EduTeach2021
CONFERENCE | CANADA

5th Canadian International Conference on Advances in Education, Teaching & Technology 2021

June 12, 2021
Toronto, Canada

Papers of 5th Canadian International Conference on Advances in Education, Teaching & Technology 2021

PAPERS

Unique Conferences Canada Publication
Toronto, Canada

Published by

Unique Conferences Canada

info@uniqueca.com
http:// www.uniqueca.com

Published in Canada
August 2021

ISBN978-1-988652-41-2

(ISBN 978-1-988652-41-2)

5th Canadian International Conference on Advances in Education, Teaching &Technology 2021 (EduTeach2021)

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(ISBN 978-1-988652-41-2)

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Director, Professor, Indigenous Scholar and Advocate
School of Education, Shepherd University,
U S A

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(ISBN 978-1-988652-41-2)

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Abstract of the Keynote Speech

Re-envisioning Teacher Preparation Programs in the Service of Humanity

Dr. Jennifer (Jenny) L. Penland
School of Education, Shepherd University, U S A

What does it mean to re-envision teacher education? This is the question that the faculty at the newly named School of Education at Shepherd University have been asking and exploring. More than a quixotic pursuit, the purpose of this inquiry has been to re-design what we think of as classroom space, to re-construct an educator preparation curriculum, and to model both the distinct art and distinct science of creative teaching. According to Freire (1998) there is a unique "art and science" to teaching and it should be considered as a deep, reflective thought and practice. Setting aside the hubris of a formulaic approach to improvement in the wider field of teacher education, we recognize that a major challenge to re-envisioning teacher education is overcoming the systemic notions of "what school is supposed to look like" including "what teaching is supposed to look like."

Analysis investigating how vocational instructors adapting to online teaching during the COVID-19 pandemic: A case study in Hong Kong

Dr. Michelle Cheng Michelle W.T. Cheng[1]; Bonnie K.L. Mak [2]; K.M. Mok[3]

[1]*Graduate School, The Education University of Hong Kong [ORCID: 0000-0002-0820-3545]*

[2]*David C. Lam Institute for East-West Studies, Hong Kong Baptist University [ORCID: 0000-0001-8796-7414]*

[3]*Office of Student Affairs, Lingnan University [ORCID: 0000-0003-2185-6468]*

Abstract

The COVID-19 pandemic has had far-reaching consequences all over the world, especially in the education sector. While the higher education teaching environment seems to have welcomed a swift and effective shift to the digital world, vocational education, which is a form of tertiary education that highly emphasizes practical work skills and hands-on training, is expected to experience a more challenging situation. In hopes of smoothing the transition to online teaching in this particular education setting, this study explores the perceptions of four current vocational instructors from different institutions in Hong Kong. Thematic content analysis was adopted, and the results found three main themes, namely acknowledging the challenges of online teaching, new instructional strategies, and institutional support. It is hoped that this study can draw more attention to the vocational education industry and help inform stakeholders to impart better support for the instructors to provide high quality teaching in the future.

Keywords: *COVID-19; Vocational education and training; Teaching support; Case study*

1. Introduction

Vocational education and training (VET) play an important role in integrating education and employment in support of Hong Kong's development, as well as providing diversified study pathways for secondary school leavers and in-service personnel as well as nurturing the requisite human capital in support of the development of Hong Kong (Task Force on Promotion of Vocational Education, 2014). Since most VET programmes are self-financing, not publicly funded, Hong Kong government's support to instructors in VET settings is often insufficient. The Coronavirus Disease 2019 (COVID-19) refers to the cluster of viral pneumonia cases occurring in Wuhan, Hubei Province, since December 2019 (Centre for Health Protection, 2020). To prevent the spread of COVID-19, all levels of education institutions from kindergarten, primary schools, secondary schools, technical and vocational education and training institutions, universities, tutorial centres have been closed all across the world. According to the latest figures released by UNESCO, about 1.58 billion children and youth, from pre-primary to higher education, in 200 countries, were not able to attend school or university by mid-April 2020 (United Nations, 2020). This represents that 94 percent of learners worldwide were

affected by the pandemic. Education has changed dramatically with the rise of e-learning or online learning and teaching is undertaken remotely and on digital platforms for both academic education and VET. "Academic education" in relation to VET usually refers to learning in a university to obtain a bachelor's, master's, or other types of degrees. VET is training for a specific industry through a combination of teaching and practical experience. This paper examines how instructors in VET settings adapting to online teaching during the COVID-19 pandemic in Hong Kong using thematic analysis. Literature review

VET conveyed occupation specific and curriculum-bound skills (Black and Reich, 2010). Therefore, the pedagogical approach of VET is more on direct instruction, practical demonstration and authentic learning (Wheelahan, 2009). Online teaching mode is a necessity during the COVID-19 pandemic because the quarantine and social distancing kept the face-to-face teaching difficult. Teaching VET online would introduce tensions to the instructors who needed change the teaching approach dramatically (GonzÁLez, 2013). Technology barrier is of concern because both instructors and students may struggle with using computer and lacking online teaching experience (Pan, Graham and Luyegu, 2018). This problem has occurred in the society in the past decade, however the pandemic-induced online teaching mode magnified the problem. Suitable equipment and teaching support should be provided to both instructors and students. Dhawan (2020) emphasizes that governmental and institutional support were crucial to smoothen the transition from face-to-face to online teaching. It is of utmost importance that the VET instructors could be supplied with both pedagogical and technical competency of online teaching.

Adjusting the learning outcomes would be a great help for online learning success. With the sufficient support on transiting to online teaching, prior study reported that the teaching quality can still be preserved. The synchronous online teaching is oragnised in the sense that there are real-time interactions between instructors and students from attending live lectures, and therefore instant feedback is possible (Littlefield, 2018). In addition, synchronous online learning can provide opportunities for social interaction (McBrien, Cheng and Jones, 2009). Student could potentially have a positive online experience and enhance social connection using synchronous learning approach during the pandemic.

In response to the sudden outbreak of COVID-19, the timing of transition to online teaching was different among institutions due to the discrepancy in the school management and the prior experience of online teaching among the instructors (Day et al., 2021). It is of great interest to understand how the VET instructors in Hong Kong adapt to online teaching in different school settings and teaching specialties.

2. Methodology

Case study is adopted in this study to allow the researchers to get an in-depth understanding towards the contexts of vocational education under COVID-19. To delve deeper into the expressed perceptions, semi-structured interviews of selected respondents were conducted. Self-selection sampling was used. All interviewees are pursuing Postgraduate Diploma in Education (Professional & Vocational Education) (PGDE (PVE)) which caters for professionals involved in pathways that offer an alternative to academic studies such as career-oriented studies, associate degrees, vocational professional training and re-training. One of the requirements to be enrolled in the PGDE (PVE) programme is to hold a teaching position in a post-secondary education institution during the study period. Therefore, all the recruited interviewees are educators in the PVE context. The interviews were carried out online (Zoom) or by phone, which are deemed the most sociable ways to gather data

under COVID-19. Interviewees were first informed about the interview and its objective, the procedures of the interview, and they were assured about the anonymity and confidentiality of their answers. The voluntary interview began after the interviewees gave consent to participate, interviewees were well aware that they could withdraw from the interview at any time without negative consequences. An interview guide devised by the authors was adopted to facilitate the interview. Each interview took on an average of 30 minutes and a maximum period of 1 hour. The transcripts (written notes) of the interviews, conducted in the local Cantonese dialect, were translated to English immediately afterwards. Content analysis was performed on their opened-ended interview responses. Data collection was supplemented by interviewees' assignments of PGDE PVE programme.

3. Results and Discussion

Six interviewees were approached and four agreed to complete the semi-structured interviews. The overall response rate was 66.7%. The background information of the four interviewees is tabulated in Table 1.

Table 1 - Background information of the interviewees.

Participant's pseudonym	Hilda	Celina	Christy	Olive
Sex	F	F	F	M
HE teaching experience	4 years	6 years	2.5 years	1.5 years
Teaching mode before COVID	face-to-face	face-to-face	face-to-face	face-to-face
Teaching subject	Childcare / special education	Environmental engineering	Information technology (IT)	Physical Education

3.1 Challenges of online teaching

Shifting to online teaching in the VET context created challenges on teaching and learning experiences, as well as assessment. In general, the interviewees found their students were less motivated and engaged, as well as more difficult to concentrate during the class. Since VET is heavily relied on to face-to-face hands-on practical sessions, COVID-19 has made such learning experiences difficult, if not impossible to deliver. The cancellation of practical sessions made Olive unable to teach practical sports sciences and sports medicine knowledge (e.g. first-aid). In addition, some learning activities are more difficult to be conducted online, as elaborated by Hilda,

> *It is quite difficult to do group discussions and role-play exercises with students by online teaching. Online teaching does not provide a favourable environment for students to devise lesson plans and make teaching aids for SEN children together.*

In terms of assessment, Celina found it difficult to decide how to assess students' laboratory skills online. Although COVID has already lasted for more than one year, she admitted that she was still unable to find an appropriate and fair assessment method that can truly reflect students' laboratory skills. While Celina decided not to assess students' laboratory skills, and shift the focus to theoretical knowledge; Christy chose to readjust the assessment criteria and marking scheme so that students

would still be able to complete the assignment that assess their IT skills, as demonstrated below.

> *In the past, students were required to use cameras to take photos, but now I am more lenient and allow them to take photos with their smartphones. In addition, group work must be formed by 4-5 people in the past, but I understand it is difficult for them to know their classmates via online learning, so I allow them to form a group of 2-3 or even work independently this year*

3.2 New instructional strategies

All the interviewees were forced to change teaching plans, such as shifting the focus to theory-based learning materials, reducing skills session training, and preparing self-paced learning materials for students. One of the most common strategies among the interviewees is to create instructional videos. All the laboratory sessions have been cancelled in Celina class, so she replaced all the laboratory sessions by video-learning, which usually include strong demonstration elements, such as showing how to use specific laboratory equipment. Hilda also created instructional videos for her students, but she insists on complemented with face-to-face sessions, as illustrated.

> *I took videos to show students how to help children with physical disability to wear hand sleeves. However, video learning does not offer opportunities for students to learn by doing. Therefore, students were required to attend extra face-to-face small group tutorials for instant demonstration and exercises.*

While some chose to use instructional videos as the main tool of the course, Christy only perceives it as an option for interested students to further enhance their IT skills. Christy insisted on teaching all the basic IT skills through synchronous online teaching, so students would be able to seek help immediately. For students who were eager to learn more advanced IT skills, they could choose to watch the instructional videos created by Christy, so students with different learning abilities and interests can be catered.

3.2 Institutional support

To facilitate online teaching and learning under COVID-19, the school plays an important role to smoothen the transition. Hilda believes the institution that she belongs to has provided adequate support to students by lending phone cards and notebooks to students to attend online classes. However, the remaining three interviewees all believe that there was insufficient support at all. To be precise, it is a lack of technical support and long-term management planning. To begin with lack of technical support, some tertiary institutions lack the resources to support online teaching and learning due to limited financial support. For instance, Olive and his colleagues needed to subscribe and use their own Zoom accounts for online teaching; and Celine needed to learn how to use "Blackboard" learning management systems and Microsoft Teams by herself as the university did not offer such training.

There is also a lack of long-term planning from the senior management. Olive was unable to know whether the program will be terminated next year because of COVID-19, while Christy needed to wait for the school to update every week to know what teaching mode would be adopted in the following week, as illustrated below.

> *I hope the school can announce the COVID teaching arrangement earlier. For instance, I know that some other schools will announce the whole*

> *semester adopted online teaching prior to the beginning of the semester. But our school sticks with the government policy which is updated every week. This is actually quite difficult for us to plan the course ahead, making class design become very last minute*.

4. Conclusion

This paper examines how instructors in a VET context adapting to online teaching during the COVID-19 pandemic in Hong Kong using thematic analysis. The results of case studies and discussion are divided into three main themes, including acknowledging the challenges of online teaching, new instructional strategies and institutional support. Student engagement and lack of authentic assessment on hands-on skills are common challenges of online teaching in the VET setting. To meet the challenges, instructors adopted new instructional strategies, including using theory-based learning materials, reducing skills session training, and preparing self-paced learning materials for students. Instructors in the VET context emphasize the important role of the school in supporting online teaching and learning during the COVID-19 pandemic by providing adequate technical support and long-term planning in teaching arrangements.

The major limitation of this study is that the interview results cannot be generalizable as it only examined vocational instructors in Hong Kong. Still, the current study could serve as a foundation for future research to understand the needs of vocational teachers when it comes to online teaching and learning. Future research could adopt a similar method to investigate how instructors in a VET context adapting to online teaching during the COVID-19 pandemic in other cities and countries, which could help facilitate the sustainable development of online education in the VET context. According to the World Economic Forum, there was already high growth and adoption of technology in education even before COVID-19, with global investments reaching US$18.66 billion in 2019 and the overall market for online education projected to reach $350 billion by 2025 (World Economic Forum, 2020). In view of the outbreak of COVID-19, a new hybrid model of education with both face-to-face and online teachings has emerged. It is believed that the integration of information technology in education will be further accelerated, and that online education will eventually become an integral component of school education. Three recommendations should be considered for supporting online education in Hong Kong. First, special grants should be approved and given by the government to steer and support the strategic move towards more intensive and systematic adoption of online education in the medium-term to long-term run by the entire VET and higher education settings. Second, educational technology companies should develop better mobile apps, virtual tutoring, video conferencing tools and online learning software for teachers and students. Third, teachers and students should be provided with adequate training and information about online education because online teaching literacy should be emphasized in future teacher training.

References

Black, S. R. and Reich, A. J. (2010) 'The elephant in the room: Audit culture and TAFE teachers', Paper presented at the 13th Annual Conference VT Research: Leading and responding in turbulent times, Gold Coast, Australia.
Centre for Health Protection. (2020) 'Coronavirus Disease 2019 (COVID-19)'. Available at: https://www.chp.gov.hk/en/healthtopics/content/24/102466.html

Day, T., Chang, I. C. C., Chung, C. K. L., Doolittle, W. E., Housel, J. and McDaniel, P. N. (2021) 'The Immediate Impact of COVID-19 on Postsecondary Teaching and Learning', *The Professional Geographer*, 73(1), pp. 1–13. doi:10.1080/00330124.2020.1823864

Dhawan, S. (2020) 'Online Learning: A Panacea in the Time of COVID-19 Crisis', *Journal of Educational Technology Systems*, 49(1), pp. 5–22. doi:10.1177/0047239520934018
GonzÁLez, C. (2013) 'E-Teaching in Undergraduate University Education and Its Relationship to Approaches to Teaching', *Informatics in Education*, 12(1), pp. 81–92. doi:10.15388/infedu.2013.06

Littlefield, J. (2018) 'The difference between synchronous and asynchronous distance learning'. Available at: https://www.thoughtco.com/synchronous-distance-learning-asynchronousdistance-learning-1097959

McBrien, J. L., Cheng, R. and Jones, P. (2009) 'Virtual Spaces: Employing a Synchronous Online Classroom to Facilitate Student Engagement in Online Learning', *The International Review of Research in Open and Distributed Learning*, 10(3). doi:10.19173/irrodl.v10i3.605

Pan, C. C., Graham, J. A. and Luyegu, E. (2018) 'Student profiling, instructor use of mobile devices, and device ownership', *Distance Learning*, 15(4), pp. 29–37.
Task Force on Promotion of Vocational Education. (2014) 'Report of the Task Force on Promotion of Vocational Education'. Available at: https://www.edb.gov.hk/attachment/en/edu-system/other-edu-training/vocational- other-edu-program/Report%20of%20the%20Task%20Force%20on%20Promotion%20of%20Vocational%20Education%20(ENG).pdf

United Nations. (2020) 'Policy Brief: Education during COVID-19 and beyond'. Available at: https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/08/sg_policy_brief_covid- 19_and_education_august_2020.pdf

Wheelahan, L. (2009) 'The problem with CBT (and why constructivism makes things worse)', *Journal of Education and Work*, 22(3), pp. 227-242. doi:10.1080/13639080902957913
World Economic Forum. (2020) 'The COVID-19 pandemic has changed education forever. This is how'. Available at: https://www.polyu.edu.hk/sllo/hackathon/index.php/library/50-the-covid-19-pandemic-has-changed-education-forever-this-is-how#:~:text=This%20is%20how,-Print%20Email&text=While%20countries%20are%20at%20different,closures%20due%20to%20the%20pandemic.

(ISBN 978-1-988652-41-2)

Faculty and Student Success in Online Courses Delivery: Assembling an Online Support Team

Carlos R. Morales

TCC Connect Campus—Tarrant County College, United States

Abstract

The need to implement support services for faculty and students becomes essential with online learning transformation. The dedication of support services to ensure student retention and success and facilitate faculty accomplishment is paramount. The literature regarding faculty support indicates the necessity for strategic training (Lai, Shum & Tian, 2014; Marín, Asensio, Villagrá, Hernández & García, 2018) opportunities to adopt and implement (Hagler, 2013) access to specialized staff for support service consulting (Morales Irizarry, 2006). Effective strategies require faculty development initiatives grounded in research, best practices in online learning and case studies, using a sense of urgency and agility as a necessary attribute to achieve the fastest and highest effect (Kotter, 2007; 2012).

Keywords: *Faculty support, faculty success, online learning, virtual campus*

Introduction

The need to implement support services for faculty and students becomes essential with online learning transformation. The dedication of support services to ensure student retention and success and facilitate faculty accomplishment is paramount**.** The literature regarding faculty support indicates the necessity for strategic training (Lai, Shum & Tian, 2014; Marín, Asensio, Villagrá, Hernández & García, 2018) opportunities to adopt and implement (Hagler, 2013) access to specialized staff for support service consulting (Morales Irizarry, 2006). Effective strategies require faculty development initiatives grounded in research, best practices in online learning and case studies, using a sense of urgency and agility as a necessary attribute to achieve the fastest and highest effect (Kotter, 2007; 2012).

Instructional Design Services

A critical support service identified in the literature is Instructional Design, also known as learning architect, is a consultant to the faculty in creating content for online course delivery. The Instructional Designer is the possessor of the competencies (IBSTPI, 2012) to assist faculty with converting and transitioning content to online learning or enhance it for face-to-face delivery too. Through careful and planned consultations, Instructional Designers assist faculty in maximizing their teaching strategies, choose relevant assignments, decide levels of interactivity and engagement to produce high-quality courses for online delivery (Morales Irizarry, 2006; Park & Luo, 2017). The role of the instructional designer (Morales Irizarry, 2006) includes applying technical skills and managing Learning Management Systems such as Blackboard, Canvas, Moodle, providing web design, utilizing HTML 5 and multimedia skills (Park & Luo, 2017), and emphasizing adaptive learning, and learning analytics. In recent years with the growth of online education (Seaman, Allen, and Seaman, 2018), the profession has seen an increase in the demand for more instructional designers and even specialized roles. The surge in instructional design services is attributed to new or renovated strategic plans by higher education institutions and corporations to assembly one-stop entities to offer integrated services.

Online learning is no longer an endeavor bespoke to a subject matter expert; it requires a battery of professionals to ensure that relevant, valid, pertinent learning objects are created for maximum efficiency. According to the literature, online teaching bolsters faculty learning repertoire of strategies they employ in face-to-face teaching environments (Betts & Heaston, 2014; Elliott, Rhoades, Jackson, & Mandernach, 2015; Sandars, 2012; Slade, et al., 2017). The more faculty learning about online teaching, the better the student success rates (Westra, 2016). To be successful through planning and allocating the most qualified personnel to support faculty, higher education institutions should consider incorporating instructional design services for online learning. Instructional designers also play a role in fostering and facilitating the adoption of instructional technologies (Nworie & Albright, 2008) due to their frequent involvement in their review and selection.

Continuous Training

An area of opportunity and impact we identified at the TCC Connect Campus has been faculty development in the form of continuous training (Slade, et al., 2017). Ongoing orientation should include both new and returning faculty to encourage a participatory environment while fostering a connection with the academic programs. TCC Connect Campus, since 2014, has held a faculty orientation at the beginning of every semester, averaging approximately 180 faculty members per event. The faculty orientation event serves the purpose of providing professional development and onboarding, updating the knowledge on policies, and showcasing new tools (Elliott, Rhoades, Jackson, & Mandernach, 2015; Sandars, 2012). The campus academic leadership leveraged the use of the Learning Management System (LMS) as a repository of materials (Gautreau, 2011; Slade et al., 2017) that supplements and holds all the content covered, ultimately making it reference material. TCC Connect Campus academic team has found a direct correlation in the level of engagement of faculty teaching online courses with the frequency of training sessions (Reneau, Wallace, Claywell, Price, Burdi, & Trybulski, 2018).

The process to select and establish training and development ventures has many roots, from needs assessments (Smart, Ross, Carollo, & Williams-Gilbert, 2020), intrinsic factors (Gautreau, 2011) to accreditation (Hagler et al., 2013), to quality assurance and perceptions (Westra, 2016) and for strategic planning purposes (Chu & Hogue, 2019). The literature identified motivational factors such as availability of resources, adequate training and support, rewards, and incentives to influence faculty participation in professional development programs. Another area of opportunity that has been identified to increase faculty participation is their involvement in the development of the institution's plans for distance education efforts (Betts & Heaston, 2014).

An intrinsic factor might govern faculty acceptance and adoption of instructional technology. According to Bates (2000), this is "because of the central role that faculty members play in the work of the universities and colleges, any change, especially in core activities such as teaching and research, is completely dependent on their support" (p.95). On the other hand, incentives can be provided (Gaitreau, 2011) in less disruptive ways and aid in reaching wider audiences.

Excellence in Course Design

Smith and Rhoades (2006) provide a wide-ranging description of three modes of course development, all valid and tailored to the needs and focus of the institution. Online course development at TCC is accomplished through a process known as "Peer Development" (Morales, 2017).

CN Campus course development process uses a project management methodology ensuring teams progress through the completion of milestones for the peer-development process of online courses. Using a call for participation process, between 2-4 faculty members acting as Subject Matter Experts (SMEs) are selected and paired with an Instructional Designer and a Graphics/Multimedia Designer. SMEs select content, teaching strategies, activities, assessments, multimedia elements, and other resources to create an online version of the course (Hicks, 2016; Morales, 2017). This process is also employed at the time an online course needs to be revised. The reasoning behind the process is that the new version of the online course will be strengthened based on the contribution, experiences, and collaboration of more than one SME.

This methodology takes advantage of the experienced online faculty and what they bring to the project and makes them successful in the online classroom.

Quality Checks

Designing online instruction requires faculty to understand the LMS (Gautreau, 2011). To be effective in the online classroom in ways that allow faculty to feel confident requires guidelines and indicators anchored in proficiency and quality (Bates, 2000), ensuring faculty achieve a high level of confidence, results in proper modeling the use to the tool to students.

Moreover, it has been identified in the literature that a robust support system is conducive to a better outcome as they relate to faculty and student learning. The practices employed at CN Campus include a robust support system ranging from the availability of resources, both human and technological, to the alignment and application of guidelines grounded in research, best practices, and innovative strategies to serve student needs. Since its inception, the campus has implemented four projects that position quality assurance in the center of the delivery of instruction (Table 1).

Table 1. Support System for Faculty

Projects	Year Implemented
Online Learning Certification	2014
Course Checklists	2014
eFaculty Coaches	2018
Faculty Performance Indicators	2018

The team at the campus has been in a relentless pursuit of identifying, developing, and implementing initiatives that increase and improve student success. Student success at CN Campus has been growing, starting in the fall of 2017, by the campus agreeing to increase student retention by 2% annually (Table 2). A project that has been paramount towards faculty success is the addition of e-Faculty Coaches, and by consequence, the success of students has been on the rise. The e-Faculty Coaching resource plays a vital role. It is done by providing faculty with coaching on the best practices to develop their online pedagogy, managing the virtual classroom, and strengthening their online presence (Morales & Tapia, 2018) while meeting teaching expectations (Dana, Havens, Hochanadel, & Phillips, 2010).

Table 2 Online Enrollments and Success Rates

Semester	Enrollments	Passed with C or Better		Received D or F		Withdrew	
Spring 2021	22,032	In Progress		In Progress		2,612	11.9%
Fall 2020	22,601	16,253	71.9%	3,381	15.0%	2,960	13.1%
Spring 2020	22,748	16,780	73.8%	2,777	12.2%	3,174	14.0%
Fall 2019	21,697	15,043	69.3%	3,783	17.4%	2,860	13.2%
Spring 2019	22,573	16,054	71.1%	3,499	15.5%	3,008	13.3%
Fall 2018	19,501	13,380	68.6%	3,308	17.0%	2,809	14.4%

Spring includes Wintermester

Online includes Weekend College and ECA courses that were 100% online

Conclusions

For higher education institutions to succeed in online learning, it is paramount for them to assemble an online support team for both faculty and student success. Widely mentioned in the literature are the components in the form of organizational structure, faculty support, faculty training, student support, technology selection, and the inclusion of a critical professional, the instructional designer, which all are strategic factors. These activities and components increase the chances for colleges and universities to be more successful as they develop and grow their online enterprise. Instructional designers help subject matter experts (SMEs) stay the course as many embark on teaching for a learning modality that requires planned activities. Operational processes such as continuous training keep the instructional team at the cutting edge of what works in the online classroom. At the same time, it provides them with the opportunity to pursue their digital scholarship as they develop, refine, and showcase their work in teaching and learning. Also, continuous training allows faculty to create an online presence to operate at the optimum level in the more dynamic online classroom. The collective implementation and utilization of these activities have impacted in a positive way faculty performance and engagement, thus improving student success and graduation rates. These quality assurance processes do that ensure that the offerings and services are of the utmost quality to meet the needs and the success of the students and the faculty.

References

Akroyd, D., Patton, B., & Bracken, S. (2013). Factors that predict full-time community college faculty engagement in online instruction. *Community College Journal of Research and Practice*, *37*(3), 185-195.

Bates, A. W. (2000). Managing Technological Change: Strategies for College and University Leaders, San Francisco: Jossey-Bass.

Betts, K., & Heaston, A. (2014). Build it but will they teach?: Strategies for increasing faculty participation & retention in online & blended education. *Online Journal of Distance Learning Administration, 17*(2). Retrieved from: http://www.westga.edu/~distance/ojdla/summer172/betts_heaston172.html

Chu, H., & Hogue, W. (2019). A Strategic Leader for Student Success: An Argument for the Chief Academic Technology Officer. *EDUCAUSE Review, 54*(2), 46-47.

Dana, H., Havens, B., Hochanadel, C., & Phillips, J. (2010). An innovative approach to faculty coaching. *Contemporary Issues in Education Research*, *3*(11), 29-34.

Hagler, D., Kastenbaum, B., Brooks, R., Morris, B., & Saewert, K. (2013). Leveraging the technology du jour for overt and covert faculty development. *The Journal of Faculty Development*, *27*(3), 22-29.

Kotter J. (2007) Leading change: why transformation efforts fail. *Harvard Business Review Best of HBR* 1-10.

Kotter, J. P. (2012). *Leading change*. Boston, Mass.: Harvard Business Review Press.

Gautreau, C. (2011). Motivational factors affecting the integration of a learning management system by faculty. *Journal of Educators Online, 8(1)*, 1-25.

Elliott, M., Rhoades, N., Jackson, C. M., & Mandernach, B. J. (2015). Professional development: Designing initiatives to meet the needs of online faculty. *Journal of Educators Online*, *12*(1), 160-188.

Hicks, T. L. (2016). *Community College Full-Time Faculty Members' Intentions to Integrate Audio or Video Technology into their Instruction: A Qualitative Study* (Order No. 10250516). Available from ProQuest Dissertations & Theses Full Text. (1873478355). Retrieved from https://search.proquest.com/docview/1873478355?accountid=36783

IBSTPI (International Board of Standards for Training, Performance and Instruction) (2012). *The 2012 Instructional Designer Competencies.* Retrieved from http://www.ibstpi.org/introducing-the-2012-instructional-design-competencies/

Lai, C., Shum, M., & Tian, Y. (2014). Enhancing learners' self-directed use of technology for language learning: The effectiveness of an online training platform. *Computer Assisted Language Learning*. Advance Online Publication. doi:10.1080/09588221.2014.889714

Reneau, M., Wallace, C., Claywell, L., Price, J., Burdi, M., & Trybulski, J. (2018). Factors influencing part-time faculty engagement with online nursing programs. *Nurse educator*, *43*(6), 297-301.

Marín V., Asensio J., Villagrá S., Hernández L. & García S. (2018). Supporting online collaborative

design for teacher professional development, *Technology, Pedagogy and Education*, (27) 5, 571-587, https://doi.org 10.1080/1475939X2018.1547787

Morales Irizarry, C.R. (2006). *La Importancia del Diseñador Instruccional en el diseño de cursos en línea*. Revista Didáctica, Innovación y Multimedia (DIM). 1 (3). Barcelona, España.

Morales, C.R. (2017). Managing quality in online education: a peer development approach to course design. *In Proceedings 33rd Annual Conference on Distance Teaching & Learning Conference*. *Paper presented at the 33rd DT&L Conference*. Madison, Wisconsin.

Morales, C.R., Tapia, G. (2018). La implementación de un programa de mentoría para la facultad en línea: El "Faculty Coach". *In CIIE Proceedings 5to Congreso Internacional de Innovación Educativa (CIIE)*, (pp.1954-1960). Monterrey, México. Available at: https://goo.gl/Koq7nD

Morales, C.R. (2018). El rediseño de un programa de capacitación de profesores de programas en línea mediante un modelo de competencias. Proceedings VIII Jornadas Internacionales de Campus Virtuales (JICV'18). 2018:29-33.

Nworie, J., & Albright, M. J. (2008). Rethinking academic technology leadership in an era of change. *Educause Quarterly*, *31*(1), 14-23.

Park, J. Y., & Luo, H. (2017). Refining a competency model for instructional designers in the context of online higher education. *International Education Studies, 10(*9), 87-98.

Rippé, C. B., & Weisfeld-Spolter, S. (2019). Crafting a Consistent Model of Instruction for Teaching Across Modalities. In *Mission-Driven Approaches in Modern Business Education* (pp. 289-305). IGI Global.

Sandars, J. (2012). Technology and the delivery of the curriculum of the future: opportunities and challenges. *Medical Teacher*. *34* (7): 534–538.

Seaman, J.E., Allen, I.E., and Seaman, J. (2018). Grade Increase: Tracking Distance Education in the United States. Wellesley MA: *The Babson Survey Research Group*. Retrieved from: https://onlinelearningsurvey.com/reports/gradeincrease.pdf

Slade, J. D., Robb, M., Sherrod, B., & Hunker, D. (2017). Online adjunct faculty support: An innovative use of a learning management system. *Nurse educator*, *42*(3), 143-146.

Smart, D., Ross, K., Carollo, S., & Williams-Gilbert, W. (2020). Contextualizing instructional technology to the demands of nursing education. *CIN: Computers, Informatics, Nursing*, *38*(1), 18-27.

Tarrant County College. (2020). *Tarrant County College named top online community college.* Retrieved from https://news.tccd.edu/2020/01/21/tarrant-county-college-named-top-online-community-college/

Westra, K. L. (2016). Faculty and Student Perceptions of Effective Online Learning Environments. (Doctoral dissertation, Minnesota State University Mankato). Retrieved from https://cornerstone.lib.mnsu.edu/cgi/viewcontent.cgi?article=1595&context=etds

(ISBN 978-1-988652-41-2)

Synchronous Distance Learning Using Virtual Reality in Low Bandwidth Condition

Kasmir Syariati[1], Zahir Zainuddin[2], Syafruddin Syarif[3]

[1,3] *Department of Electrical Engineering, Hasanuddin University, Indonesia*

[2] *Department of Informatics Engineering, Hasanuddin University, Indonesia*

Abstract

The COVID-19 pandemic has forced most learning facilities to close and change the learning method using distance learning and online lecture. While some universities might already have an online learning platform, the lower education level might not have difficulties adapting. The synchronous distance learning method, being the closest to face-to-face interaction commonly occurring in the classroom, is currently the preferred method, mainly using video conferences with Zoom or Google Hangout or chat app such as WhatsApp Group (WAG) as an alternative.

This synchronous method comes with its own set of problems, especially in the less developed area due to the lack of ICT infrastructure and educational resources. One of those problems is the required bandwidth and data usage. Some students would turn off their camera feed to reduce this bandwidth usage, which would reduce its main advantage as a synchronous learning method and may induce the feeling of isolation. With the constraint of low bandwidth and data cap, the main concern lay in providing smooth direct many to many interactions without raising the feeling of isolation and minimal delays. In this paper, we explore the possible advantages of using virtual reality classrooms with its avatar-based interaction and immersion, focused on its flexible capabilities to change from synchronous to asynchronous learning with relatively low bandwidth and data usage.

Keywords— *distance learning, virtual reality, avatar-based interaction, cyber presence, COVID-19*

Introduction

Distance learning, where the learning process occurred without the student being physically present on-premises, is said to have revolutionized the learning process, whether in universities or corporation landscape (Kaplan & Haenlein, 2016). Massive Open Online Course (MOOC) being the most common method implemented in universities, while Small Private Online Course (SPOC) is more likely used in the corporation. With the advent of the internet, new methods started to be used like distributed learning, e-learning, m-learning, and virtual classrooms.

This distance learning method directly widens access to education. With the limitation of distance removed and far more flexible scheduling, a new chance opened up for people with other time commitments or geographical barriers to learn with relative ease.

The importance of an exemplary implementation of distance learning was made clear at the onset of the COVID-19 pandemic. With almost every country affected at 116.874.912 confirmed cases, including 2.597.381 death (WHO, 2021), most learning facilities were forced to close and continue using distance or online lectures. While some universities might already have an online learning platform, whether, in MOOC or SPOC, this situation is a problem for universities without one.

In Indonesia, The Ministry of Education and Culture with the cooperation of online learning platforms, focuses on providing asynchronous learning methods as widely as possible (Abidah, et al., 2020). Although the asynchronous method had a negligible difference in learning retention (Jordan, et al., 2013), the interactive synchronous learning method was still more popular. However, implementing synchronous distance learning using the traditional face-to-face class as a base model was proved difficult due to the lack of ICT infrastructure and educational resources (Basilaia & Kvavadze, 2020). Another obvious limitation is that it is almost impossible to teach practicals and labs, music, and art courses using the current distance learning method (Sahu, 2020).

On the other side, reports from UNICEF show that 66% of 60 million students across 34 provinces felt uncomfortable learning from home during the Covid-19 pandemic. 87% of that student wishes to go back to school. While so, the student, realizing the effect of the pandemic, still chooses to wait for the pandemic effect to reduce before doing so (UNICEF, 2020). There is difficulty understanding the online lesson caused by the lesson delivery, thus being a heavier burden to the students than face-to-face offline learning (Sadikin & Hakim, 2019). The situation made worse with the high cost of internet access and uneven accessibility to the ICT infrastructure in some areas (Sadikin & Hamidah, 2020).

Distance Learning During COVID-19 Pandemic

Looking at the current online learning method, namely synchronous, asynchronous, and the hybrid of the two, each has its advantage and disadvantage. The synchronous method, whether it is via chat room or video conference, although more preferably, was hard to use in low bandwidth conditions and students complained about running out of the internet data cap. While the asynchronous method seems feasible in this situation, the feeling of isolation due to the lack of interaction tends to make students feel frustrated (Khotimah, 2020). Due to this, WhatsApp was one of the most popular applications used as a synchronous learning method (Pramana, et al., 2021).

While using WhatsApp Group (WAG) may reduce the imminent use of bandwidth and data caps, the fast velocity nature of synchronous distance learning will cause problems in the long run. Especially in the case of learning which needs near-instantaneous voice interaction. This is due to the WAG video call limitation. As an alternative, while not nearly as effective, students and lecturers might use the file-sharing or voice note feature, which would be limited by the smartphone memory and data cap (Afifah, 2021).

Video conference is the other preferred method as a synchronous distance learning method though the problem remains the same. Zoom, one of the most popular video meeting software during the COVID-19 pandemic requires, at the lowest quality, 600kbps (up/down) for 1:1 video calling and 3.8Mbps/3.0Mbps (up/down) for 1080p HD video. For group video calling it needs 1.0Mbps/600kbps (up/down) and 3.8Mbps/3.0Mbps (up/down) for 1080p HD video. In addition, the gallery view receiving in group video calling requires 2.0Mbps for 25 views or 4.0Mbps for 49 views. Screen sharing needs an additional 50-75kbps and 60-80kbps for audio VoIP (Zoom, 2021).

Depending on the stream quality, a 1:1 Zoom meeting will use somewhere around 540 MB to 1.62 per hour. While during a group call, it uses around 810 MB to 2.4 GB per hour just for the video feed alone. This bandwidth usage would be a problem for students with a weak internet connection. Moreover, to reduce bandwidth usage, some students would turn off their camera feed (Castelly & Sarvary, 2021). In turn, this would reduce the main advantage of video conference as a synchronous learning method that allows the participant to feel a direct many to many communications (Beutner & Echterling, 2019).

Virtual reality (VR), as a relatively new rising technology, has the ability to simulate a real environment onto a digitized three-dimensional space. According to Coburn (2017), the very basic definition of a VR experience is replacing one or more physical senses with virtual senses. With the constraint of low bandwidth conditions, the primary concern of synchronous distance learning lies in providing smooth direct many to many interactions without raising the feeling of isolation. Furthermore, the system needs to provide a sense of presence with the ability to interact with minimal delays even under limited bandwidth. So we propose using avatar-based interaction as a replacement for the video feed and a virtual reality environment to provide the interactive media.

Related Works

Xue-qin Chang, Dao-hua Zhang, Xin-xin Jin (2017) proposed a model of a web-based multi-user virtual campus (WMUVC) system to simulate a three-dimensional world as a learning environment. The concept combines virtual reality three-dimensional environment with traditional website information such as video chat, email, VOIP to make the teaching resource browsable.

Another research in the viability of virtual reality as a distance learning platform was done by Leanne Coyne, Jody K. Takemoto, Brittany L. Parmentier, Thayer Merritt, and Rachel A. Shapton (2018). They found that 94.44% of the participants would prefer to use VR media if offered. Furthermore, it was identified that the interactive tools provided in the VR environment were helpful in this use case. Finally, the engagement provided made the participant feel more confident to express their ideas with their team.

Yiqun Liu, Xuanxia Fan, Xiaojing Zhou, Meiqin Liu, Jianfeng Wang, and Tao Liu (2019) proposed five application modes of VR in its usage as a distance learning method in higher education. These modes include self-exploration learning, distance group discussion, open learning, and experiment learning. They identified the main challenge in this implementation: the cost and portability of the VR system and the difficulty in adapting current teaching resources to the VR environment.

In this paper, we explore the possibilities of applying VR environment as a virtual classroom in a low bandwidth situation. Taking advantage of its avatar-based interaction and the adaptability of the learning method, focused on its synchronized learning capabilities compared to the current widely used method.

Proposed Method

A. Virtual Reality Classroom Environment

The main goal of a virtual classroom environment is simulating a real classroom for remote participants by providing the ability to participate and interact in the class (Deshpande & Jenq-Neng Hwang, 2001). With its fully immersive nature (Bowman & McMahan, 2007), virtual reality also could give nearly the same effect as doing face-to-face learning in the real world (Blume, et al., 2019). A Virtual reality environment with a full 6 degrees of freedom (6DoF) movement would give students chances to visualize, explore, manipulate, and interact with virtual objects, which would add the student ability to respond to instruction inside the classroom (Crumpton & Harden, 1997).

Using virtual reality to simulate the class classroom could also be directed to another way. One of the main limitations of video conferences as a synchronized learning method is its inherent lack of ability to provide "lab experience". On the other hand, virtual reality could provide an interactive experience akin to using real tools and experiments.

Inside this virtual classroom, every student and teacher would be represented with a 3-dimensional avatar tracked to their device. Since the avatar only loaded once at the initialization, the movement could

(ISBN 978-1-988652-41-2)

be controlled only by its coordinate in the virtual 3d space. In comparison, a video conference would need to broadcast every single video frame which needs more bandwidth in the long run.

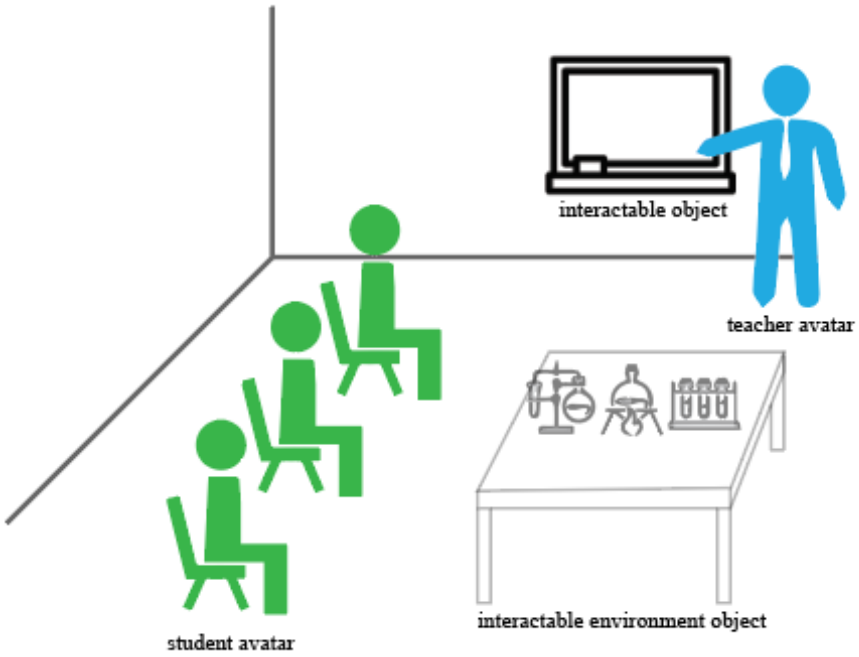

Fig. 1: virtual classroom mockup composition

B. Avatar-based Interaction

In an avatar representation, take for example a rigged bipedal human avatar with 20 pivot points; the movement of this avatar could be controlled just by sending the coordinate location and its rotation relative to each other. Since most consumer VR headsets used only three tracking points, head and both hands, the movement data needed to be broadcast would be far smaller. The server could skip any processing of this data and directly broadcast it. The client would then process this coordinate and location individually to do the movement or interaction.

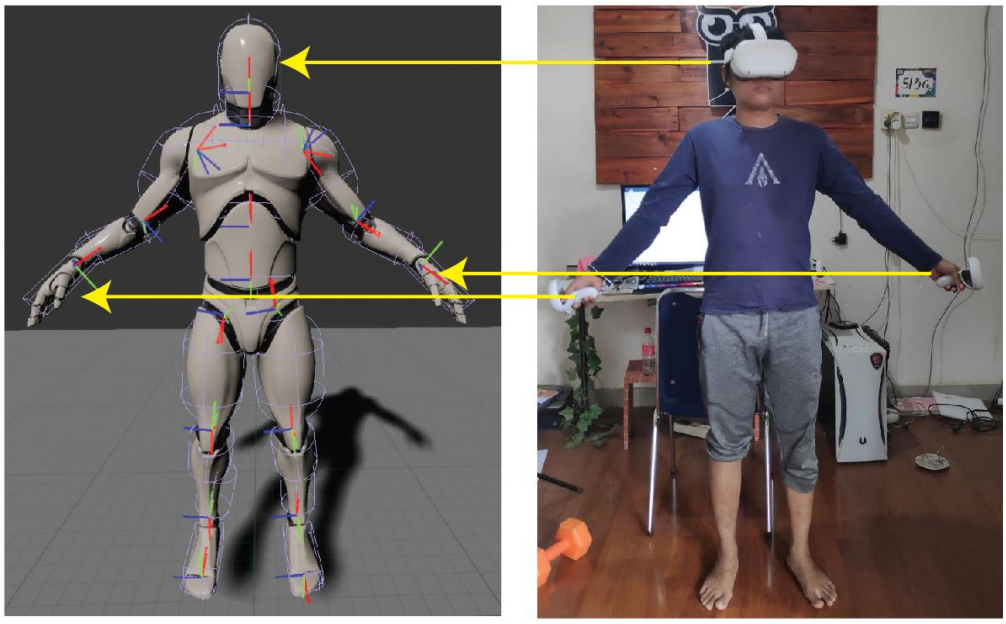

Fig. 2: Human-Avatar Three-Point Motion Tracking

C. Bandwidth Optimation

A system made using Unreal Engine 4 defaulted in 10kbps bandwidth limit in the UNetDriver config. This setting, of course, could be changed to accommodate our needs. In our preliminary testing, sending movement through multicast RPC to about 100 actors use around 20kbps - 30kbps without any optimization. In comparison, Zoom 1:1 video calling needs 600kbps at the lowest resolution and up to 3.8Mbps at the highest resolution. Since the client dictates the render resolution in a VR environment, the bandwidth usage would stay mostly the same across any resolution in the clients.

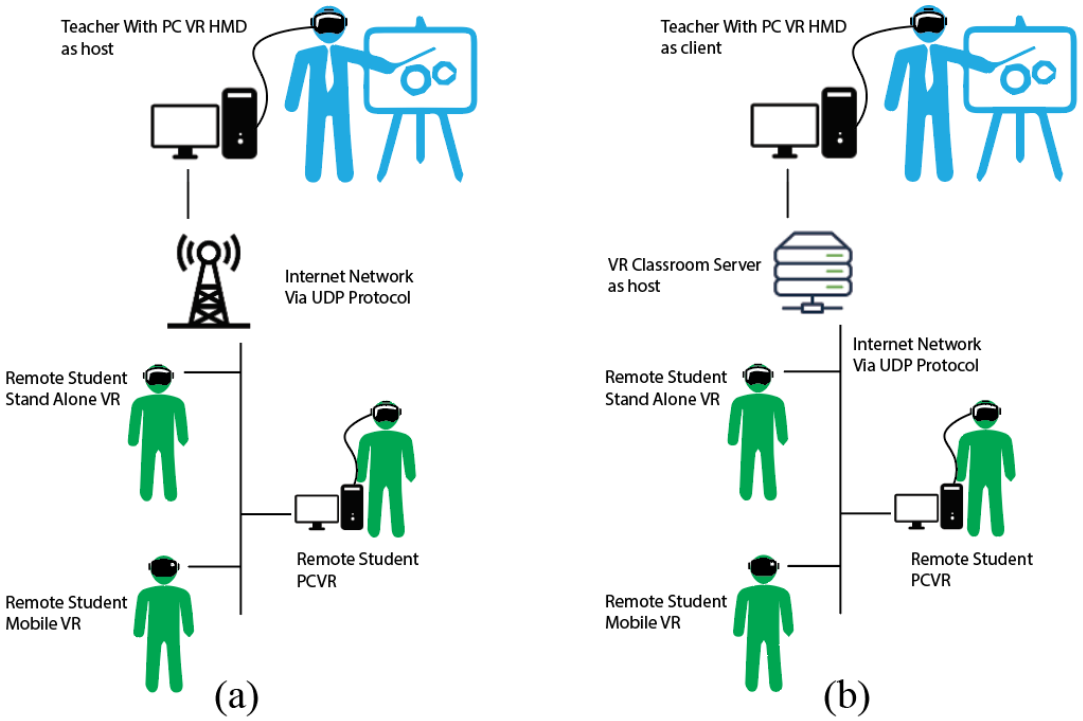

Fig. 3: System architecture (a) peer-to-peer with the teacher as host. (b)client-server with teacher & students as clients

To further reduce the bandwidth usage, we could reduce the transmission frequency and let the client interpolate the coordinate by itself. This would result in the same movement with an imperceivable motion delay and a smaller bandwidth usage. Furthermore, this would also mean that the transmission could be done with UDP protocol which will not guarantee the error but compensate in less delay. By default, an avatar-based interaction using a VR environment does not need that much bandwidth.

Furthermore, a VR system could also be used as an asynchronous method if needed, switching it to self-exploration learning.

(ISBN 978-1-988652-41-2)

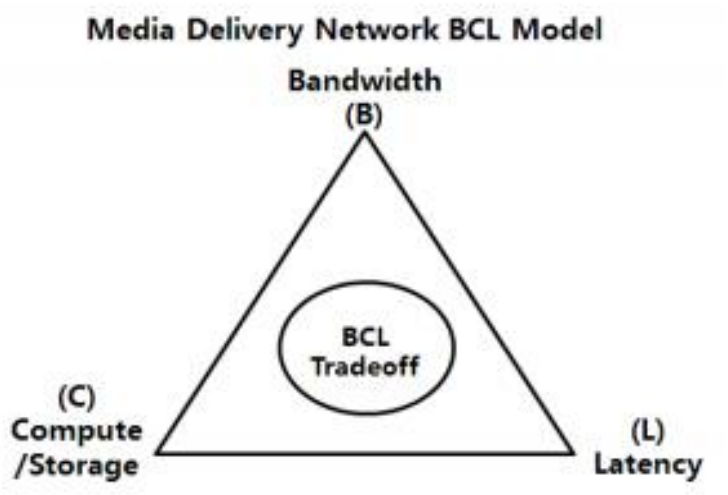

Fig. 4: Media Delivery Network BCL Model (Mangiante, et al., 2017)

According to Magiante et al. (2017), Media Delivery Network BCL Model, by moving to one extreme end of the BCL tradeoff triangle, in this case, the compute/storage angel, thus eliminating the real-time bandwidth usage. This could be done by allowing the client to download content individually and allow them to explore the provided content by themselves.

If we compare this to a video conference, in this case, a pdf presentation file over a Zoom video call, we could predict the bandwidth usage difference just in the presentation sharing alone. Zoom bandwidth requirement uses 50-150kbps for screen sharing with no video thumbnail and this usage increase to 50-150kbps with video thumbnail.

Take the 10-page pdf file without embed image at 300kb size. Then, by pre-downloading and displaying it in the VR environment, the bandwidth usage would only need that 300kb. On the other hand, by using zoom screen sharing, the bandwidth usage would increase by the time it is displayed.

Method	Data Usage		
	20 minutes	60 minutes	120 minutes
Predownload	300 kb	300 kb	300 kb
Zoom (min, no thumbnail)	60 mb	180 mb	360 mb
Zoom (max, no thumbnail)	90 mb	270 mb	540 mb
Zoom (max, with thumbnail)	180 mb	540 mb	1.08 gb

Table 1. theoretical data usage overtime for screen sharing small pdf file (300kb)

As we could see, the data usage for pre-download would remain the same no matter how long the session takes since the weight was moved to the compute/storage side. The client would need to store and render (compute) the file by themselves. In theory, there would be a point where the shared file would be

(ISBN 978-1-988652-41-2)

too big to handle effectively by the client itself in comparison to the screen sharing method. However, at that point, there is also a time factor and the bandwidth limitation that we need to consider. For example, sharing an HD video for 20 minutes via screen sharing would use less data on zoom. Furthermore, when we factor in the video compression (50-150kbps limit on zoom screen sharing), the resulting video stream could be less than optimal.

Conclusion

The fast growth of VR technology in the recent year and with devices getting relatively cheaper in the consumer market opens up new chances of widespread adoption and implementation, especially in the education field. Meanwhile, the COVID-19 pandemic forced learning institutions to quickly adopt distance learning even without adequate infrastructure, also pushing new methods to be considered further.

Solving the feeling of isolation in a distance learning environment is an advantage we should take seriously, especially if this "forced" long-distance learning situation would need to be prolonged further. As shown above, this virtual reality environment could be a better solution in a low bandwidth situation than the currently used method. VR lab also opens up chances for a cheaper experiment learning medium since there is no need to provide physical material. More research needs to be done in making this technology easier to adopt by the public, especially to make the devices cheaper to make adaptation far more widespread.

References

Abidah, A.,, Nuurul H.H., Simamora, R., Fehabutar, D., Mutakinati, L.. (2020). The Impact of Covid-19 to Indonesian Education and Its Relation to the Philosophy of "Merdeka Belajar". Studies in Philosophy of Science and Education. 1. 38-49. 10.46627/sipose.v1i1.9.

Afifah, Afifah. (2021). The Using Of Whatsapp In Teaching Pronunciation Practice To The Third Semester Students Of Tadris English Study Program In IAIN Palu. Datokarama English Education Journal. 1. 29-36. 10.24239/dee.v1i2.11.

Basilaia, G., & Kvavadze, D. (2020). Transition to Online Education in Schools during a SARS-CoV-2 Coronavirus Transition to Online Education in Schools during a SARS-CoV-2 Coronavirus (COVID-19) Pandemic in Georgia. Pedagogical Research, 5(4).

Beutner, Marc & Echterling, Denise. (2019). Developing the MultiDimensional Communication Channel Model (MDCC model) - A communication model for Virtual Classrooms. IAC 2019.

Blume, F., Göllner, R., Moeller, K., Dresler, T., Ehlis, A. C., & Gawrilow, C. (2019). Do students learn better when seated close to the teacher? A virtual classroom study considering individual levels of inattention and hyperactivity-impulsivity. Learning and Instruction, 61, 138-147.

Bowman, D. A., & McMahan, R. P. (2007). Virtual reality: how much immersion is enough?. Computer, 40(7), 36-43.

Castelli, F. R., & Sarvary, M. A. (2021). Why students do not turn on their video cameras during online classes and an equitable and inclusive plan to encourage them to do so. Ecology and Evolution.

Chang, X. Q., Zhang, D. H., & Jin, X. X. (2016). Application of Virtual Reality Technology in Distance Learning. International Journal of Emerging Technologies in Learning, 11(11).

Coburn, J. Q., Freeman, I., & Salmon, J. L. (2017). A Review of the Capabilities of Current Low-Cost Virtual Reality Technology and Its Potential to Enhance the Design Process. Journal of Computing and Information Science in Engineering, 17(3), 031013. doi:10.1115/1.4036921

Coyne, L., Takemoto, J. K., Parmentier, B. L., Merritt, T., & Sharpton, R. A. (2018). Exploring virtual reality as a platform for distance team-based learning. Currents in Pharmacy Teaching and Learning.

Crumpton, L. L., & Harden, E. L. (1997). Using virtual reality as a tool to enhance classroom instruction. Computers & Industrial Engineering, 33(1-2), 217-220.

Deshpande, S. G., & Jenq-Neng Hwang. (2001). A real-time interactive virtual classroom multimedia distance learning system. IEEE Transactions on Multimedia, 3(4), 432–444.

Jordan, J., Jalali, A., Clarke, S., Dyne, P., Spector, T., & Coates, W. (2013). Asynchronous vs didactic education: it's too early to throw in the towel on tradition. BMC Medical Education, 13(1), 1-8.

Kaplan, A. M., & Haenlein, M. (2016). Higher education and the digital revolution: About MOOCs, SPOCs, social media, and the Cookie Monster. Business Horizons, 59(4), 441-450.

Khotimah, K. (2020, December). Exploring Online Learning Experiences During the Covid-19 Pandemic. In International Joint Conference on Arts and Humanities (IJCAH 2020) (pp. 68-72). Atlantis Press.

Liu, Y., Fan, X., Zhou, X., Liu, M., Wang, J., & Liu, T. (2019). Application of Virtual Reality Technology in Distance Higher Education. Proceedings of the 2019 4th International Conference on Distance Education and Learning - ICDEL 2019.

Mangiante, S., Klas, G., Navon, A., GuanHua, Z., Ran, J., & Silva, M. D. (2017). VR is on the Edge. Proceedings of the Workshop on Virtual Reality and Augmented Reality Network - VR/AR Network '17. doi:10.1145/3097895.3097901

Pramana, C., Susanti, R., Violinda, Q., Yoteni, F., Rusdiana, E., Prihanto, Y. J. N., ... & Purwahida, R. (2021). Virtual Learning During The COVID-19 Pandemic, A Disruptive Technology In Higher Education In Indonesia. Okma and Arkiang, Fajeri and Purwahida, Rahmah and Haimah, Virtual Learning During The COVID-19 Pandemic, A Disruptive Technology In Higher Education In Indonesia (February 2, 2021).

Sadikin, A., & Hakim, N. (2019). Pengembangan Media E-Learning Interaktif Dalam Menyongsong Revolusi Industri 4.0 Pada Materi Ekosistem Untuk Siswa SMA: Interactive Media Development of E-Learning in Welcoming 4.0 Industrial Revolution on Ecosystem Material for High School Students. Biodik, 5(2), 131-138.

Sadikin, A., & Hamidah, A. (2020). Pembelajaran Daring di Tengah Wabah Covid-19:(Online Learning in the Middle of the Covid-19 Pandemic). Biodik, 6(2), 214-224.

Sahu, Pradeep. (2020). Closure of Universities Due to Coronavirus Disease 2019 (COVID-19): Impact on Education and Mental Health of Students and Academic Staff. Cureus. 12. 10.7759/cureus.7541.

UNICEF (2020). Survei UNICEF: 66 Persen Siswa Mengaku Tak Nyaman Belajar di Rumah,, Available: https://edukasi.kompas.com/read/2020/06/24/090832371/survei-unicef-66-persen-siswa-mengaku-tak-nyaman-belajar-di-rumah . Accessed: March 10th, 2021.

WHO (2021). WHO Coronavirus (COVID-19) Dashboard, March 9th 2021, Available: https://covid19.who.int/ . Accessed: March 10th, 2021.

Zoom (2021). System requirement for Windows, macOS, and Linux, available: https://support.zoom.us/hc/en-us/articles/201362023-System-Requirements-for-PC-Mac-and-Linux . Accessed: March 10th, 2021.