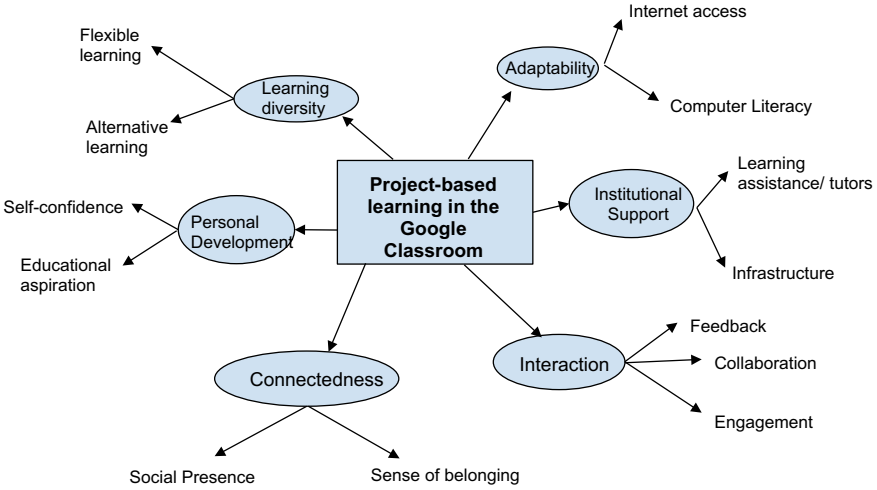

Fig. 10.2 Themes summary from the experience of circus students, teachers, and parents with project-based learning via Google Classroom

(5) institutional support, and (6) interaction. Of these themes, personal development, connectedness, and interaction are directly related to the impact of Google Classroom in the intervention.

10.6.1 Learning Diversity

The Google Classroom experience was perceived as flexible, providing an alternative learning platform that suits the user's adaptability to the new technology and institutional support.

Learning flexibility. Interview participants indicated that virtual learning and Google classroom provided flexibility in terms of the location and schedule of educational delivery. Indeed, students noted that engaging in virtual learning enabled them to remain in remote settings while participating in collaborative learning with other students elsewhere. It has been suggested that for disadvantaged children, virtual classrooms may provide a valuable alternative to mainstream education given the cultural emphasis placed on staying connected with family and community (Lohoar, Butera, & Kennedy, 2014). A real-time virtual classroom would enable remote, disadvantaged students to engage in learning activities and reach their full potential and maintain their collectivist lifestyle and value system. The students in the case study remained with their circus communities and received quality education at the same time, as explained by a parent:

> Well so I was born into the circus and my husband has been with the circus for about 20 years. (Name removed) is our eldest child ... she also works in the circus. So, when she's not doing school, she's practicing moves and acts in the show.

Alternative learning. The parents interviewed agreed that Google Classroom is an alternative learning method and they were aware of its future importance, as a parent noted

> I think it's the way of the future, that's why you - I can see it, this is the future of learning in schools and I'm surprised we haven't done it earlier actually, to be honest with you. So, it's been good, and the kids are preparing for the future, I see.

Another parent also agreed that one of the benefits of using technology is to search for information, which is not a usual focus in traditional classrooms.

10.6.2 Personal Development

It is evidenced from the analysis that using Google Classroom to complete online projects could foster the ethos of teamwork and help overcome learning barriers. The virtual classroom provides inclusive digital learning which further enhances self-confidence and educational aspiration. A teacher mentioned that "*…because we have constructed our Google Classrooms from a project-based learning format, as in we've challenged the kids with a problem to be solved, it's almost levelled the playing field between our high ability students and [who] are probably lower ability students, because the high ability students just can't answer the question kind of thing. So, they've really got to think about it.*"

Self-confidence. Virtual classroom activities appeared to enhance self-competence beliefs. As the virtual PBL approach encouraged students to work on projects that connected academic learning to what they were passionate about and gave them opportunities to make things relevant to these interests, it resulted in good personal development and increased self-confidence, especially among the Aboriginal students. A teacher commented

> Regarding the kids who identify as Indigenous, I have found they're a little bit more reserved at commenting and stuff like that. I'm not exactly sure why with some of my kids... they're a bit nervous about probably being judged by their comments. So, they're a little bit hesitant to kind of put their comments out there and yeah just with the Circus kids it's kind of like taking them a little while to warm up to it.

After enrolling in the program for a year, a parent noticed that her daughter liked doing work on the computer.

Educational aspiration. It was also observed from the parents' feedback that PBL could support young people in remote locations in remaining engaged in education as parents indicated that the Google platform generated interest and in turn ongoing educational aspiration. The virtual PBL approach encouraged students to work on

projects that connected academic learning to what they were passionate about, which helped them to relate their education to their lives. A parent noted

> He seems to be trying harder at school… I know that from… we talk to him at home, you know, about to try going to go to school and learning and trying harder and he seems to be like, a bit more… he seems to be more interested. Before he would be like, ooh.

10.6.3 Connectedness

A third theme that emerged from the data is connectedness. Students value relationships and thrive in an active collaborative learning environment (Goss & Sonnemenn, 2017) and interviewees indicated that student engagement in virtual learning enabled greater connectivity and belonging among students.

Social presence. Responses from a teacher highlighted that Google Classroom improved remote students' social presence: "*…to know that they are part of a class. A lot of the time I think they just think they're doing it on their own.*" Students can communicate and view other students' work in the virtual classroom, and there are opportunities for active interaction. "*They can ask for help off each other as well as the teachers and then we use that in the satellite room as well and you can put up everybody's work on the screen at the same time and we can talk about it. So, I think it's another dimension in assisting these children feel less isolated and more like they've got a classroom.*"

Sense of belonging. A strong sense of belonging and feeling of connectedness appeared to improve learning outcomes. Commenting on a student's performance, a teacher said "*He is putting effort and he's more motivated too [than] what he has been.*" Positive effect was also observed by another teacher: "*…this has had a fairly substantial impact on him in the sense that he's getting more involved in things. He's feeling more comfortable as time goes on and having a bit of an input and he's learning.*"

10.6.4 Interaction

Virtual classroom activities enabled the students to communicate and collaborate from any device with an Internet connection. Assignments were created in Google Doc template and were easily accessible in Google Drive. The virtual classroom simplifies the tasks of receiving and returning the students' assignments. Hence, virtual classroom has advantages over traditional classroom in several ways.

Feedback. Teachers can communicate with students and provide assignment feedback "*instantly*" through the platform. Students can also access other G Suite apps such as Slides, Forms, and Gmail to collaborate in a project. The project can be completed online at real-time with peers also helping to provide feedback.

Collaboration. A major contribution of Google Classroom is the facilitation of peer collaboration. As one teacher puts it

> I guess working collaboratively as well with their peers. So, they get to see what - they get to see how their peers are working and the kind of answers that they're giving and that may influence them in a positive way.

Engagement. It was identified from the interviews that students' active engagement in both collaborative and independent learning processes in a virtual classroom was thought to be much alike in many aspects of circus training. The students found the development of skills "…*like a circus tent sometimes,*" a reply when asked about his views on using Google Classroom to complete his project. The virtual platform seems to have fostered both collaboration and learning engagement by creating a real-time classroom. A teacher remarked

> So, it was kind of brought it back to the fact like if you're a teacher in the classroom you are moving around the class seeing how kids are going, checking where they're up to, and yeah Google Classroom combined with Google Doc allows us to do that for these kids who are miles away or overseas.

10.6.5 Institutional Support

An important theme that emerged was the need for institutional support. Helping students to adapt with the technology, the program attempts to remove the structural barrier to education. However, technology itself may not solve all problems, and human support may also be crucial. There are students who are not disposed toward virtual PBL and may require more technological assistance.

Learning assistance tutors. The program employs tutors who travel together with the circus. The need for learning assistance tutors seems well justified as the pattern of low literacy levels of the families and the circus community's unique lifestyle mean that many parents are unable to help their children with the school work required through distance education. The need for human support was evidenced in the interviews. Indeed, surfing the multitude of information on the Internet itself can be challenging. Therefore, the role of a face-to-face tutor is essential in providing technical guidance on the spot. Highlighting this essential support, a tutor interviewed discussed the need for greater time and support for students:

> You know, I can't be with them all the time, that's the trouble. I'm not just their tutor, I'm also the tutor of a girl in year nine and a girl in year 10, who have their own sets of problems. So, I've got to be with them sometime too as well. They don't have my full attention.

Infrastructure. In addition to sessions with their tutor to complete their projects, the students attended a weekly satellite lesson for each school subject in a portable classroom caravan. The infrastructure provided by the circus management was apparently limited as students and tutor struggled with limited space due to increasing student

enrollment in the program: "*We don't have a lot of room in our classroom.*" Evidence points to the need for infrastructure support for the intervention to provide optimal benefits.

10.6.6 Adaptability

Adaptability in this context represents the ability of learners to accept the new learning platform. Despite parents' positive feedback on Google Classroom, adaptability issues kept emerging in the analysis. While Google Classroom helped to connect distance learners and teachers, the application of PBL could be challenging in such a learning environment (Verstegen et al., 2016).

Internet access. Internet access is a major challenge when the circus travels to places with poor Wi-Fi connection. As the students needed to connect to the Internet to complete their projects, lack of digital connectivity hindered their learning progress. An apparent issue is that the approach requires great reliance on stable Internet connections. A parent highlighted that they "*travel around a lot and sometimes we go out into the smaller town,*" where Internet connections are poor.

Computer literacy. Computer illiteracy, if taken as a requirement, could demotivate students from engaging in their learning. When asked about how their children adapted to the new technology at the start of the program, a parent responded "… *they're not used to doing it, that's all.*" Obviously, it took time for the children to get used to this learning mode.

On the contrary, it was also observed from the parents' feedback on PBL delivered via Google Classroom that in fact, they saw their children improving in computer literacy at the later stages of the course, and they were happy about it.

10.7 Discussion

Many studies have investigated the impact of ICT on student learning (e.g., Bai, Mo, Zhang, Boswell, & Rozelle, 2016; Skryabin, Zhang, Liu, & Zhang, 2015), and interaction is identified as a central component of an effective collaborative learning process (Rashid & Asghar, 2016). While a project-based approach promotes collaborative learning, the integration of ICT has expanded the accessibility to collaborative learning for students who have limited opportunities of face-to-face interactions in a traditional classroom setting. Careful examination of the data in this study showed that the crucial elements for successful learning, in this case for the special student sample, include interaction during the process of learning, a sense of connectedness encompassing social presence and a sense of belonging, and personal development potentials for building self-confidence and educational aspirations. These findings provide answers to our research questions.

RQ1: "What are the impacts of project-based learning on students through Google Classroom delivery?" Pertaining to geographically disadvantaged students, a sense of connectedness could foster the ability to build personal and interpersonal capabilities. Social presence and a sense of belonging strengthen the connection to the learning process and translate into better self-confidence and educational aspiration. Hence consistent with the report by Alexander et al. (2013), an interactive learning that strongly connects to the learners tends to improve the learning outcomes. However, it is also important for us to understand and address potential barriers to the success of digital education.

RQ2: "Which are the barriers (perceived by students, parents, and teachers) that affect the success of the virtual project-based learning?" The major concerns identified from the analysis were adaptability issues and infrastructure. Internal (e.g., student adaptability/readiness) and external (e.g., tutors, infrastructure) factors are important potential barriers identified from the study. Profiling the digital readiness of circus students and other distance education students, including teachers and parents, is a gap that needs to be addressed. Such a study is lacking and is yet to be conducted in Australian settings.

Particularly relevant to the special sample in our study is the merit of ICT in providing students in a remote location access to an educational opportunity that they would not have enjoyed otherwise. This opportunity enabled them to interact online with other children who are gifted and talented. An amazing finding from this research was that even PBL, which typically requires regular and concentrated interaction among cooperating learners, was effectively conducted online. This illustrates the power of ICT in making a difference to the lives of remote learners who are disadvantaged in various ways (Mooney et al., 2016), and in supporting learning in rural and remote locations (Nielsen et al., 2014). Overall, our findings echo the benefits of a virtual learning platform to facilitate student learning, as demonstrated by other researchers (Cheung & Vogel, 2013; Colazzo et al., 2013; Davis et al., 2018; Kuo et al., 2015; Schipke, 2018). However, while some researchers expect stakeholders' acceptance of virtual learning as a potential challenge (Cheung & Vogel, 2013), the students and families in our sample seemed to happily accept it as a beneficial alternative to conventional schooling. Our findings indicate that online distance learning such as that described here has the potential of expanding educational access and providing specialized learning opportunities for special student populations, such as the circus kids in the present study.

10.8 Recommendations

Based on our findings, we recommend the following:

1. In the context of geographically disadvantaged students, a virtual classroom environment is a possible solution.

2. Project-based learning that requires interactions among learners is viable in a virtual classroom setting.
3. Virtual classroom activities would benefit students in remote locations through the design of projects that focus on helping students develop real-world skills and connect to their daily life.
4. The implementation of virtual classrooms should be strengthened with adequate technical and infrastructure support.
5. A blend of online and on-site provisions will be useful for best program effects. However, having a tutor travel with the circus all the time, looking after a few students may not be cost-effective. Therefore, further research should investigate more cost-effective ways to provide support to students in remote locations.
6. Basic to the success of any ICT application, stable and reliable Internet access and quality should be a prioritized consideration for policy-makers. For ICT to be effectively used to educate geographically disadvantaged students, advanced technological support should be the government's first priority.

10.9 Conclusion

Our findings suggest that ICT, if used appropriately, can provide rich learning opportunities for the most disadvantaged students. The most significant contributions of ICT for circus students who are continually moving from one place to another include interaction, connectedness, and personal development. Educators of special student samples who do not have access to regular classrooms should consider applying ICT to suit instructional purposes and learners' needs. Program developers should consider how best to design programs and pedagogies presented through virtual platforms to effectively cater to learners' needs. Education for disadvantaged students is always a challenge for administrators in schools and teacher education. However, given our finding that even collaborative PBL activities can be facilitated through a virtual classroom, the design of innovative and effective virtual classroom materials and activities remains as an important endeavor for educators and researchers.

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