

# Student Engagement Through Project Based Learning in An Online Mode Amidst The COVID-19 Pandemic-An Enquiry

<sup>1</sup>Dr Parimala Veluvali <sup>2</sup>Jayesh Suriseti

<sup>1</sup>Assistant Professor, Symbiosis Centre for Management Studies, Pune, Maharashtra  
Symbiosis International (Deemed University), India.

Email: [Parimala.veluvali@scmstpune.ac.in](mailto:Parimala.veluvali@scmstpune.ac.in)

*\*Corresponding author*

<sup>2</sup>Founder, Happea, Nine Lives Technology Solutions LLP, Raipur, Chhattisgarh, India.

## Abstract

Project-based learning (PBL) is well accepted as an experiential learning intervention designed to provide students with practical learning drawn from real-life situations. Owing to certain discernible benefits that it offers, project-based learning is integrated into the curriculum in management education, both at undergraduate and postgraduate levels. In a regular physical learning environment, students work on projects involving physical visits to organizations, collect data through field observations, and interact with people, making it experiential learning. However, with the onset of the COVID-19 pandemic, teaching and learning shifted online through synchronous and asynchronous modes. In this context, the present paper discusses the challenges faced in executing project-based learning in an online setting. Drawing from extant works, secondary sources and personal observations, the paper explores strategies for engaging students in project-based learning when offered online.

**Keywords:** Project-based learning, Online learning, strategies, experiential learning, COVID-19

## Introduction:

In the words of Dewey (1897), “Education must be conceived as a continuing reconstruction of experience, as the process and goal of education are the same things”. For a meaningful and effective learning experience, students must be actively engaged in the teaching and learning process. A student-centric approach to education, where the learning is driven through various experiential, participatory and problem-solving methodologies, is arguably the best way to ensure that learning objectives are met. In this context, project-based learning (PBL) is a teaching intervention extensively used in management education. Students work on real-life projects and gain knowledge, skills and problem-solving abilities.

Widely studied, tried and tested educational pedagogy, project-based learning is a successful model to fill the gap between the higher education objectives and the industry or societal needs. PBL has been steadily integrated into the curriculum in many higher education institutions. Studies have established that integrating project-based learning into a regular curriculum translates into greater academic performance, higher employability, and entrepreneurial ability (Kokotsaki et al., 2016).

The COVID-19 pandemic has compelled all teaching-learning activities to be conducted online through various synchronous and asynchronous modes. To keep up with social distancing norms, the

pandemic and the resultant lockdown have disrupted the delivery of education across the globe. While teachers had to adapt to new pedagogical concepts for which they may not have been trained, students had to rely on their resources to continue learning remotely (OECD, 2020). Higher education institutions had to conceive new ways to deliver instructions and assignments. In this sudden shift to an online mode of learning, issues regarding the preparedness of faculty and students for this new normal and effectiveness of e-learning in the attainment of learning outcomes has not been closely studied. In addition to various other factors, online teaching is dependent on the nature of the courses taught. Online courses, originally designed for a practical and hands-on experience, may not be effective in their objectives without remodelling them to suit the online delivery.

While project-based learning in a regular physical classroom setting has been a successful learning intervention as established in academic literature, the delivery of project-based learning in an online mode, right from execution till completion, requires rethinking. Research has shown that, while the traditional classroom has seen a tremendous reform with PBL, it appears difficult to incorporate PBL in an online classroom (Amissah and Kow,2019). Given this scenario, it is important to explore ways and means to ensure student engagement and attainment of the intended outcomes when project-based learning is executed online. By drawing from extant works and personal observations, the paper discusses some of the challenges encountered in the online execution of PBL. Towards the end, the paper explores strategies to attain the desired outcomes from project-based learning in an online setting.

### **Project-based learning- theoretical underpinnings:**

Learning by doing is a deeply rooted educational philosophy recognized as early as the 4th century, with Chinese philosopher Confucius being its early proponent. John Dewey, the American educational theorist, also endorsed learning from hands-on experience. The traditional approach to a teacher-centric education, where the learner was a passive recipient, was challenged by Dewey, who argued for learning through doing.

Project-based learning (PBL) is a learning model that structures learning around projects. It is focused on teaching by engaging the students in the investigation (Blumenfield et al.,2011). In addition to active learning, students acquire critical thinking skills and problem-solving abilities in PBL. The students work on projects involving practical application of knowledge in an organizational setting. Existing studies have explained the features of PBL at length. Projects are complex tasks that involve answering challenging questions and real-life problems (Thomas, 2000). Projects involve students in the design, decision making, problem-solving and investigative activities, giving the students the chance to work autonomously under the supervisor's guidance, culminating in realistic experiences, findings and presentations (Jones et al., 1997) as cited in Thomas (2000). Used in several disciplines to provide undergraduate students with the opportunity to simulate professional activities and apply theory to practice, PBL is identified as an effective way to develop a range of transferable skills required by employers (Fitzsimons, J. and Turner, R 2013). Literature also documents other important features of PBL such as authentic learning content, authentic assessment, teacher-facilitated learning, cooperative learning, reflection, and incorporating adult skills (Diehl et al., 1999). PBL also enables a community of inquiry and cognitive (technology-based) tools (Crawford and Meyer, 1994). Learning outside the classroom has been

proven to provide value, especially in experiential learning, where the students learn to apply the knowledge and skills acquired in the class. Project-based learning paves the way for collaborative and constructive communication between the students and the real world. Being largely practical, project-based learning helps students internalize what they experience.

Theories of experiential learning modelled based on the works of John Dewey, Kurt Lewin, Jean Piaget and others explain that learning is best facilitated by a process that draws out the student's beliefs and ideas about a topic so that they can be examined, tested integrated with new and more refined ideas. Learning stems from synergetic transactions between the person and the environment and is a holistic adaptation process to the world. In that sense, project-based learning allows students to build 21st Century skills like creativity, critical thinking, problem-solving, initiative and self-direction, adaptability, information and media literacy (Ghobrini,2020). Successful experiments of project-based learning have demonstrated improvement in student attendance and student performance (Almulla, Mohammed, 2020). PBL intends to bring about deep learning through a constructivist pedagogy -by allowing the students to use an enquiry-based approach to engage with real and in their domain of study (Markham,2012). Projects help students to identify their career paths. In addition to domain skills, students also acquire soft skills such as networking and teamwork (Albert, 2019)

Project-based learning must be distinguished from problem-based learning, albeit the similarities between the two. While problem-based learning is driven by the problem that may be real or hypothetical and focuses on research and inquiry, project-based learning focuses on executing a real-life project (Noordin et al., 2011).

### **The execution of PBL in a conventional setting**

The execution of PBL in a normal physical setting is well laid out and is used as a primary teaching method. While the actual application of PBL varies from discipline to discipline, Duch, Groh and Allen (2001) have outlined some core features of the PBL that apply to all disciplines. Central to the PBL, according to Duch, Groh and Allen (2001), is problem identification. The problem identified for PBL must motivate students to understand the concepts better. Duch et al. (2001) maintain that the problem chosen for PBL must require the students to make reasoned decisions and relate to the content being taught. The problem must possess a certain level of complexity that would require students to work together to solve it.

Nuntasukan and Yuthong (2014) articulate six steps in project-based instruction management as given below:

1. Step-1 Preparation: The scope of the project and the sources of information are explained to the students by the instructors so that the students are motivated to seek the topics of the project.
2. Step-2 Topic definition and selection: The students identify the topics for the project-based learning by studying the possibilities of each topic for selection and submit the same for the approval of the faculty supervisor.
3. Step 3- Project layout: students study the project's scope and search for the sources of information and plan the project implementation in a group by agreeing on the tasks to be performed, intense roles and responsibilities of the group members and the duration of the project.
4. Step 4- Project implementation: The group members then carry out their tasks and responsibilities by

mutually collaborating and sharing their knowledge while exchanging experiences under the guidance of the faculty supervisor.

5. Step 5 – On completing the assigned tasks, the group collates their findings, prepares a report, and presents the project with the other groups.

6. Step 6- Evaluation: The faculty supervisor evaluates the projects by applying varying assessment tools such as understanding the project, process of executing the project and attainment of learning outcomes.

Norzaini Azman (2012) developed a conceptual framework where a ‘real-life problem’ triggers PBL, and students, through a collaborative learning environment, plan their learning to solve the problem. In the backdrop of clearly defined objectives, the next step is the execution of the project. This will involve collecting data from primary and secondary sources to gather information on the issue in question. In a PBL setting, students mostly work in groups which gives the chance of sharing responsibilities amongst group members for the project and help ensure success. Students on the team are assigned an equal amount of the task based on their expertise and strengths.

During this process, students have to collaborate with other team members to finish the process successfully. Promotes motivation and self-confidence: During the PBL process, students are responsible for meeting deadlines and milestones in groups. Each group member is assigned a task that they are expected to deliver on time. At the end of the project, the students become proud of the work they have delivered.

### **Challenges of implementing project-based learning in an Online mode:**

The COVID-19 pandemic has brought about a paradigm change in education delivery (Mishra et al., 2020), with Universities going the digital way to ensure that the learnings are not interrupted. While the problems associated with distance learning, such as limited peer interaction, technical difficulties and lesser learning orientation (Furlonger and Gencic, 2014), are well understood, the pandemic induced online learning has further confirmed that online learning cannot fully substitute for physical classroom learning.

Every pedagogical approach has a conventional model to follow to be successful. Theories of teaching prescribe for the delivery of instruction sharing learning material in a structured and sequential manner for effective learning (Wilson, 2018). Conventionally, project-based learning was intended for a physical delivery model where students collaborate, engage in field visits, make on-site observations and learn from real-life experiences. In a physical setting, a project would entail collecting primary data on a practical problem, analyzing the data and reporting their findings, making it truly experiential.

However, the execution of online project-based learning is beset with certain limitations as captured in existing studies. While some of the challenges stem from the inherent nature of online learning that requires a certain level of preparation from the side of the teachers, awareness regarding tools and technology to be used in the online platform (Lasaukiene & Rauduvaite, 2015), studies also maintain that this lack of preparedness also culminates into lack of motivation and guidance for the students (Tally, 2015).

Students may lose focus when the necessary milestones for the project and the rubric is not set properly by the teachers. Another challenge is finding a driving question that is relevant and

meaningful for the project to be undertaken online. Much of it depends on the teacher's ability to guide the students. Teachers new to online PBL may not be effective in engaging the students to collaborate and form their questions. (Tally, 2015). Not meeting the students face to face may also make it difficult for the teachers to effectively monitor the progress of the work done by the students. Teachers have to rely on the group reports and student presentations (Alves et al., 2016) and (Lin, 2018) to assess their learnings. Most of the time, students miss out on completing the projects due to technical difficulties hindering their progress. Experience emerging from an online execution of PBL (Chounta et al., 2017) states that it is difficult to assess, reflect, and monitor the students' progress with no physical interaction between the students themselves and between the students and the faculty supervisor.

### **Student engagement in online project-based learning:**

The need to constantly connect and motivate the students is more when students are working on the project remotely from different locations. Constant and clear communication about all aspects of PBL is critical for student engagement. To start with, clear guidelines on the project's objective, the duration, the steps involved, the stages of completion, the format of the report, manner of evaluation and the rubrics must be communicated to all the students in the form of a project manual. Important information such as submission deadlines could be posted on the institutional Learning Management System for quick reference and easy access to the students. Undertaking any academic project involves extensive research on the area of study. A guided online tour of the institutional library will help the students get information on databases and access them. This would help students access the learning resources required for the project remotely.

The next step is to create successful online student groups for the project. This would require careful consideration, as the team's composition will determine its productivity. PBL is substantially a group activity where students work together, leverage their strengths and learn from their peers. While a random formation of groups (Nilson, 2010) is considered the simplest method, an online PBL, an instructor guided grouping, will ensure a balanced distribution of member resources (Michaelson et al., 2004).

Students must know each other well before forming groups. Students can be encouraged to introduce themselves on a discussion board of a Padlet, based on which grouping of students can be done. The faculty supervisor could also ensure a balanced congregation in terms of skill sets, and each group has a mix of students with the required skill sets so that all groups are sufficiently equipped to handle the PBL tasks.

The key to engagement is constant communication with the students at every stage of the project process. The online delivery of education has made it possible that faculty supervisors are available for discussions even after class hours through emails, calls and online meetings. Meets over Google Meet, Microsoft Teams or Zoom can be held regularly with the student groups. A dedicated time for such interactions can be a part of the academic calendar and shared with the students in advance. Faculty supervisors may use breakout rooms to provide an opportunity for the students to talk within their groups for a more focused discussion and provide support and clarification. This also facilitates live guidance on a real-time basis for quick assimilation and action. Reflections on the project progress can also be sought through google forms to understand the students' progress at regular intervals. Students can be asked to make week bound presentations of their work. This allows the students to measure

their progress against the weekly expected outcomes.

### **Aligning best practices with conducting PBL online**

1. Learning Objectives –The key to attaining the learning outcomes in PBL is setting clear learning objectives. When students lack structure in an online context, instructors and course designers need to set clear and directed learning objectives. This clarity would be the first step in alleviating any concerns that might arise on the part of the students, especially since constant physical engagement is not feasible in an online setup
2. Course Design - Designing the Project to facilitate collaboration and effectiveness will be extremely important, and this requires regulating contact hours. The independent nature of online PBL can be used as a medium to let students take a lot more responsibility. It was suggested in Johassen (1999) that ‘problem-based tasks that make sense allow active and authentic involvement of learners, and reflect a cumulative building on past learning’ motivate students to take responsibility for constructing their learning. Creating the project schedule as a hybrid of on-screen and off-screen activities can also go a long way in balancing screen time. For instance, primarily individual elements like research, writing and physical activity can be done off-screen, whereas collective elements like creativity, meeting and debriefing can be done on video platforms.
3. Group Formation - Collaboration and teamwork are *sines qua non* when it comes to PBL. In group interactions, students collaborate

towards an objective, generating new ideas and perspectives in the process. In an online PBL setup, the interpersonal dynamic faces intense pressure because of students’ limited understanding of their peers. There needs to be a healthy balance between organic and planned groups. Left to their own choice, students might want to pick students with shared interests and common behaviours or similar backgrounds. However, certain commonalities can lead to predetermined notions and conflicts, affecting compatibility.

4. Platform - Various functionalities of many available platforms such as Google Meet and Microsoft Teams can help replicate these experiences in an online classroom. Digital whiteboards can also be used for creativity or concept maps to facilitate collaboration in online PBL.
5. Assessment and Feedback - An assessment rubric needs to be defined at the beginning of the course to clarify expectations from students and provide direction for them to make efforts towards the success of PBL. Once the rubric is defined, students know their expectations and can put in effort in a directed manner without getting disoriented. In PBL, formative and summative assessments can be taken care of through some functionalities in modern-day systems. Grading can also be done to reward group behaviour instead of individual capabilities or contributions. Feedback is another important aspect that needs to be taken care of to ensure an online PBL. Periodic student reflections in video or social learning format can go a long way in engaging students. Introducing live feedback in a course can also help students

express their displeasures and positivities and resolve them together.

### **Ethical Considerations in Online PBL**

Since the operating environment of online learning is entirely different, certain challenges are bound to arise. With these challenges also come a few ethical lacunae that might derail the PBL process. It is important to identify these early on and deal with these considerations ethically. Some of the salient ethical considerations have been highlighted below.

1. Digital Divide - Inequity in access to technology is perhaps one of the key factors determining online learning involvement in general, especially in PBL. Students differ in digital access in various formats - the quality of internet connection, the availability of smartphones, access to a quiet workplace - students vary in owning these facilities. As a result, the ability of students to experience online learning is limited in different ways. Instructors and course facilitators need to ensure that the digital divide is factored while designing online learning and projects.
2. Native language support - Most of the platforms and software in online PBL are created in Western countries. As a consequence, the linguistic complexity is often designed for native speakers. Everyone can't be at similar proficiency levels in English speaking. This variance in English proficiency manifests in different situations such as visuals, vocabulary, sentences etc. In physical classrooms, the instructor is available to take care of any such concerns. However, online learning does not have many provisions to this effect. Instructors need to go

through the course and the platform to ensure that the language is accommodating of such variance in proficiency and there is linguistic support available.

3. Power Dynamics - Any online setup that facilitates collaboration is prone to power dynamics arising from gender or culture. This becomes especially important in PBL, which requires people of various backgrounds to collaborate constantly. Online platforms provide a certain level of anonymity, which empowers anti-social elements to take advantage and misuse their power. Instructors can create a few ground rules to ensure that this does not play out in their PBL setup.
4. Access to Differently Abled students - Educational institutions have become cognisant of ensuring access to Differently Abled students through infrastructure and learning. Apart from instructors and peers, many people can help such students in various situations; prominent examples could be librarians and other support staff. In an online setup, this can take a backseat. The course material available online also need to consider accessibility to this section of students. Another important aspect of online PBL is creating a culture of sensitivity among students for their Differently Abled peers, especially because PBL requires close collaboration and mutual dependence.

### **Conclusion:**

It is expected that the online delivery of educational offerings will continue, if not completely but certainly in a blended mode in the years to come. Students are at the centre of learning in PBL (Koparan and

Güven, 2014), and student engagement must remain intact even when PBL is executed online. Online PBL requires constant interaction between the students and the students and the faculty as a peer group. Therefore the design and approach to online PBL must be strategic, keeping in view the challenges faced in the online learning environment. The discussions in this paper will support course instructors in designing PBL so that the desired outcomes of PBL are attained.

## References

1. Albert (2019), ‘Successful project-based learning available at <https://hbsp.harvard.edu/inspiring-minds/successful-project-based-learning>
2. Almulla, Mohammed. (2020). The Effectiveness of the Project-Based Learning (PBL) Approach as a Way to Engage Students in Learning. SAGE Open. 10. 215824402093870. 10.1177/2158244020938702.
3. Amissah, Peter Alex Kow, “Advantages and Challenges of Online Project Based Learning” (2019). Thesis. Rochester Institute of Technology. Available at <https://scholarworks.rit.edu/cgi/viewcontent.cgi?article=11386&context=theses>
4. Blumenfeld, Phyllis & Soloway, Elliot & Marx, Ronald & Krajcik, Joseph. (2011). Motivating Project-Based Learning: Sustaining the Doing, Supporting the Learning. Educational Psychologist. 26. 369-398. 10.1207/s15326985ep2603&4\_8.
5. Dewey (1897), ‘My Pedagogic Creed’, School Journal vol. 54 pp. 77-80 available at <http://dewey.pragmatism.org/creed.htm>
6. Diehl, W., Grobe, T., Lopez, H., & Cabral, C. (1999). Project-based learning: A strategy for teaching and learning.
7. Duch, B. J., Groh, S. E., & Allen, D. E. (2001). The power of problem-based learning: a practical” how to” for teaching undergraduate courses in any discipline. Stylus Publishing, LLC.
8. D. L. Edy, Widiyanti and Basuki, “Revisiting The Impact of Project-Based Learning on Online Learning In Vocational Education: Analysis of Learning in Pandemic Covid-19,” 2020 4th International Conference on Vocational Education and Training (ICOVET), 2020, pp. 378-381, doi: 10.1109/ICOVET50258.2020.9230137
9. Furlonger, B., & Gencic, E. (2014). Comparing satisfaction, life-stress, coping and academic performance of counselling students in on-campus and distance education learning environments. *Australian Journal of Guidance and Counselling*, 24(1), 76–89. <https://doi.org/10.1017/jgc.2014.2>
10. Fitzsimons, J. and Turner, R. (2013), “Integrating project-based learning into an undergraduate programme using Web 2.0 and videoconferencing”, *Journal of Applied Research in Higher Education*, Vol. 5 No. 1, pp. 129-140. <https://doi.org/10.1108/17581181311310324>
11. Ghobrini, Rafik. (2020). Sharpening Students’ 21st Century Skills through Project-Based Learning in an EFL Context. 3. 102-112.
12. Koparan, T and Güven, B. (2014) The Effect on the 8th grade Students’ Attitude towards Statistics of Project Based Learning. *European Journal of Educational Research*. 3 (2) 73-85



13. Mishra, L., Gupta, T., and Shree, A. (2020). Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. *Int. J. Educ. Res.* 1:100012. doi: 10.1016/j.ijedro.2020.100012
14. OECD (2020), 'The impact of COVID-19 on education-Insights from education at a glance' available at <https://www.oecd.org/education/the-impact-of-covid-19-on-education-insights-education-at-a-glance-2020.pdf>
15. Oza, Preeti. (2021). Re: How do you organize the Project Based Learning (PBL) in higher education during the online learning? Retrieved from: [https://www.researchgate.net/post/How\\_do\\_you\\_organize\\_the\\_Project\\_Based\\_Learning\\_PBL\\_in\\_higher\\_education\\_during\\_the\\_online\\_learning/6061ff77250dca1d276f17b5/citation/download](https://www.researchgate.net/post/How_do_you_organize_the_Project_Based_Learning_PBL_in_higher_education_during_the_online_learning/6061ff77250dca1d276f17b5/citation/download).
16. Sahu, P. (2020). Closure of universities due to Coronavirus Disease 2019 (COVID-19): impact on education and mental health of students and academic staff. *Cureus* 12:e7541. doi: 10.7759/cureus.7541
17. Thomas, John W. (2000). A review of research on project-based learning. San Rafael, CA: The Autodesk Foundation available at [http://www.bobpearlman.org/BestPractices/PBL\\_Research.pdf](http://www.bobpearlman.org/BestPractices/PBL_Research.pdf)
18. Jones, B. F., Rasmussen, C. M., & Moffitt, M. C. (1997). Real-life problem solving.: A collaborative approach to interdisciplinary learning. Washington, DC: American Psychological Association.
19. Jalinus, Nizwardi & Nabawi, Rahmat & Mardin, Aznil. (2017). The Seven Steps of Project Based Learning Model to Enhance Productive Competences of Vocational Students. 10.2991/ictvt-17.2017.43.
20. Johassen, D. (1999) Designing Constructivist Learning Environments, in C.M. Reigeluth (Ed.) *Instructional-Design Theories and Models: a new paradigm of instructional theory*, vol. II. Mahwah: Lawrence Erlbaum
21. Marx, R. W., Blumenfeld, P. C., Krajcik, J. S., Blunk, M., Crawford, B., Kelley, B., & Meyer, K. M. (1994). Enacting project-based science: Experiences of four middle grade teachers. *Elementary School Journal*, 94, 517-538
22. Markham, T. (2012). Project based learning; Design Coaching Guide. California: Wilsted & Publishing Service.
23. Metz, S. (2015). Editor's Corner: Project-Based Science Learning. *The Science Teacher*, 82(1), 6-6. Retrieved May 30, 2021, from <http://www.jstor.org/stable/24148462>
24. Markham, T. (2012). Project based learning; Design Coaching Guide. California: Wilsted & Publishing Service.
25. Noordin, Muhammad Khair & Skudai, Malaysia & Malaysia, Johor & Nabil, Ahmad & Md Nasir, Ahmad Nabil & Farzeeha, Dayana & Teknologi, Ali & Nordin, Mohd. (2011). Problem-Based Learning (PBL) and Project-Based Learning (PjBL) in engineering education: a comparison.
26. Rahim, Kwestan. (2021). Re: How do you organize the Project Based Learning (PBL) in higher education during the online learning?. Retrieved from: [https://www.researchgate.net/post/How\\_do\\_you\\_organize\\_the\\_Project\\_Based\\_Learning\\_PBL\\_in\\_higher\\_education\\_during\\_the\\_online\\_learning/60765f94d0400a72276ce92d/citation/download](https://www.researchgate.net/post/How_do_you_organize_the_Project_Based_Learning_PBL_in_higher_education_during_the_online_learning/60765f94d0400a72276ce92d/citation/download).

27. Savery, J. R. (2006). Overview of Problem-based Learning: Definitions and Distinctions. *Interdisciplinary Journal of Problem-Based Learning*, 1(1).<https://doi.org/10.7771/1541-5015.1002>
28. Kokotsaki, Dimitra & Menzies, Victoria & Wiggins, Andy. (2016). Project-based learning: A review of the literature. *Improving Schools*. 19. [10.1177/1365480216659733](https://doi.org/10.1177/1365480216659733).
29. Kolb, A., & Kolb, D. (2005). Learning Styles and Learning Spaces: Enhancing Experiential Learning in Higher Education. *Academy of Management Learning & Education*, 4(2), 193-212. Retrieved May 30, 2021, from <http://www.jstor.org/stable/40214287>
30. Veselov, Gennady & Pljonkin, Anton & Fedotova, A(2019). Project-based learning as an effective method in education. 54-57. [10.1145/3341042.3341046](https://doi.org/10.1145/3341042.3341046).
31. Lasauskiene, Jolanta & Rauduvaitė, Asta. (2015). Project-Based Learning at University: Teaching Experiences of Lecturers. *Procedia - Social and Behavioral Sciences*. 197. 788-792. [10.1016/j.sbspro.2015.07.182](https://doi.org/10.1016/j.sbspro.2015.07.182)
32. Lokey-Vega, A., & Bondeson, K. (n.d.). Project Based Online Learning: Meeting the Challenge | Blog | Project Based Learning | BIE. Retrieved October 16, 2018, from [https://www.bie.org/blog/project\\_based\\_online\\_learning\\_meeting\\_the\\_challenge](https://www.bie.org/blog/project_based_online_learning_meeting_the_challenge)
33. Nuntasukon, P., & Yuthong, W. (2014). Vocational Education and Application Course. Bangkok: Vocational Education Supervisory Unit, Office of the Vocational Education Commission.
34. Wilson, J.L. (1981). *Student Learning in Higher Education: A Halsted Press Book* (1st ed.). Routledge.