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Reflective Piece

Work-Integrated Learning in Medical Laboratory Science and Medical Technology during COVID-19

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ABSTRACT

Work Integrated Learning (WIL) remains an integral part of the Medical Laboratory Science and Medical Technology curriculum. However, the onset of the COVID-19 pandemic necessitated a reconfiguration of operations and practices in institutions of higher education globally. The current, theoretically-based paper reflects on the impact of the COVID-19 pandemic on the instructional offering of Work Integrated Learning. A recount of the lessons of the transitional phase of our pedagogical approach from the traditional instructional method to strategic implementation of Problem Based Learning (PBL) in the (WIL) module is shared, including highlighting the overall long-term implications of remote instruction as an alternative to experiential learning within the Medical Laboratory Science and Medical Technology education.

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Introduction

Work Integrated Learning (WIL) prepares innovative, dynamic and knowledgeable students with essential skills that allow university graduates to be competitive locally and internationally in demanding work environments (Zegwaard & Rowe, 2019). The COVID-19 outbreak presented a formidable public health challenge (Marinoni, Van't Land & Jensen, 2020). The South African Higher Education sector was not spared from this emergency, and enacted contingency plan for the continued delivery of essential curricular activities, such as the delivery of WIL for prospective graduates. This reflective report is underpinned by John Dewey's five-phase framework of description, reflection, influencing factors, alternative strategies, and learning (Dewey, 2012). The discussion focuses on the challenges faced and lessons learnt during delivery of the undergraduate WIL program during the COVID-19 pandemic for the qualifications, Medical Laboratory Science and Medical Technology, at a University of Technology in South Africa.

Background and Context

Health Science reviews on the practice of WIL are still scarce (Govender, Prakaschandra & Mohapi, 2021). WIL, formerly known as experiential learning (Govender, Prakaschandra & Mohapi, 2021), is a semester module embedded in the Medical Laboratory Science (MLS) and Medical Technology (MT) curriculum. 76 students were enrolled in these programmes in 2021. The purpose of WIL is integration of laboratory practice to academic theory via the experiential model of learning (Govender, Prakaschandra & Mohapi, 2021). The initial design of the program prior to the COVID-19 pandemic assumed that WIL happens in a pathology laboratory setting. Proponents of active learning report its usefulness in health education as it enhances the learning environment and provides meaningful educational experiences (Bradley, 2006). As such, students are allocated clinical case study research projects that require a clinical setting for investigation; they are assessed by a panel of industry specialists in Cytology, Clinical Chemistry, Haematology, Histopathology, Medical Microbiology, and Virology. Additionally, for MLS and MT students, WIL is a career-defining scheduled rotational period, as students select a discipline of specialization. Project-based learning is an instruction method that is applicable from formative years of study to postgraduate level (Campbell & Norton, 2007). This approach enables independence on the part of the student to embark on constructive research, setting goals, engaging in teamwork, effective communication and reflection while in real practice (Kokotsaki, Menzies & Wiggins, 2016). But, the emergence of the COVID-19 pandemic necessitated hard lockdowns globally, including in South Africa, raising challenges regarding the implementation of WIL.

Application of Problem-Based Learning

During the COVID-19 pandemic, we applied the problem-based learning (PBL) pedagogical approach in a virtual setting. Problem-based approaches to learning have a long history of advocating experience-based education. Problem-based learning (PBL) is an instructional method in which students learn through facilitated problem solving. Students work in collaborative groups to identify what they need to learn in order to solve a problem. They engage in self-directed learning (SDL) and then apply their new knowledge to the problem (Hmelo-Silver, 2004). PBL has been historically applied in medical science education as projects require extensive investigative research (Kavlu, 2015; Thuan, 2018). However, PBL has been applied in other fields such as higher education, teacher education, architecture, engineering, economics and MBA programs (Savery, 2015). PBL is centred around the student and their ability to attain deeper learning and knowledge by actively participating in real world situations (Savery, 2015; Thuan, 2018). The PBL model is beneficial for both the student and lecturers during WIL in that it drives learning in accordance with the skills they possess and they are also actively involved in the learning process which, as stated by Thuan (2018), encourages and enhances the creativity of the student. It was applied in the current WIL subject with keen interest in its ability to enhance student-centred learning, autonomous learning and collaborative learning. The WIL subject serves a specific purpose for the MLS and MT programmes: the student researches a clinical pathology topic, during a routine rotation in all the diagnostic laboratory disciplines to enable them to make an informed decision for their subsequent career specialisation.

When using PBL, the instructor's role switches from the more traditional paradigm, in which the teacher gives relevant content, tells the class what needs to be done, and offers details and information for students to apply their knowledge to a particular problem. The teacher serves as a facilitator in PBL, and the learning is student-driven with the goal of addressing the problem. Furthermore, the tasks range in length from a few weeks to a semester, with daily instructional time dedicated to group work (Kurt, 2022).

The WIL process was an organized effort from both academics, industry and students, that progressed in sequential stages namely: allocation of topics, planning, researching, observation and reporting findings. This process aligned with the PBL implementation process as described by Wrigley (1998). Furthermore, the expectation was that students use the knowledge acquired during the theoretical instruction in the previous five semesters of studying, in solving the clinical case studies presented in the diagnostic laboratory and presented their presumptive diagnoses for review by academics and supervisors.

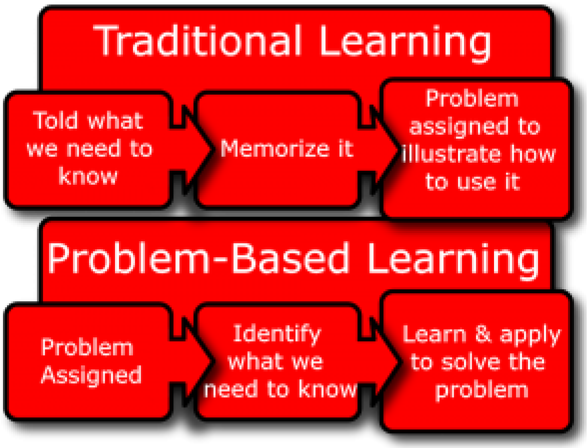

Figure 1: Difference between traditional learning and problem-based learning (Kurt, 2022)

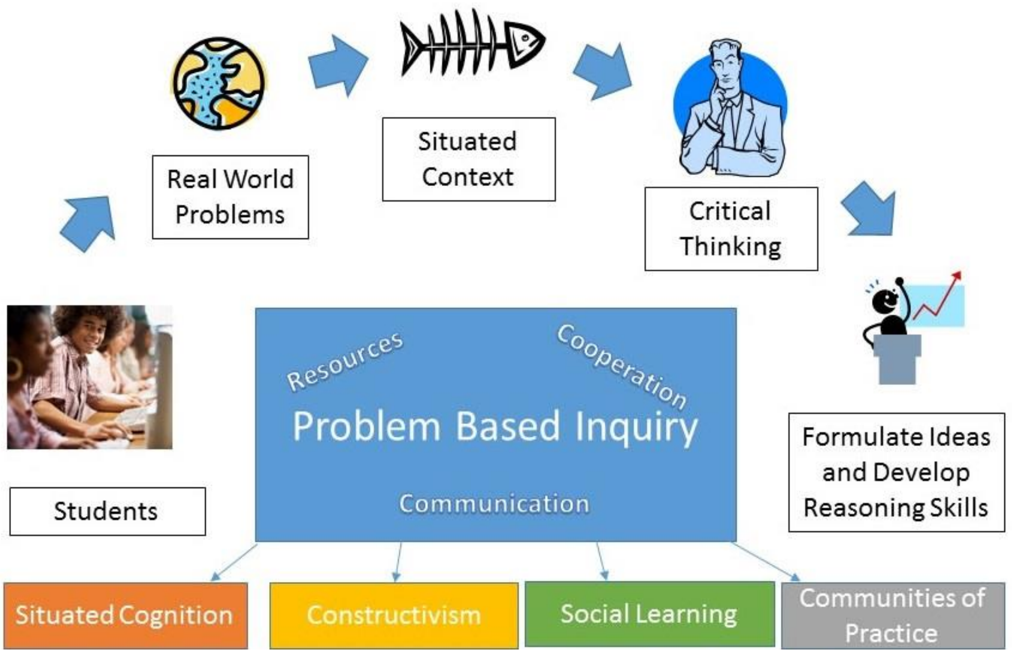

Figure 2: In problem-based inquiry environments, situated cognition, constructivism, social learning, and communities of practice are presumed theories of learning and cognition. These theories are frequently linked because they have comparable concepts concerning the context and process of learning (Orey, 2010).

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Our approach to the WIL programme was aligned with the features of PBL as applied previously by researchers and educationalists (Simpson, 2011; Thuan, 2018), and as described below in Table 1.

Table 1: Implementation of PBL in MLS and MT programmes

PBL FEATURE	APPLICATION TO WIL
Step 1: Preparation	The students were prepared through lecturing theoretical and practical concepts for the various disciplines. A WIL orientation workshop was conducted which introduces the topics to the students. Queries regarding the allocated topics and rotation schedule through the different laboratory disciplines are also raised and discussed in this platform. Additionally, an induction workshop was conducted by the clinical laboratory, introducing the students to the relevant staff members and the training managers or supervisors. In this platform, the expected workplace conduct, policies, procedures and aims of the WIL programme were explained.
Step 2: Planning	The students were furnished with all workbooks, guides, contact details of academics and laboratory supervisors. The training schedules, dates and times were also provided. By the end of this session, students understood their allocation and assigned projects.
Step 3: Research	The students were expected to conduct these complex explorations over a period of six months. For this task, the students were divided into research groups, with each allocated a scientific challenge in the form of a research project. The lecturers explained the virtual mode of teaching and learning, consultation and feedback. Furthermore, a session explaining how information will be gathered and analysed by the students. Briefly, the students could access information through the laboratory database, clinical records, and academic search engines such as Google Scholar.
Step 4: Conclusions	During this period, students evaluated and synthesized the information gathered during clinical practice. There were limited lecturer-directed activities. Students were however allowed to consult clinical laboratory supervisors and academics in the event that they required clarity and guidance whilst drawing conclusions from analysis of the collected data. Although the projects were virtual, the students experienced an authentic use of resources and technologies to gather information and formulate conclusions. This task ensured the use of effort in connecting ideas and improving the analytical skills of students.
Step 5: Presentation	During the WIL programme, there was frequent feedback from fellow students, clinical laboratory supervisors, facilitators and lecturers. The students used the online discussion platform as an opportune resource. Such an environment fostered collaboration instead of competition. Industry experts shared their expertise and demonstrated procedures.
Step 6: Evaluation	The workbook has assessments for each and every laboratory session that the students were allocated to. Through the virtual theoretical lectures, laboratory demonstrations and videos, teaching and learning occurs. Assessment of the learning process was conducted, deeming a student competed for that particular discipline upon completion. The WIL programme required use of social and time management skills for completion, which all students seemingly mastered, since all projects and workbooks were submitted timeously. Additionally, the finished research projects were assessed using a standardized rubric for presentation. The meaningful production of scientific information was prepared collaboratively by the group members and at first shared with laboratory personnel for a mock presentation. Constructive feedback on the presentations was given by the industry personnel. Thereafter a final presentation of the clinical case study was presented publicly for assessment by industry experts and academics. Comments were made on the groups' efforts and a final project mark was allocated which contributed to the final WIL subject marks.

Reflection

WIL entails gaining practical experience through realistic work conditions (Govender, Prakaschandra & Mohapi, 2021). Nonetheless, the risk of COVID-19 infection restricted access to diagnostic medical laboratories, hence a new approach was needed to meet the graduation timeframe. The department chose the PBL approach. The PBL program implementation has been found to be beneficial to students across different fields by effectively enhancing the personal growth of students (Thuan, 2018). For our students, the first step was reinforcing and building on existing theoretical knowledge through online lectures, demonstrations and videos. This was done prior to introducing complex case studies for discussion and investigation. Students had an opportunity to apply, categorize and evaluate theoretical facts to real work scenarios drawing meaningful conclusions and presenting their resultant medical diagnoses. This enabled them to improve their scientific communication skills and metacognitive skills since the WIL programme and research projects incorporated planning research, implementing plans, documentation, analysis and oral reporting (Sokhanvar, Salehi & Sokhanvar (2021). A study by Huércano (2021) confirms that PBL assists in the reduction of communication anxieties and development of evaluation skills for students. As the project concluded, it was observed that students developed confidence and independence in their work. A study by Beagon, Niall & Ní Fhloinn (2019) in a STEM field asserts that collaboration between students endows students with these qualities. Moreover, PBL incorporates collaborative teamwork, problem solving, negotiation and other interpersonal skills essential for career progression (Thuan, 2018).

PBL is a preferred method for smaller classes (Thuan, 2018). Our WIL cohort, although 76 in number, were grouped into teams of five; this significantly reduced the workload. It was not a challenge to maintain the motivation of students, ensure engagement with the allocated tasks, ensure students integrated their existing prior classroom knowledge, and foster cooperative learning. Project-based learning also encouraged collaboration and social interaction, as well as the development of higher-order cognitive skills such as analysing, synthesizing, justifying, evaluating, and producing as described according to Bloom's Taxonomy (Palmer, Peters & Streetman, 2017). Furthermore, the students had previous exposure to groupwork learning; this reduced possible difficulties with managing group interaction and conflict, negotiation and compromise which has been reported in other studies (Thuan, 2018). Also, the WIL students displayed Piirto's key attitudes of self-discipline, openness to experience, risk taking, ambiguity tolerance, and group trust in order to complete the project successfully (Palmer, Peters & Streetman, 2017).

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Nevertheless, some instructors are more comfortable with the traditional physical classroom when it comes to PBL (Thuan, 2018). The COVID-19 pandemic entailed a quick transition to save the academic year without compromising curricula standards. Also, PBL implementation requires sufficient time allocation to the problem (Thuan, 2018). To this end, the university allocated a period of a semester which was sufficient for our cohort of WIL students. The strategic implementation of PBL assisted the institution to maximize the potential benefits of projects such as student engagement, collaboration, creativity, motivation, autonomy and independence.

PBL is increasingly being adopted in the curricula of many medical schools as a strategy to develop self-directed learning. Getting PBL to achieve its educational objectives is not easy, posing unique challenges for students, academics and the faculty. There needs to be provision of clear strategies to improve the quality of PBL, and PBL requires identification of factors that impact on its quality (Malik & Malik, 2018). This section has highlighted how the Department of Biomedical Technology implemented PBL, drawing from literature on PBL, in WIL for MLS and MT contexts.

Influencing Factors

The COVID-19 pandemic meant institutions of higher learning had to hasten the transition from blended learning to online teaching and learning. Fortunately, the university under discussion had an existing learning management system, and academic members had adopted e-learning. This particular academic group is a dynamic team of techno-positivists, and early adopters of e-learning. E-learning includes any form of telecommunication- or computer-based learning (Letseka, Letseka & Pitsoe, 2018). At the outset, academics had to devise strategies that would effectively support students during this tumultuous period.

From students, there was concern about technology-enabled devices, data costs, connectivity issues and the implications of the country-wide shut down on their graduation timeframe. Barriers to e-learning have been reported in a large study conducted at the University of South Africa (Letseka, Letseka & Pitsoe, 2018) and continue to hamper the South African Higher Education sector. Unequal access to resources is further aggravated by budgetary restrictions. Arguably, COVID-19 has worsened digital inequality (Hantrais, Allin, Kritikos, Sogomonjan, Anand, Livingstone, … , 2021). Although the university provided student data directly to their personal cell phones, curriculum redesign was nonetheless unavoidable.

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Industry participated, through the region's Joint Advisory Board Committee (JAB), in strategizing with other institutions to ensure delivery of quality WIL education. In fact, simulation videos and other teaching materials, such as fixated teaching slides for diagnostic microscopy were generously provided by pathology industry partners. Also, there was an urgent request to review the existing WIL curriculum so that it was fit for the purpose of online learning. Owing to the non-linear WIL curriculum, seamless revisions were brought into effect. Studies reveal that rigid curricula stifle creativity and serve as a barrier to learning (Brewer & Tierney, 2010; Rowe, Ferns, & Zegwaard, 2021).

The Department of Biomedical Technology embraced PBL, a student-centred, constructivist pedagogical approach to WIL, which is based on learning by observation, processing and interpretation of knowledge. It correlates with experiential learning theory since learning was expected to occur through practical exposure to the pathology laboratory setting (Gleason, Peeters, Resman-Targoff, Karr, McBane, Kelley, Thomas & Denetclaw, 2011). WIL involves learning on the job, but lecturers also teach students to maintain social and professional relationships (Cooper, Orrell & Bowden, 2010; Eames & Cates, 2011). Supported by social learning theory, learning occurs by observation and collaboration of colleagues (Cooper, Orrell & Bowden, 2010). The current cohort of students was clustered into research teams to sharpen their critical thinking, problem solving and teamwork skills. Such soft skills honed in clinical laboratory settings are important as contemporary graduate attributes for employability (Govender, Prakaschandra & Mohapi, 2021).

Assessing industry panellist feedback on the integrated laboratory practice presentations suggests successful collaboration, self-leadership, accountability and engagement on the part of students. The students interacted with supervisors and university lecturers interacted online with the students as per a rotation schedule or through miscellaneous consultations. This interaction provided much-needed work-based supervision and academic mentorship (Cooper, Orrell & Bowden, 2010). Feedback on assessments, written reports and competency assessments was communicated during this engagement. Although the PBL approach was effective in this case, it is important to note that the workloads of academics are high and the curriculum demands for students are also burdensome, particularly at third year level. Finally, when there is a lack of clear implementation guidelines for PBL, the program may fail. It is therefore important to highlight that the success of the PBL implementation was largely due to a collaborative focus on learning outcomes and trained personnel leading the task along with relevant stakeholders.

Alternative Strategies

The initial transition from blended learning to complete online learning was challenging. Medical education entails application of tacit knowledge to a clinical setting. Practice was at the core of the pedagogical approach. Notably, virtual project-based learning limited social interaction. However, online research collaboration and communication ensured that students were somewhat socially connected. For Biomedical Technology, teamwork is a requisite skill for proper diagnosis of disease, and service delivery to patients (Govender, Prakaschandra & Mohapi, 2021); therefore, academic teams may strategize means for enhancing teamwork and critical thinking activities for the WIL program. However, we realize that PBL implementation is more expensive than traditional teaching and learning methods in terms of time and resources (Malik & Malik, 2018). There are very clear educational reasons why APL should be an indispensable part of the medical curriculum. The key drivers for effective PBL implementation involve several driving factors. For instance, the department could involve tutors in the work of PBL to boost individualized student support during WIL.

Learning

The described approach to WIL ensured that COVID-19 did not hamper instruction. Painstaking efforts were made to ensure continuation of curricular activities while maintaining a safe and sound environment that enabled effective teaching and learning. Participative decision-making and industry assistance in facilitating this abrupt change were crucial. Research confirms that through these forums, the university has the ability to discard obsolete content and keep abreast with industry, technology and science advancements (Govender, Prakaschandra & Mohapi, 2021). The aim was to ensure that students had a fulfilling learning experience and that they emerged with the required attributes of a competent Medical Laboratory Scientist and Technologist. Through the virtual platform, videos and simulations ensured students have an opportunity to apply theoretical concepts in simulated and project-based scenarios. Such a student-centred approach to self-directed learning is entrenched in the principle of providing a safe learning environment (DeCarvalho, 1991).

The tumultuous period of COVID-19 induced mental health issues for many students (Grubic, Badovinac & Johri, 2020). This distress was further exacerbated by personal loss of family members. Through the humanistic paradigm, the interrelatedness of cognitive and affective learning is understood. Correspondingly, the approach is entrenched in the values of Ubuntu, an indigenous

African philosophy (Le Grange, 2018). Thus, students that required consultation meetings and referrals to student affairs for psychological support were appropriately assisted. In hindsight, the humanistic educational philosophy approach used in dealing with students was grounded in empathy and has given an in-depth understanding of how students learn and cope.

In sum, COVID-19 has accelerated the implementation of technology in higher education in unconventional ways. Notably, it also has revolutionized the role of the teacher as facilitator. This necessitates continually investigating best practices for effective technology use in the delivery of WIL in medical education. Change is inevitable. A study reports that the drivers of digitization of teaching and learning are primarily leaders in higher education, who are uniquely positioned to sustainably implement technology as a pedagogical tool beyond the emergency response of the pandemic through long-term goal setting (Laufer, Leiser, Deacon, Perrin de Brichambaut, Fecher, Kobsda, … , 2021).

Conclusion

The effect of COVID-19 on health care and medical education has made us rethink and reflect on whom do we teach, why do we teach, and how do we teach. Such reflections have enhanced my teaching philosophy, teaching strategies and how best to support students to enhance their experience. A reflection on PBL as a student-centred constructivist approach reveals the following characteristics: cooperative learning, student-centeredness, life-long learning, self-directed learning, motivation, autonomy and creativity, which are appropriate and fruitful for medical science teaching and learning. Although the approach may have limitations, the current reflection may provide supporting evidence for academics and institutions that are keen to experiment with this pedagogical approach to WIL. Additionally, the importance of the humanistic approach in education particularly during such disasters as the COVID-19 pandemic has been provided here. Strategic curriculum change is not a unilateral decision; instead, it requires interplay between industry stakeholders and universities, and this has yielded an inspiring benefit for this particular WIL cohort. Furthermore, an inflexible curriculum stifles pedagogical creativity. The COVID-19 pandemic ushered in a technology revolution in higher education. However, the long-drawn-out limitations within the South African higher education context are still barriers. Be that as it may, perhaps the advent of technology for WIL practice is a bridge to reaching new frontiers in digital pedagogy in higher education. The WIL program was successfully administrated and delivered, but there is still room for improvement, particularly with regard to professional and social skills. The foregoing WIL reflective review used John Dewey's

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framework to critically reflect on our practice and made attempts to frame and synthesize our perspectives using theory and relevant literature.

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References

Beagon, Ú., Niall, D., & Ní Fhloinn, E. 2019. Problem-based learning: student perceptions of its value in developing professional skills for engineering practice. *European Journal of Engineering Education*, *44*(6), 850-865.

Bradley, P. 2006. The history of simulation in medical education and possible future directions. *Medical Education*, 40(3): 254-262.

Brewer, D. J. & Tierney, W. G. 2010. Barriers to innovation in US higher education. Proceedings of the American Enterprise Institute Conference on Reinventing the American University: The Promise of Innovation in Higher Education, June.

Campbell, A. & Norton, L. (eds.). 2007. *Learning, Teaching and Assessing in Higher Education: Developing Reflective Practice*. London: Sage.

Cooper, L., Orrell, J. & Bowden, M. 2010. Work Integrated Learning: A Guide to Effective Practice. London: Routledge.

DeCarvalho, R. J. 1991. The humanistic paradigm in education. *The Humanistic Psychologist*, 19(1): 88-104.

Dewey, J. 2012. *Unmodern Philosophy and Modern Philosophy*. Carbondale, Illinois: SIU Press.

Eames C. H., Cates C. H. 2011. Theories of learning in cooperative and work-integrated education. In Koll, R. K. & Zegwaard, K. (eds). *International Handbook for Cooperative and Work-Integrated Education: International Perspectives of Theory, Research and Practice* (pp. 41-52). Lowell, MA: World Association for Cooperative Education.

Gleason, B. L., Peeters, M. J., Resman-Targoff, B. H., Karr, S., McBane, S., Kelley, K., Thomas, T. & Denetclaw, T. H. An active-learning strategies primer for achieving ability-based educational outcomes. *American Journal of Pharmaceutical Education*. 75(9): 186.

Govender, D., Prakaschandra, D. R. & Mohapi, M. J. 2021. Student preparedness for work-integrated learning in biomedical technology: Student perspective. *The Journal of Medical Laboratory Science and Technology of South Africa*, 3(2): 65-71.

Grubic, N., Badovinac, S. & Johri, A. M. 2020. Student mental health in the midst of the COVID-19 pandemic: A call for further research and immediate solutions. *International Journal of Social Psychiatry*, 66(5): 517-518.

Hantrais, L., Allin, P., Kritikos, M., Sogomonjan, M., Anand, P. B., Livingstone, S., Williams, M. & Innes, M. 2021. Covid-19 and the digital revolution. *Contemporary Social Science*, 16(2): 256-270.

Hmelo-Silver, C. E. 2004. Problem-based learning: What and how do students learn? *Educational Psychology Review*, 16(3): 235-266.

Huércano, C. C. 2021. *Project based learning: A quest for motivation when teaching Spanish as a second language at an Australian University* (Doctoral dissertation, Flinders University, College of Humanities, Arts and Social Sciences).

Kavlu, A. 2015. Project–based learning assessment methods comparison in undergraduate EFL classes. *International Journal of Social Sciences and Educational Studies*, 1(4): 47.

Kokotsaki, D., Menzies, V. & Wiggins, A. 2016. Project-based learning: A review of the literature. *Improving Schools*, 19(3): 267-277.

Kurt, S. 2022. Problem-based learning (PBL). [Online] https://educationaltechnology.net/problem-based-learning-pbl/ (Accessed: 10 March 2022).

Laufer, M., Leiser, A., Deacon, B., Perrin de Brichambaut, P., Fecher, B., Kobsda, C. & Hesse, F. 2021. Digital higher education: A divider or bridge builder? Leadership perspectives on edtech in a COVID-19 reality. *International Journal of Educational Technology in Higher Education*, 18(1): 1-17.

Le Grange, L. 2018. The notion of Ubuntu and the (Post)Humanist condition. In Petrovic, J. & Mitchell, R. M. (eds). *Indigenous Philosophies of Education Around the World* (pp. 40-60). London: Routledge.

Letseka, M., Letseka, M. M. & Pitsoe, V. 2018. The challenges of e-Learning in South Africa. In Sinecen, M. (ed). *Trends in E-learning* (pp. 121-138). London: IntechOpen.

Malik, A.S. & Malik, R.H. 2018. What really is hybrid problem-based learning curriculum? A review. *Quest International Journal of Medical and Health Sciences*, 1(1): 8-18.

Marinoni, G., Van't Land, H. & Jensen, T. 2020. The impact of Covid-19 on higher education around the world. IAU Global Survey Report.

Orey, M. 2010. *Emerging Perspectives on Learning, Teaching and Technology*. North Charleston: CreateSpace.

Palmer, G., Peters, R. & Streetman, R. 2017. Cooperative Learning. In Lombardi, P. (ed). *Instructional Methods, Strategies and Technologies to Meet the Needs of All Learners*. Montreal: Pressbooks.

Rowe, A. D., Ferns, S. J. & Zegwaard, K. E. 2021. The future of work-integrated learning: Vision and insights. In Ferns, S. J., Rowe, A. D. & Zegwaard, K. E. (eds). *Advances in Research, Theory and Practice in Work-Integrated Learning* (pp. 251-268). London: Routledge.

Savery, J. R. 2015. Overview of problem-based learning: Definitions and distinctions. In Walker, A., Leary, H., Hmelo-Silver, C. E., Ertmer, P. A. *Essential Readings in Problem-Based Learning: Exploring and Extending the Legacy of Howard S. Barrows* (pp.5-15). West Lafayette: Purdue University Press.

Simpson, J. 2011. Integrating project-based learning in an English language tourism classroom in a Thai university (Doctoral dissertation, ACU Research Bank).

Sokhanvar, Z., Salehi, K. & Sokhanvar, F. 2021. Advantages of authentic assessment for improving the learning experience and employability skills of higher education students: A systematic literature review. *Studies in Educational Evaluation*, 70: 101030.

Thuan, P. D. 2018. Project-based learning: From theory to EFL classroom practice. In Proceedings of the 6th International OpenTESOL Conference (Vol. 327).

Wrigley, H. 1998. Knowledge in action: The promise of project-based learning. *Focus on Basics: Connecting Research and Practice*. 2(D).

Zegwaard, K. E. & Rowe, A. D. 2019. Research-informed curriculum and advancing innovative practices in work-integrated learning. *International Journal of Work-Integrated Learning*, 20(4): 323-334