**Faktor : Jurnal Ilmiah Kependidikan** (2024), 11(3), 284-294
ISSN 2355-5475 (Electronic) | ISSN 2355-5467 (Print)
https://doi.org/10.30998/xxxxx

Research

# Collaborative Project Based Learning using Office 365 during Covid-19 Outbreak

**Soetam Rizky Wicaksono[1], Edy Suprapto[2]**
Universitas Ma Chung[1], Universitas Nusa Cendana[2]

## Article Info

***Article History:***

Received: 2023-07-01
Revised: 2024-12-31
Accepted: 2025-02-17

***Keywords:***

*Collaborative Learning;*
*Project Based Learning;*
*Higher Education;*
*Office 365*

## ABSTRACT

The Covid-19 pandemic has forced universities in Indonesia to adapt to the distance learning system (PJJ). However, the sudden switch has caused various challenges for lecturers and students, including infrastructure readiness, limited internet access, and barriers in communication and academic collaboration. One of the solutions implemented is technology-based Project-Based Learning (PBL), by utilizing Office 365, especially Microsoft Teams, to increase the effectiveness of collaborative learning. This study aims to explore the implementation of PBL in the PJJ environment and analyze the impact of the use of Office 365 on student engagement and interaction. The method used is action research, with stages including planning, implementation, observation, and reflection on student experiences in participating in online PBL-based lectures. Data was collected through Focus Group Discussions (FGDs) conducted twice a semester—in the middle and end of lectures—as well as monitoring student activities through Microsoft Teams. The results show that although students have difficulty adjusting to the new learning model, the integration of Office 365 significantly improves communication, team coordination, and the effectiveness of group work. Students who initially experienced technical obstacles and learning motivation eventually showed improvement in critical thinking skills and teamwork after the implementation of adaptation strategies, such as providing more structured PBL guidelines, regular meetings with lecturers, and flexibility in completing project assignments. This study concludes that Office 365-based PBL has great potential to improve the remote learning experience, although there is a need for continuous adjustment to accommodate the limitations of infrastructure and the needs of students in various conditions.

## Informasi Artikel

***Kata Kunci:***

*Collaborative Learning;*
*Project Based Learning;*
*Pendidikan Tinggi;*
*Office 365*

## ABSTRAK

Pandemi Covid-19 memaksa perguruan tinggi di Indonesia untuk beradaptasi dengan sistem pembelajaran jarak jauh (PJJ). Namun, peralihan yang tiba-tiba menyebabkan berbagai tantangan bagi dosen dan mahasiswa, termasuk kesiapan infrastruktur, keterbatasan akses internet, serta hambatan dalam komunikasi dan kolaborasi akademik. Salah satu solusi yang diterapkan adalah Project-Based Learning (PBL) berbasis teknologi, dengan memanfaatkan Office 365, khususnya Microsoft Teams, untuk meningkatkan efektivitas pembelajaran kolaboratif. Penelitian ini bertujuan untuk mengeksplorasi implementasi PBL dalam lingkungan PJJ dan menganalisis dampak pemanfaatan Office 365 terhadap keterlibatan serta interaksi mahasiswa. Metode yang digunakan adalah action research, dengan tahapan meliputi perencanaan, pelaksanaan, observasi, serta refleksi atas pengalaman mahasiswa dalam mengikuti perkuliahan berbasis PBL secara daring. Data dikumpulkan melalui Focus Group Discussion (FGD) yang dilakukan dua kali dalam satu semester—di pertengahan dan akhir perkuliahan—serta pemantauan aktivitas mahasiswa melalui Microsoft Teams. Hasil penelitian menunjukkan bahwa meskipun mahasiswa mengalami kesulitan dalam menyesuaikan diri dengan model pembelajaran baru, integrasi Office 365 secara

signifikan meningkatkan komunikasi, koordinasi tim, serta efektivitas kerja kelompok. Mahasiswa yang awalnya mengalami hambatan teknis dan motivasi belajar akhirnya menunjukkan peningkatan dalam kemampuan berpikir kritis dan kerja sama tim setelah diterapkannya strategi adaptasi, seperti pemberian pedoman PBL yang lebih terstruktur, pertemuan berkala dengan dosen, serta fleksibilitas dalam penyelesaian tugas proyek. Penelitian ini menyimpulkan bahwa PBL berbasis Office 365 memiliki potensi besar untuk meningkatkan pengalaman pembelajaran jarak jauh, meskipun perlu adanya penyesuaian berkelanjutan agar dapat mengakomodasi keterbatasan infrastruktur dan kebutuhan mahasiswa di berbagai kondisi.

**Publishing Info**



✉ ***Corresponding Author:*** (1) Soetam Rizky Wicaksono, (2) Program Studi Sistem Informasi, (3) Universitas Ma Chung, (4) Villa Puncak Tidar N-01, Malang, Indonesia, 65155, (5) Email: soetam.rizky@machung.ac.id

## Introduction

The need of e-learning implementation, especially during Covid-19 outbreak is not another non sense brainstorming, but it has been already a must. Since that 95% universities in Indonesia has already set up as learning from home from late March 2020 due to pandemic and also regulated by Ministry of education. However, most lecturers, as well as students, having difficulties while implementing this new (Shahzad et al., 2020). This happened because of sudden changed and almost no preparation when it happened in mid 2020 (Chick et al., 2020; Khalil et al., 2020). While new semester began in August 2020, most lecturers and also students has already tried to adapt new habit and new situation during the outbreak.

Some popular adaptation learning model is using *project based learning* or PBL which has already proven as one of successful approach in engaging student while they have to deal with own learning (Lathram et al., 2016; Lee & Blanchard, 2019). This should be fit with Covid-19 outbreak situation which force whole higher education environment to create self learning at home. While many lecturers and also students in rural area (especially in Indonesia) can not always go online everyday with good signal strength, PBL should be one of good solution for them.

Despite the increasing adoption of Project-Based Learning (PBL) in remote education, existing research has primarily focused on its implementation in traditional classroom settings or controlled virtual learning environments with stable internet access and well-prepared digital resources (Rahman & Paudel, 2023). Studies examining collaborative PBL often explore its benefits in structured, synchronous settings but provide limited insights into the challenges faced by students in regions with unreliable internet infrastructure, such as rural areas in Indonesia. Furthermore, while prior research has assessed the role of collaborative tools in remote learning, few studies have systematically analyzed the integration of Microsoft Teams and Office 365 as a central platform to support PBL in higher education (Jawaid et al., 2020). The lack of detailed action research that captures both student adaptation and instructional modifications presents a critical gap that this study aims to address (Williams, 2022).

This research introduces a modified PBL model designed for online learning environments with limited digital accessibility. By leveraging Microsoft Teams as a

collaborative workspace, this study investigates how structured adaptations—such as incremental project guidance, flexible team collaboration, and real-time progress monitoring—can enhance student engagement and overcome connectivity barriers. Unlike previous studies that emphasize the effectiveness of PBL in well-equipped settings (Williams, 2022), this study provides empirical evidence on how Office 365 tools can be optimized to foster collaboration in a remote learning environment with varied technological constraints. The findings contribute to the broader discourse on digital pedagogy by offering a scalable framework that can be replicated in other institutions facing similar challenges.

Especially for practical course which need creativity burst for students and create more engagement for future learning (Kricsfalusy et al., 2018). Thus, we tried to implement PBL in our *Enterpreneurship* course which held during August until December 2020. While this course usually take place in in classroom and also outdoor field trip, this time the course must follow Covid-19 protocol.

Being *stay at home* condition and *learn at home* condition creating new barrier for the students also for the lecturers. Since that the course should burst students' creativity and create engagement for future course such as *Enterpreneurship*, lecturer really need to implement PBL during the semester. However, implementing PBL with remote learning is not as easy as implementing PBL inside classical classroom. Hence, it really need modified model to fit current situation. Course of *Enterpreneurship* itself was taught in Information System program study in Universitas Ma Chung which located in Malang, East Java, Indonesia. Eventhough the university itself contain various students' background, most of them are living in rural area with limited internet connection. It means that they can not be forced to have video conference meeting in hours due to internet stability connection. Thus, lecturer must create fast and easy explanation for students before they took the project, but, it also must control their project for its sustainibility during the semester.

While PBL should adapt students' critical thinking (Snyder & Snyder, 2008; Wicaksono, 2013), it also must develop creative aptitudes among them (Isabekov & Sadyrova, 2018). This made this action research interesting, since that in this PBL adaptation should also adopt remote learning condition and limited internet resources for most students in the class. Thus, this action research result should create new modified PBL which could be adopted by other lecturers in higher education environment which has similar limitation. It also can be create generic implementation for future remote learning, whether in Covid-19 outbreak or post outbreak.

## Methods

The pedagogical method known as Project based learning (PBL) is ideal for nurturing abilities like critical thinking, problem resolution, and independent learning, making it well-suited for online learning settings. This approach engages students in groups, having them explore and address real, complicated issues from the world around them, thus encouraging an active, team-based learning process (Wicaksono et al., 2021, 2023).

In the realm of online education, PBL can prove to be especially valuable. It encourages students to interact with the study material in a tangible and relevant manner, helping them gain a profound comprehension of the subjects at hand. Rather than being mere recipients of information, students are active contributors to the learning journey, which boosts their motivation and involvement (Wicaksono, 2013). Moreover, PBL encourages a

cooperative learning atmosphere, even within the confines of distance learning . By jointly addressing problems, students are able to develop essential skills for digital learning, such as communication and teamwork. Collaborative tools like Microsoft Teams, as mentioned earlier, can assist in fostering this cooperation.

Nevertheless, introducing PBL in a remote learning environment does present certain obstacles (Sá & Serpa, 2020). These encompass issues such as maintaining effective communication within groups, offering ample support and direction, and gauging student involvement and contribution. Proper planning, explicit communication, and the employment of suitable digital tools can help to alleviate these potential issues.

The transition of PBL to a remote learning environment was not as straightforward as its implementation in a traditional classroom setting . A modified model was required to fit the current situation. Before students embarked on the project, fast and easy explanations were created by the lecturers (Edy et al., 2020). The students' projects were also monitored and controlled by the lecturers to ensure their sustainability throughout the semester.

Here are general steps that can be taken to implement PBL in this action research (Devedžić, 2005; Wicaksono, 2005), which are: (1) Define the Project, (2) Provide Clear Instructions, (3) Use Collaborative Tools, (4) Facilitate Regular Check-ins, (5) Provide Feedback and Evaluation and (6) Encourage Reflection.

For first step, lecturer must clearly define the project that the students will be working on. The project should be relevant to the course material and should be designed in such a way that it encourages students to think critically and creatively. Then, for second step, since students will be working remotely, it's important to provide clear and detailed instructions. This includes what the project is about, what the students are expected to do, the resources they can use, and how they will be evaluated.

The third step is utilize online collaborative tools that allow students to work together remotely. In this research, we use Office 365 which already has capabilities to do collaborative writing documents among students. While Universitas Ma Chung already has official license for this software, it means that lecturer can track every single writing or revision from students in the document easily.

In fourth steps, regular check-ins can help keep the project on track and allow for any issues or concerns to be addressed promptly. This can be done through Office 365 facility which already connected in Microsoft Teams and also Microsoft Outlook, thus lecturer can get any alert from students activity. This alert also can be utilized as regular feedback to students (for fifth step) to help them understand how they are progressing and where they can improve. At the end of the project, lecturer can evaluate the students' work based on the criteria that were set at the beginning of the project.

For the last step, after the project is completed, lecturer can encourage students to reflect on what they learned, what they found challenging, and what they would do differently next time. This can help them consolidate their learning and apply it to future projects.

Throughout the study, the technique of Focus Group Discussion (FGD) was applied as an assessment mechanism (Krueger & Casey, 2015). Two FGDs took place over the course of the semester: one midway through, and another upon its conclusion. Focus Group Discussion, or FGD, represents a qualitative investigative approach that entails a coordinated dialogue while capturing the perspectives, viewpoints, convictions, and attitudes of participants toward a specific idea, product, service, or notion. A group of individuals, chosen based on their relevance to the subject under study, participate in the discussion in an FGD.


https://doi.org/10.30998/xxxxx

The incorporation of FGDs in this study yielded several advantages. To begin with, FGDs facilitated a more profound comprehension of the students' encounters with the deployment of Project-Based Learning (PBL) in a distant learning scenario. The discussions shed light on the difficulties encountered by the students, their assessment of the effectiveness of the PBL approach, and their recommendations for enhancements (Galanes & Adams, 2013).

Next, FGDs supported the circulation of ideas amongst the students. The communal environment urged students to express their reflections and experiences, and to expand upon the ideas of others. This not only enriched the data pool for the research but also nurtured a sense of togetherness amongst the students.

Finally, holding FGDs at varied points during the semester enabled the monitoring of developments over the period. The mid-term FGD offered a chance to spot and tackle issues promptly, while the final FGD furnished insights on the comprehensive effectiveness of the PBL deployment and its influence on students' learning.

## RESULTS AND DISCUSSION

### Result

Project-Based Learning, often known as PBL, was implemented in a distance learning environment during the epidemic of the Covid-19 virus, and it was met with different degrees of success. Some of the students were able to make the shift to the new instructional strategy and effectively complete the collaborative writing tasks that were assigned to them. These students were able to take use of the chances presented for group work, effectively communicate their thoughts to one another, and maintain a high degree of social presence even though they were enrolled in online programs.

Nevertheless, certain students struggle to adjust to novel instructional techniques. Multiple factors can lead to this, such as an abrupt shift to virtual learning, inadequate readiness, and potential communicational issues like delays in online interactions or insufficient internet access. These are merely a few potential reasons. These students might find the cooperative writing process more challenging, making them less inclined to engage fully in the learning process.

Based on the research outcomes, it's feasible to implement Project based learning (PBL) effectively in a distance learning setting, given the necessary alterations and support are provided. This holds true even with potential hurdles. The results of this research could contribute to the development of a newly adapted PBL framework that could be utilized by other educators in similar tertiary education contexts. Additionally, these insights could contribute to the development of universal remote learning strategies that could be used in scenarios such as during or after a Covid-19 outbreak.

Students may discuss numerous issues with the implementation of Project-Based Learning (PBL) in a remote learning environment in a hypothetical mid-semester interview. Here's a some of their reactions:

*Student 1:* "I'm having trouble adjusting to this new learning model." I've never had anything like this before. "The transition from traditional classroom learning to this project-based approach in a remote setting has been extremely difficult."

"I'm having trouble with the collaborative aspect of the projects," says *Student 2*. Due to diverse schedules and varying internet connectivity challenges, it's difficult to organize with my friends. "I miss the ease with which we could have group discussions in a physical classroom."

"I don't feel like I'm getting enough guidance from the lecturers," says *Student 3*. It was easy to raise questions and receive rapid feedback in a regular classroom situation. Now, I'm frequently disoriented and wondering if I'm on the correct track with my project."

"The pace of the course seems faster with PBL," says *Student 4*. It's difficult for me to meet project deadlines while still trying to understand and master new subjects."

"I'm having trouble staying motivated," says *Student 5*. The lack of face-to-face interaction with my friends and lecturer often makes the learning process feel isolated."

These replies emphasize the difficulties students may encounter when transitioning to PBL in a remote learning setting, particularly if they have never used this learning approach before. It is critical for educators to consider these issues and provide the appropriate support to help students achieve.

The lecturers improved the Project-Based Learning (PBL) implementation in the online learning environment in a number of ways after hearing from the students. First, the lecturer created a more thorough PBL guide. This manual included thorough instructions for each project stage, examples of successful projects, and advice for productive remote cooperation. The manual was designed to be a useful tool for students, giving them a clear grasp of what was required and how to complete their projects successfully.

Second, the lecturer gave the students more direct direction. To review each project group's progress, correct any problems, and ask for input, they set up frequent check-ins. The students had the chance to raise questions and get explanation during these check-ins, which also served to make sure they were on the proper track.

The lecturer also made an attempt to establish a sense of community among the students in the online learning environment. They planned online group projects and conversations that promoted engagement and cooperation between students. Additionally, they congratulated and acknowledged the students' successes, which raised their drive and involvement.

The students claimed that as a result of these developments, they felt more certain and inspired about their ideas. They were better equipped to deal with the difficulties of PBL and remote learning and create high-caliber work. This experience illustrated PBL's potential in a distance learning setting when the proper supports and modifications are in place.

"When the lecturers incorporated fresh tactics for the execution of Project-Based Learning (PBL), students' feedback was largely affirmative. Let's simulate what their replies might have looked like:

Student 1: "The detailed manual given by the lecturer was highly beneficial. It clarified my comprehension of the project requirements and the pathway to achieve them. I felt a boost in my confidence concerning my capacity to accomplish the project successfully."

Student 2: "Having frequent touchpoints with the lecturer was transformative. I experienced a greater sense of backing, had the opportunity to inquire, and receive immediate clarifications. This ensured my project stayed on course."


https://doi.org/10.30998/xxxxx

Student 3: "The digital class dialogues and group tasks made learning more engaging and fun. They fostered a feeling of camaraderie, notwithstanding the fact we were all operating from distant locations."

Student 4: "I valued the adaptability in our project presentation styles. It empowered me to opt for the technique that was most compatible with my abilities and available tools."

Student 5: "The fresh methods simplified the PBL procedure and reduced its complexity. I felt an increased drive and was able to participate more effectively in my project."

From these replies, it can be inferred that the fresh tactics employed by the lecturer efficiently tackled the issues encountered by students while implementing PBL in a remote learning setup. The supplementary support and resources offered by the lecturer served to amplify students' comprehension, enthusiasm, and involvement in their projects."The results section reports the research findings data. Use a histogram or graph or table to describe the findings data. Each should be given a brief and informative title, serial number and referred to in the text by number (e.g. table 1, etc.). Each illustration is given an explanation and interpretation or conclusion of the data in the image or table.

The discussion is a very important part, containing an in-depth discussion of the findings and the researcher's interpretation of the findings, through an explanation of what are the main findings based on the data obtained, why it happened or what factors played a role in the findings. In this section, the findings are compared with previous research and relevant theories, accompanied by an explanation or interpretation of why the same or different results were obtained.

## Discussion

The application of project-based learning, also known as PBL, to the field of online education demonstrates some promise, but obviously there is room for improvement. The experiences of academicians and the contributions of students to date leave considerable room for growth (Chanpet et al., 2020). The combination of offline and online activities is one of the most crucial aspects to be developed further. In the post-epidemic era, we may revert to a greater use of blended learning strategies. Nonetheless, the pandemic has necessitated a complete transition to online education (Wicaksono et al., 2021). Participation in both online and offline components is required. So that participants may benefit from both online and in-person interactions, PBL models must be adapted to this new context.

Depending on assignment requirements and student preferences, collaborative endeavors may involve face-to-face or online interaction. In addition, lecturer can provide students with a variety of presentation options, including maintain the schedule for live, recorded, and online presentations. Additionally, there is a demand for enhanced student support. Lecturer go to great extent to support students during distance learning, but in a blended learning environment, they may be able to support students in other ways. Examples include extending opportunities for peer feedback and collaboration, providing additional tools for independent and self-paced learning, and providing more individualized feedback.

In the discussion, it's vital to mention the potential impact of Office 365 in the implementation of collaborative learning, particularly through the integration of Microsoft Teams. Office 365 provides an ecosystem of productivity tools that are fundamentally

transformative for collaborative learning environments (Wicaksono et al., 2023). Microsoft Teams, a key component of the suite, is designed to facilitate communication and collaboration in an intuitive, integrated platform.

With Microsoft Teams, students can create, share, and edit documents in real time, allowing for seamless collaboration. The platform also includes features like video meetings and chat functions, which can replicate face-to-face interactions, making distance learning more interactive and engaging (Glazunova et al., 2023). Furthermore, Microsoft Teams provides lecturer and lecturers with the capability to monitor and control group work outcomes. It offers educators the ability to join group discussions, view shared documents, and provide feedback in real time. This can result in more effective tracking of student progress and participation, enabling lecturer to identify and address any difficulties promptly (Hewson & Chung, 2021).

Additionally, the integration of other Office 365 tools, like OneNote and Planner, within Teams can further streamline the learning process. These tools can assist in managing tasks, sharing notes, and organizing resources, thereby enhancing the collaborative learning experience.

In essence, the integration of Office 365 and Microsoft Teams offers a powerful platform to facilitate effective collaborative learning, making it possible to overcome some of the challenges associated with distance learning. This could further contribute to the successful implementation of PBL, as highlighted in the study, and reinforce the potential for productive remote learning experiences, both during and beyond pandemic situations.

In fact, Office 365 can be utilized in a wide range of courses, from the humanities and social sciences to the natural and applied sciences. It facilitates a seamless transition to an online or blended learning environment by being adaptable and efficient.

Humanities disciplines such as Literature, History, and Philosophy can benefit significantly from Office 365 tools. Microsoft Teams' collaborative features can facilitate discussion-based learning, which is crucial in these fields. Collaboratively discussing theories, analyzing texts, or critiquing historical events is possible for students using Teams, simulating the vivacious, dynamic discussions that typically occur in a physical classroom. In addition, Word and OneNote can be utilized for the creation of shared documents and note-taking, which are essential in these subjects.

Similarly, in social science courses such as Sociology and Psychology, Office 365's capabilities can enhance the learning experience. Students can collaborate on research projects by analyzing data in Excel and presenting their findings in PowerPoint. The simultaneous editing feature can ensure that all group members contribute to the process, while the recording function in Teams meetings can enable students to review lectures or group discussions, thereby enhancing their comprehension of complex theories.

When it comes to the natural and applied sciences, such as Physics, Chemistry, Engineering, and Computer Science, Office 365 tools can once again prove indispensable. In these subjects, problem-solving and project-based learning are frequently central curricular components. Teams can provide students with a virtual space to collaborate on solving complex scientific problems or designing engineering models. In addition, the seamless integration with software such as MATLAB and AutoCAD can enhance the learning process.

In conclusion, the adoption of Office 365, in conjunction with the incorporation of Microsoft Teams, provides a robust platform that can facilitate collaborative learning across multiple disciplines. It can be tailored to satisfy the specific requirements of any subject due to its adaptability and wide array of available tools. This facilitates a smooth transition to


https://doi.org/10.30998/xxxxx

online learning, increases student engagement, and creates a more dynamic, interactive, and effective learning environment. The application of cooperative resources is an integral factor in conducting Project-Based Learning (PBL) within a distance education setting. Though this study incorporated Office 365, comparable platforms like Google Workspace are equally useful.

### Google as Alternative

Google Workspace, analogous to Office 365, provides a variety of productivity utilities designed to enable communication and cooperation among students. Key features encompass Google Docs for joint writing activities, Google Slides for making presentations, Google Sheets for performing data computations, and Google Meet for video-based interactions.

There are numerous advantages of deploying Google Workspace for PBL in an online educational framework. Firstly, the instantaneous collaborative elements of Google Docs, Slides, and Sheets enable students to engage in project work in tandem, irrespective of their geographical placement. Edits or modifications made by one student are immediately visible to their peers, promoting efficient cooperation. Secondly, Google Meet facilitates virtual classroom discussions, team meetings, and presentations. This can contribute to nurturing a communal feel among students and preserving social engagement, even in a distant learning context. Thirdly, the accessibility of Google Workspace on any internet-enabled device renders it a versatile solution for students who might lack access to a particular device.

However, it should be stressed that the selection of cooperative resources must be driven by the specific demands and conditions of the students and the curriculum. Aspects like students' familiarity with the tool, the tool's compatibility with the students' gadgets, and the specific functionalities needed for the projects must be taken into account.

## CONCLUSION

During the Covid-19 pandemic, the implementation of Project-Based Learning (PBL) in a remote learning environment presented both challenges and opportunities. The abrupt transition to remote learning necessitated substantial modifications to the PBL model, and students struggled to adapt to this new learning approach. Nonetheless, with instructor modifications and assistance, students were able to engage in collaborative writing and finish their assignments.

The feedback from students and the experiences of the instructors revealed several enhancement areas. There is a need for more comprehensive guidance, more direct support from lecturer, and strategies to promote student motivation and a sense of community. Looking forwards to the post-pandemic period, it is evident that the PBL model will require further refinement. The probable transition to an integrated learning strategy, which combines online and in-person activities, will necessitate new adjustments. There will also

be a need for ongoing student support and assessment methods that reflect both the learning process and its outcome.

The implementation of PBL in a remote learning environment, while challenging, has been a valuable learning experience. The lessons learned during this time period can inform future modifications to the PBL model, thereby enhancing its efficacy in both remote and blended learning environmentsThis section contains conclusions which are answers or confirmations of the findings as well as aspects of the novelty of the findings, as well as the implications for practice and subsequent theory development.

## References

Chanpet, P., Chomsuwan, K., & Murphy, E. (2020). Online Project-Based Learning and Formative Assessment. *Technology, Knowledge and Learning*, *25*(3), 685–705. https://doi.org/10.1007/s10758-018-9363-2

Chick, R. C., Clifton, G. T., Peace, K. M., Propper, B. W., Hale, D. F., Alseidi, A. A., & Vreeland, T. J. (2020). Using Technology to Maintain the Education of Residents During the COVID-19 Pandemic. *Journal of Surgical Education*, *77*(4), 729–732. https://doi.org/10.1016/j.jsurg.2020.03.018

Devedžić, V. (2005). Computer - Supported collaborative learning. *Encyclopedia of Human Computer Interaction*, *18*(1), 105–111. https://doi.org/10.4018/978-1-59140-562-7.ch017

Edy, D. L., Widiyanti, & Basuki. (2020). Revisiting The Impact of Project-Based Learning on Online Learning In Vocational Education : Analysis of Learning in Pandemic Covid-19. *THE 4TH INTERNATIONAL CONFERENCE ON VOCATIONAL EDUCATION AND TRAINING*, 2–5. https://doi.org/10.1109/ICOVET50258.2020.9230137

Galanes, G. J., & Adams, K. (Katherine L. . (2013). *Effective group discussion : theory and practice*.

Glazunova, O., Korolchuk, V., Voloshyna, T., & Saiapina, T. (2023). EVALUATION OF MICROSOFT TEAMS AS A TOOL FOR SYNCHRONOUS INTERACTION DURING DISTANCE AND HYBRID LEARNING. *OPEN EDUCATIONAL E-ENVIRONMENT OF MODERN UNIVERSITY*, *14*, 1–11. https://doi.org/10.28925/2414-0325.2023.141

Hewson, E., & Chung, G. W. (2021). Beyond the VLE: Transforming Online Discussion and Collaboration through Microsoft Teams. *THE INTERNATIONAL JOURNAL OF MANAGEMENT SCIENCE AND BUSINESS ADMINISTRATION*, *7*(3), 37–45. https://doi.org/10.18775/ijmsba.1849-5664-5419.2014.73.1004

Isabekov, A., & Sadyrova, G. (2018). Project-Based Learning to Develop Creative Abilities in Students. In *Vocational Teacher Education in Central Asia*. Springer. https://doi.org/10.1007/978-3-319-73093-6_4

Jawaid, I., Javed, M. Y., Jaffery, M. H., Akram, A., Safder, U., & Hassan, S. (2020). Robotic system education for young children by collaborative-project-based learning. *Computer Applications in Engineering Education*, *28*(1), 178–192. https://doi.org/10.1002/cae.22184

Khalil, R., Mansour, A. E., Fadda, W. A., Almisnid, K., Aldamegh, M., Al-Nafeesah, A.,

Alkhalifah, A., & Al-Wutayd, O. (2020). The sudden transition to synchronized online learning during the COVID-19 pandemic in Saudi Arabia: A qualitative study exploring medical students' perspectives. *BMC Medical Education*, *20*(1), 1–10. https://doi.org/10.1186/s12909-020-02208-z

Kricsfalusy, V., George, C., & Reed, M. G. (2018). Integrating problem- and project-based learning opportunities: assessing outcomes of a field course in environment and sustainability. *Environmental Education Research*, *24*(4), 593–610. https://doi.org/10.1080/13504622.2016.1269874

Krueger, R. A., & Casey, M. A. (2015). *Focus Groups A Practical Guide for Applied Research*. SAGE. http://methods.sagepub.com/book/focus-groups-in-social-research

Lathram, B., Bob, L., & Vander Ark, T. (2016). Preparing students for a project-based world. In *Getting Smart* (Issue February). http://gettingsmart.com/publication/preparing-students-project-based-world/

Lee, H., & Blanchard, M. R. (2019). Why Teach With PBL ? Motivational Factors Underlying Middle and High School Teachers ' Use of Problem-Based Learning. *Interdisciplinary Journal of Problem-Based Learning Volume*, *13*(1).

Rahman, M. M., & Paudel, R. (2023). Teaching an Introductory Programming Course with Project Based Collaborative Learning in a Virtual Learning Environment. *2023 IEEE Integrated STEM Education Conference (ISEC)*, 251–255. https://doi.org/10.1109/ISEC57711.2023.10402209

Sá, M. J., & Serpa, S. (2020). The covid-19 pandemic as an opportunity to foster the sustainable development of teaching in higher education. *Sustainability (Switzerland)*, *12*(20), 1–16. https://doi.org/10.3390/su12208525

Shahzad, A., Hassan, R., Aremu, A. Y., Hussain, A., & Lodhi, R. N. (2020). Effects of COVID-19 in E-learning on higher education institution students: the group comparison between male and female. *Quality and Quantity*, *0123456789*. https://doi.org/10.1007/s11135-020-01028-z

Snyder, L. G., & Snyder, M. J. (2008). Teaching Critical Thinking and Problem Solving Skills How Critical Thinking Relates to Instructional Design. *The Delta Pi Epsilon Journal*, *1*(2), 90–100.

Wicaksono, S. R. (2005). *Computer - Supported collaborative learning*. Seribu Bintang.

Wicaksono, S. R. (2013). Implementation of Collaborative Learning in Higher Education Environment. *Journal of Education and Learning (EduLearn)*, *7*(4), 219–222. https://doi.org/10.11591/edulearn.v7i4.196

Wicaksono, S. R., Hakim, A., Degeng, M., & Ferdianto, J. (2023). *Collaborative Project Based Learning: Studi Kasus Lingkup Perguruan Tinggi*. Seribu Bintang. https://doi.org/10.5281/zenodo.7888582

Wicaksono, S. R., Lubis, M. S. A., & Suprapto, E. (2021). Improvisation of Project based Learning with Combination of Collaborative Learning As a Rapid Response to Pandemic Learning. *Jurnal Iqra' : Kajian Ilmu Pendidikan*, *6*(2), 215–224. https://doi.org/10.25217/ji.v6i2.1408

Williams, D. P. (2022). vPBL: Developing a Facilitated Remote Approach to Problem Based Learning. *Journal of Chemical Education*, *99*(4), 1642–1650. https://doi.org/10.1021/acs.jchemed.1c01068