IJOEM

Indonesian Journal of Elearning and Multimedia
https://ejournal.1001tutorial.com/index.php/ijoem

OPEN ACCESS

Enhancing Student Collaboration and Participation through Google Workspace in Higher Education

Asep Herry Hernawan[1], Mario Emilzoli[2*], Gema Rullyana[3], Ai Pemi Priandani[4], Yori Andes Saputra[5]

[1,2,3,4,5]Universitas Pendidikan Indonesia
Bandung, Indonesia
✉ emilzoli@upi.edu*

Article Information:
Received January 10, 2025
Revised January 21, 2025
Accepted January 25, 2025

Keywords:
Collaborative-Participatory; Google Workspace; Higher Education; Instructional Design

Abstract

This study focuses on creating a collaborative-participatory digital learning design utilizing Google Workspace to enhance student interaction, collaboration, and participation in higher education. The research adopts the Design-Based Research (DBR) methodology, which includes three stages: analysis and exploration, design and construction, and evaluation and reflection. The study involved 50 lecturers from five universities, 25 students, two curriculum experts, and two educational technology experts. Data collection methods included questionnaires, focus group discussions (FGDs), and design trials. The resulting learning design incorporates Google Workspace features such as Google Docs, Google Slides, Google Forms, Google Meet, and Google Classroom to support learning objectives, content, strategies, and assessments. The findings reveal that this design significantly improves student engagement, fosters deeper collaboration, and facilitates more objective and efficient assessments. This research underscores the potential of optimizing Google Workspace to enhance the quality of learning and ensure that students' skills are relevant to the evolving demands of the workforce and industry. The proposed design offers a scalable and practical model for advancing digital education in universities.

A. Introduction

Higher education plays a central role in producing quality human resources for the progress of a nation (Jonbekova et al., 2023; Wang & Zhou, 2023; Xia et al., 2023). Higher education also serves as the main catalyst for shaping individuals into qualified leaders, professionals, and citizens (Muktamar et al., 2023; Munna, 2023). This is, of course, greatly influenced by a quality education system in which there is a curriculum that suits the needs of the business world, the industrial world, and the world of work (in Indonesian it is called *Dunia Usaha dan Dunia Industri Kerja*/DUDIKA). Through a structured and competency development-oriented curriculum, higher education provides a solid foundation and in-depth understanding to produce students and graduates who are competent and ready to face DUDIKA (Findler et al., 2019; Ingaldi et al., 2023; O'Neill & Short, 2023). In addition, the academic environment that is a characteristic of higher education also promotes critical thinking, creativity, and innovation, which can help to improve the skills needed by students in overcoming complex challenges in society and the world of work (Akpur, 2020; Almulla, 2023; Guaman-Quintanilla et al., 2023).

More than that, higher education also plays a role in shaping students' character and moral values, including academic ethics, social responsibility, and interpersonal skills, which are some of the most basic things expected by the business world, the industrial world, and the world (Jonbekova et al., 2023; Xia et al., 2023). To encourage the strengthening of student competence, the Indonesia government, through the Ministry of Education, Culture, Research and Technology (*Kemdikbudristek*) of the Republic of Indonesia,

How to Cite : Hernawan, A. H., Emilzoli, M., Rullyana, G., Priandani, A. P., & Saputra, Y. (2025). Enhancing Student Collaboration and Participation through Google Workspace in Higher Education. *IJOEM Indonesian Journal of E-Learning and Multimedia*, *4*(1), 30–42. https://doi.org/10.58723/ijoem.v4i1.359
ISSN : 2830-2885
Published by : Asosiasi Profesi Multimedia Indonesia

always strives for various things, one of which is through policies on the implementation of collaborative and participatory learning as stated in the Main Performance Indicator (in Indonesian it is called *Indikator Kinerja Utama*/IKU) of Higher Education number 7, namely collaborative and participatory classes (Kemdikbudristek, 2020).

In terms of the concept of collaborative and participatory learning, it is a learning approach in which students or students are actively involved in the learning process together and collaborate with fellow students and lecturers (Matee et al., 2023; Qureshi et al., 2023; Yang, 2023). This approach emphasizes the active participation, cooperation, and contribution of all members of the learning group or community (Qureshi et al., 2021; Radović et al., 2023). Collaborative and participatory learning is not necessarily used as a demand for IKU but also to answer the challenges and needs of Business, Industry, and Workforce, where, in the current era, all types of work have led to collaboration. Therefore, collaborative learning is very important to be considered and applied to the maximum, considering that collaborative and participatory learning is able to improve the development of social skills, collaboration skills, and deeper understanding through interaction between students (Boud & Bearman, 2024; Radović et al., 2023). This approach is considered to be able to stimulate creativity, increase learning motivation, and help students build stronger knowledge (Matee et al., 2023; Meijer et al., 2020; Yang, 2023).

In its implementation collaborative and participatory learning has basically been implemented by universities, but the implementation of collaborative learning has not been optimal, so obstacles or difficulties are often encountered, especially for lecturers (Bjelobaba et al., 2023; Børte et al., 2023). Lecturers still apply collaborative learning in the classroom through discussions or group work, which, in the end, the resulting collaboration is only limited to working together. Meanwhile, conceptually, collaboration has various levels as explained by Microsoft Educator Certified (MCE), the first level of collaboration is working together, the second level is sharing responsibilities, the third level is making important decisions, and the highest level is collaboration in the context of interdependence (UNESCO, 2023).

With the entry of the digital era, higher education is slowly shifting from a traditional to a digital model (Alenezi, 2023; Romero-Hall & Cherrez, 2023). Technology use in learning can potentially improve accessibility, flexibility, and learning effectiveness (Børte et al., 2023; Mhlongo et al., 2023). One of the digital platforms that provides collaboration and participatory services that is quite easy and widely used is Google Workspace. Google Workspace has become one of the leading platforms in recent years in providing a wide range of productivity and collaborative applications that can be integrated into the learning process (Sombria et al., 2022). In its implementation, various applications can be used to collaborate, including Google Docs, Google Slides, and Google Spreadsheets, which can be used for student worksheets. In addition, in the context of assessment, lecturers can also use Google Forms to assess or provide formative tests. Even better, lecturers can use Google Calendar to monitor work or project assignments with students. However, the challenge is how a lecturer can take advantage of the various features or applications provided by Google Workspace when learning activities are carried out (Akcil et al., 2021; Nurkhin & Rohman, 2023).

Based on preliminary studies that have been carried out on several Study Programs from several universities in Indonesia, especially universities that are included in the category of higher education institutions and education personnel (in Indonesian it is called *Lembaga Pendidikan Tenaga Kependidikan*/LPTK), there are still very few lecturers who develop learning designs or in this case Semester Learning Plans (in Indonesian it is called *Rencana Pembelajaran Semester*/RPS) by utilizing various technologies or digital platforms, especially google workspace. Most platforms used are applications such as Canva, Mentimeter, Quizziz, Kahoot, and Google Form, both for presentation media and assessment purposes (Sofi-Karim et al., 2023). Therefore, it is necessary to develop a comprehensive digital learning design that uses various features from Google Workspace to improve the ability to collaborate and student participation in this digital era.

The development of collaborative digital learning designs based on Google Workspace covers various aspects relevant to the latest developments in higher education and digital technology. Currently, the use of digital learning platforms is increasingly dominating in various higher education institutions in response to technological developments and the need for more flexible and organized learning (Glazunova et al., 2023). The use of Google Workspace as a digital ecosystem offers a number of collaborative features and applications that can be used in the learning process (Glazunova et al., 2023; Hakim & Pertiwi, 2023). Google Docs, Google Slides, Google Sheets, Google Form, Google Jamboard, and more allow students and faculty to collaborate in real time on collaborative documents, presentations, and worksheets. In addition,

the use of Google Meet provides a platform for video conferencing, discussions, and online meetings, supporting direct interaction between students and educators.

The urgency of collaboration in learning is evident through increased student engagement, participation, social skills development, and understanding of the material (Qureshi et al., 2023). Through a learning model that integrates Google Workspace technology, students can engage in advanced collaborative activities, create joint projects, and make decisions together. Based on this, this research is relevant to global trends in the context of higher education transformation towards digital learning (Alenezi, 2023; Romero-Hall & Cherrez, 2023). Through a deep understanding of collaborative digital learning design based on Google Workspace, this research is expected to contribute to improving the quality of learning and developing the abilities of lecturers and students in this digital era. The main problem of this research is how to design collaborative and participatory digital learning based on Google Workspace in universities. Furthermore, the main problem is elaborated into a more technical problem formulation of how to describe the implementation of collaborative digital learning based on the Google Workspace digital platform in universities, how to deliver material by lecturers, material packaging, and assessment systems in collaborative learning-based on the Google Workspace digital platform.

B. Research Methods

This research was carried out from February 2024 to July 2024, involving 50 lecturers from 5 universities in the category of Educational Personnel Education Institutions (LPTK) in Indonesia, 2 experts in the field of Curriculum and Learning, and 2 experts in the field of Educational Technology. The method used in this study is Design-Based Research (DBR), which aims to create and test innovative solutions to practical problems, including in the context of education. DBR combines elements of design and scientific methods to generate knowledge that can be used to improve educational practices and develop new theories relevant to specific contexts (Anderson & Shattuck, 2012). This method is used in order to produce a collaborative and participatory digital learning design based on google workshops. The stages of design development of this program are carried out based on the following steps (1) analysis and exploration, (2) design and construction, and (3) evaluation and reflection. The details of the application of the DBR method in this study are presented in Figure 1.

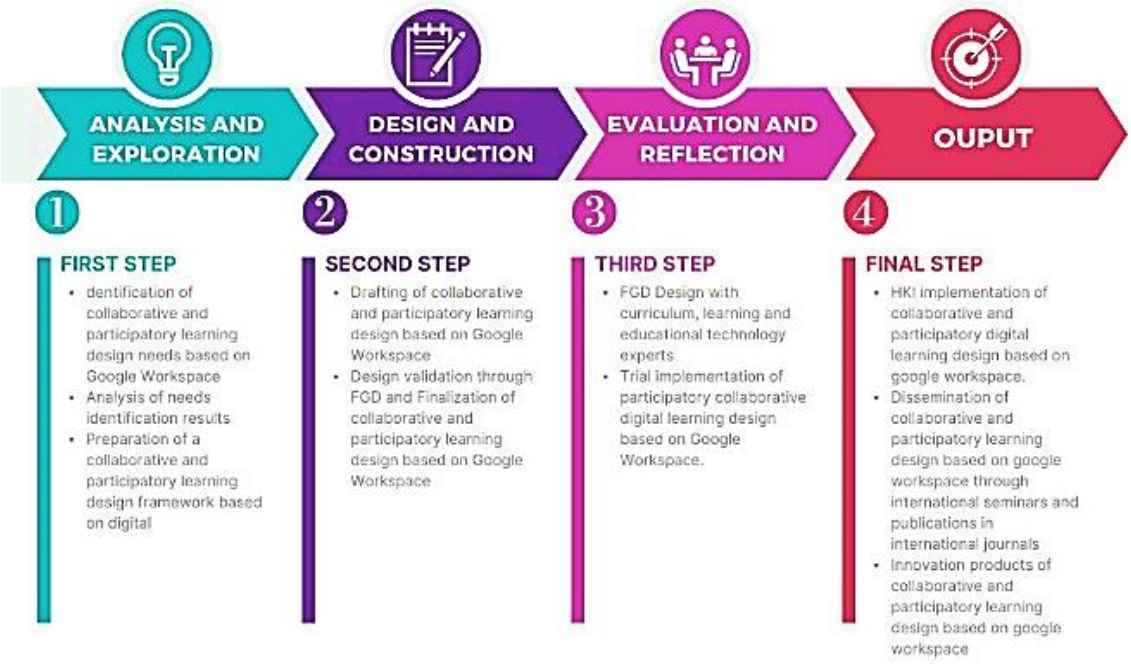


Figure 1. Stages of Developing Google Workspace-Based Collaborative and Participatory Learning Design

The first stage is the initial stage that is the basis for developing collaborative and participatory learning designs based on google workspace. At this stage, an overview identification study was carried out on collaborative and participatory learning design based on Google Workspace for lecturers who play a crucial role in implementing learning activities. The data collection technique is a questionnaire containing Google

Workspace-based digital learning activities in the current university environment. The data obtained through the questionnaire was then identified and analyzed, which was then derived into the initial framework for collaborative and participatory learning design based on Google Workspace to be applied to courses ranging from planning and implementation to assessment.

In the second stage, the researcher developed a collaborative and participatory learning program design based on Google Workspace. After the draft design was completed, a Focus Group Discussion (FGD) was held involving 2 experts in the field of curriculum and learning, and 2 experts in educational technology. Furthermore, the data obtained through FGD activities is used to finalize the design of collaborative and participatory learning programs based on Google Workspace, which is prepared for evaluation and reflection.

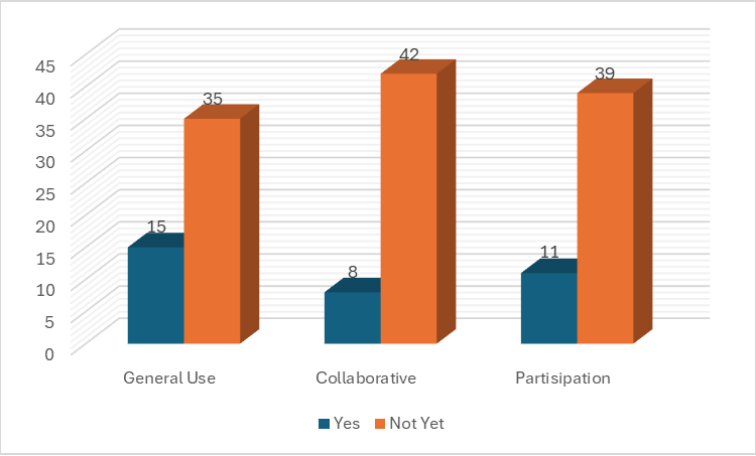
In the third stage, evaluation and reflection on collaborative and participatory learning design based on Google Workspace are carried out. Previously, a learning design trial was carried out on 40 students from one of the universities who were the sample in this study. After that, evaluation and reflection were carried out by distributing questionnaires to subjects in learning activities, namely lecturers and students, related to implementing a participatory, collaborative digital learning design based on Google Workspace.

The data analysis used in this study refers to the Miles and Huberman model, which consists of three steps: data reduction, data presentation, and conclusion drawing (Mezmir, 2020). Data analysis was carried out by analyzing the questionnaire filled out by the respondents (the first stage of DBR), analyzing the results of the FGD related to the development of digital-based collaborative learning program design, and analyzing the questionnaire results. The data obtained is then used to develop a participatory collaborative digital learning design based on Google Workspace. After the presentation of the data, at the end the researcher concludes the research results of the design of a digital-based collaborative learning program (Mezmir, 2020).

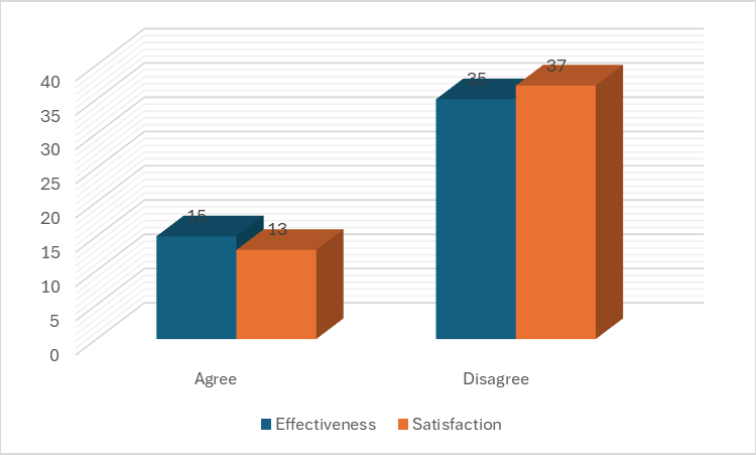
C. Results and Discussion

Analysis and Exploration of the Utilization of the Google Workspace Platform in Learning

Analysis and exploration are stages carried out to explore how the implementation of Google Workspace-based participatory collaborative digital learning is currently implemented in universities. In this case, 5 aspects are explored, namely the use of Google Workspace or other digital platforms in learning, student collaboration in digital learning, student participation in digital learning, the effectiveness of digital learning, and lecturers' satisfaction with the implementation of collaborative digital learning. Based on the results of the research conducted, the data shows that only 30% (N=50) lecturers have used Google Workspace or digital platforms in learning activities, 16% (N=50) have used the Google Workspace platform for student collaboration, and 22% (N=50) lecturers have used the google workspace platform for student participatory activities. Furthermore, related to lecturers' perception of their effectiveness and satisfaction with the use of the Google Workspace platform, the data shows that 30% (N=50) stated that Google Workspace is effectively used in participatory collaborative learning, and 26% (N=50) lecturers stated that they were satisfied with the google workspace platform. For clearer data, it is presented in Figure 2.



(a)



(b)

Figure 2. Utilization of the Google Workspace Platform in Learning (a) and (b) lecturers' perception of the Google Workspace platform in the context of effectiveness and satisfaction

Participatory collaborative digital learning has become an important topic in the context of learning in higher education. With significant technological developments lately, universities have begun utilizing various digital platforms to support the teaching and learning process. One of the platforms that is often used is Google Workspace. However, it is quite unfortunate that this is not fully optimal, as presented in Figure 2. These findings align with research by Mercader and Gairin that although digital tools for learning are available, their adoption by lecturers is often limited due to a lack of training or technical support (Mercader & Gairín, 2020). Lecturers' confidence and ability to use technology are greatly influenced by the training they receive; even further, if lecturers do not develop themselves, they will automatically be replaced by digital technology (Qureshi et al., 2021).

On the other hand, collaborative and participatory learning is one of the concrete efforts that must be carried out by lecturers to strengthen student competencies so that they can adapt to the demands of 21st-century skills, which is also in line with the demands of the world of work and the industrial world which currently emphasizes aspects of collaboration. Collaborative learning can improve students' critical thinking and social skills. In participatory learning, digital learning can significantly improve student learning outcomes (Gopinathan et al., 2022).

Furthermore, in the context of the effectiveness of collaborative digital learning, as many as 30% (N=50) of lecturers stated that Google Workspace is effectively used in participatory, collaborative learning. This is in accordance with the survey results of the number of lecturers who have used Google Workspace in learning in this study. This is in line with the results of research conducted by Bond and Tuma that well-designed educational technology can increase learning effectiveness (Bond et al., 2020; Tuma, 2021). In addition, as many as 26% (N=50) of lecturers stated that they are satisfied with the Google Workspace platform. It should be noted that lecturer satisfaction is an important indicator of the success of the application of educational technology. Regarding lecturer satisfaction, it is greatly influenced by factors such as ease of use, technical support, and relevance to learning materials (Priatna et al., 2020). However, it should be noted that generally, the percentage of lecturers who are satisfied and consider Google Workspace effective is still relatively low. This is directly proportional between lecturers who have used Google Workspace and those who have not. The majority of lecturers who have used Google Workspace expressed satisfaction and considered Google Workspace effective to be used in collaborative and participatory digital learning. In the context of effectiveness, this depends on the integration of technology into the curriculum as well as the support of appropriate teaching methods. This shows that although Google Workspace has great potential, instructional designs that integrate this technology need to be more paid attention to and developed according to learning needs.

Construction of Google Workspace-Based Participatory Collaborative Digital Learning Design

The construction of a Google Workspace-based participatory collaborative digital learning design is produced through a need identification process referring to the description of the use of Google Workspace or other digital platforms in learning, student collaboration arrangements in digital learning, student participation in digital learning, digital learning effectiveness and lecturers' satisfaction with the

implementation of participatory collaborative digital learning which in general is still in the low category. Based on this, it was found that the need to construct a participatory collaborative digital learning design based on Google Workspace includes goals, content, strategies, and assessments. The construction of the Google workspace-based participatory, collaborative digital learning design can be seen in Table 1.

Table 1. Construction of Google Workspace-Based Participatory Collaborative Digital Learning Design

No	Component	Leverage Google Workspace	Activity
1	Learning Outcomes	Google Docs	Create a shared document to set learning objectives. Students can provide real-time input on their goals, assignments, and projects.
		Google Sites	Create a course website that lists learning objectives so all students can access them easily. In addition, lecturers are easy to monitor project progress and so
2	Contents	Google Drive	Storage and sharing learning materials such as e-books, articles, and videos. Folders can be organized by topic.
		Google Classroom	Organize course content and assignments with ease. All materials are accessible in one place.
		Google Slides	Interactive presentations that students can edit collaboratively.
		Google Forms	Collect initial *feedback* on content understanding from students.
3	Strategy	Google Meet	Host synchronous learning sessions, group discussions, and individual consultations.
		Google Jamboard	Facilitate interactive and collaborative *brainstorming* sessions. Students can add their ideas on the digital boardl.
		Google Docs	Students work together to create papers, reports, or other projects. The comment and *suggest edits* feature facilitates collaboration and feedback.
		Google Chat	Communication and collaboration in small groups. Create a dedicated chat room for each discussion group or project.
		Google Calendar	Set class schedules, assignment deadlines, and reminders for collaborative activities.
4	Evaluation	Google Forms	Create quizzes and surveys to assess student understanding. Results can be analyzed with Google Sheets.
		Google Classroom	Digital collection and assessment of tasks. *Feedback* can be provided directly on the platform.
		Google Sheets	Analyze assessment data and make student progress reports.
		Google Docs	Providing written feedback on individual and group tasks.
		Google Sites	Students can create digital portfolios to showcase their projects and assignments.

The use of technology in learning today has become necessary to realize effective and efficient learning (Bond et al., 2020; Szymkowiak et al., 2021). One of the technologies that can be leveraged is Google Workspace, a cloud-based productivity suite that provides a variety of tools for collaboration. In relation to this research, the design of collaborative and participatory digital learning based on Google Workspace includes several components, namely objectives, content, strategies/methods, and assessment/evaluation. These components can be integrated with Google Workspace features to support collaborative and participatory learning. In setting learning objectives in learning design, Google Docs and Google Sites can be used to set and communicate learning objectives to students. With Google Docs, faculty and students

can collaborate on setting clear and measurable goals. Collaboration in goal setting can basically increase student understanding and involvement in learning (Hew et al., 2022).

Furthermore, in the context of learning content, Google Drive, Google Classroom, and Google Slides are some of the tools from Google Workspace that can be used to compile and organize learning content. Google Drive allows for easy storage and sharing of learning materials, while Google Classroom helps organize assignments and lecture materials. On the other hand, Google Slides can be used to support the creation of interactive presentations that students can edit collaboratively. Google Slides in collaborative learning can increase student creativity and engagement (González-Lloret, 2020; Oguguo et al., 2023).

In the strategy or method component, Google Meet, Google Jamboard, Google Docs, and Google Chat can be used to support collaborative and participatory learning strategies. Google Meet is used for synchronous learning sessions, group discussions, and individual consultations. Google Jamboard allows for interactive brainstorming sessions, where students can add their ideas on a digital board. Google Docs facilitates collaboration on other papers or projects, while Google Chat supports communication in small groups as needed. Using digital-based collaborative tools can increase student interaction and cooperation effectively and efficiently (Fadhli et al., 2023; Thalib et al., 2023).

Finally, digital learning activities can be carried out in the assessment and evaluation component using Google Forms, Google Classroom, and Google Sheets. Google Forms allows the creation of quizzes and surveys to assess student understanding, with results that can be analyzed using Google Sheets. Google Classroom facilitates the collection and grading of assignments digitally. In addition, lecturers can provide comments through Google Docs in the context of written feedback. Conceptually, the use of digital evaluation tools in learning can increase the speed and effectiveness of feedback given to students (Nsabayezu et al., 2023).

Based on this, it can be identified that using Google Workspace in participatory collaborative learning design allows for creating a more dynamic and interactive learning environment. At the beginning of the class, Google Classroom can be used to convey learning objectives and initial materials. Google Forms is used to understand the level of students' prior knowledge. During the learning process, Google Meet and Google Jamboard are used for interactive learning sessions and discussions, while Google Docs is used for collaborative tasks. Assessments are conducted through Google Classroom and Google Forms, with Google Sites being used to create digital portfolios showcasing student projects and assignments.

Evaluation and Reflection of Google Workspace-Based Collaborative Digital Learning Design

Evaluation and reflection on the design of collaborative digital learning based on Google Workspace was carried out through focus group discussions (FGD). The FGD on learning design was carried out by involving two curriculum experts, two educational technology experts, 15 lecturers, and 25 students. The FGD produced several inputs and improvements both from the context of learning and the context of the technology used and will be applied to this design. The responses and evaluation results carried out through the FGD on the components of the Google workspace-based participatory, collaborative learning design can be seen in Table 2.

Table 2. Results of FGD on collaborative digital learning design based on Google Workspace

No	Components	Responses	Result of FGD
1	Learning Outcome	Curriculum experts: emphasize the importance of setting learning goals that are specific, measurable, relevant, and based on student learning outcomes. Educational technologists: highlighting the need for technology integration to achieve these learning goals in a more interactive and collaborative way. Lecturer: Determining learning objectives by involving students is very interesting to do. This can increase their participation and responsibility for the learning outcomes or objectives they will carry out. However, it	It was agreed that in the context of learning objectives, it was adjusted to the needs of the course so that the design could be used as a model for each course. Google Classroom and Google Sites will be used to convey learning objectives to students in a clear and structured manner.

No	Components	Responses	Result of FGD
		must be strengthened to master various digital technologies such as Google Workspace. Students: Preparing learning objectives in what context and how lecture activities will be carried out by involving students through the Google Workspace digital platform is a new thing and very good to implement.	
2	Content	Curriculum Expert: The material should include a variety of formats such as text, video, and other multimedia resources to cater to the different learning styles of students. Educational Technologists: Content must be efficiently crafted and delivered using digital tools that support collaboration and active participation by leveraging Google Scholar and Gemini AI. Lecturer: Learning will be more varied, interactive, and fun. In addition, students can repeat the material again because it is available in Google Drive, both presentation slide materials and lecture recordings from Google Meet. Students: Learning activities become more collaborative and participatory through cooperation carried out with the help of Google Workspace. In addition, work becomes more effective and efficient.	Google Scholar and Gemini are used as alternative reference sources to compile material according to the goals set. Educational technologists emphasize the importance of interactivity in content to increase student engagement by leveraging the various tools available on Google Workspace, such as Google Docs, Google Slides, and Google Sheets for collaborative worksheets.
3	Strategy / Method	Curriculum Expert: The importance of designing learning activities that involve student collaboration and active participation, such as group projects and online discussions. Educational Technologists: Using technology to support this strategy, for example, with Google Workspace, enables real-time collaboration and effective communication. Lecturer: The learning organization is better, because all lecture files and documentation are stored in the cloud so that it is easy to open anywhere and anytime and easy in terms of monitoring.	Collaborative and participatory learning activities such as group projects and online discussions use Google Meet, Google Jamboard, Google Sheets, Google Slides, Google Docs, and Google Classroom.

No	Components	Responses	Result of FGD
		Students: Using various applications on Google Workspace will make learning more personalized and fun and minimize inequality in teamwork through each activity being monitored in real time.	
4	Evaluation	Curriculum Expert: Establishment of assessment methods that include formative and summative assessments and individual and group assessments. Educational Technologist: digital tools to manage assessments and provide constructive and timely feedback. Lecturer: The assessment will be better, more effective, and more efficient. Students: Assessments become more objective, and we can get real-time feedback from lecturers.	Google Forms can be used for quizzes and surveys, while Google Classroom manages and recapitulates assessments and feedback.

Based on the above, it can be identified that Google Workspace-based participatory collaborative digital design includes objectives, content, strategy, media, and evaluation. Experts agree that setting specific, measurable, and relevant learning goals is very important to be the basis for choosing what kind of learning experience will be provided to students. Clear learning objectives help align learning activities and assessments so that, in the end, it can improve the quality of student learning outcomes (Munna & Kalam, 2021). In the digital context, Google Classroom is identified as an effective tool to convey learning objectives in a structured and easily accessible way for students.

Furthermore, lecturers can use Google Scholar to find credible and up-to-date reference sources in the learning content. Google Scholar is one of the effective tools to access scientific resources in a wide and in-depth manner (Vara et al., 2022). In addition, the "Cited By" and "Related Articles" features in Google Scholar help lecturers find research that has high relevance to the purpose or topic they teach (Pereira & Mugnaini, 2023). This allows lecturers to enrich learning content with various perspectives and the latest findings. Using Gemini AI can make it easier for lecturers to compile learning materials or content according to the needs of achieving learning objectives. Gemini AI allows lecturers to get suggestions on educational resources that suit the learning needs to be implemented. AI in education can increase effectiveness and efficiency in structuring learning content by providing recommendations based on in-depth data analysis (Chatterjee & Bhattacharjee, 2020; Kuleto et al., 2021).

In the strategy component, it can be identified that the design of collaborative learning activities such as group projects and online discussions by utilizing Google Meet, Google Jamboard, Google Sheets, Google Slides, Google Docs and Google Classroom allows active participation of students. The use of collaborative learning in learning can improve students' social and academic skills (Järvelä et al., 2023). The activity design that encourages active participation is also supported by the constructivist theory initiated by Vygotsky, which emphasizes the importance of social interaction in learning, including in digital learning (Newman & Latifi, 2021).

The last component is evaluation or assessment. Determining evaluation or assessment methods includes formative and summative assessments, individually and in groups. Google Forms for quizzes and surveys and Google Classroom for managing assessments and feedback support this approach. Assessment in learning is very important because it serves as a tool to evaluate and improve the quality of the teaching-learning process. Formative assessments, in particular, provide continuous feedback to students, allowing them to correct deficiencies before the final assessment and increase motivation and engagement in learning (Rahman et al., 2022; Widana, 2020). In addition, assessments assist lecturers in adjusting teaching methods based on student needs, ensuring that the curriculum remains relevant and effective. Thus, integrating Google workspace-based assessment in learning is the key to improving learning effectiveness, efficiency, and quality. For more clarity, the participatory, collaborative digital learning design based on Google Workspace in its entirety from the FGD results can be seen in Figure 3.

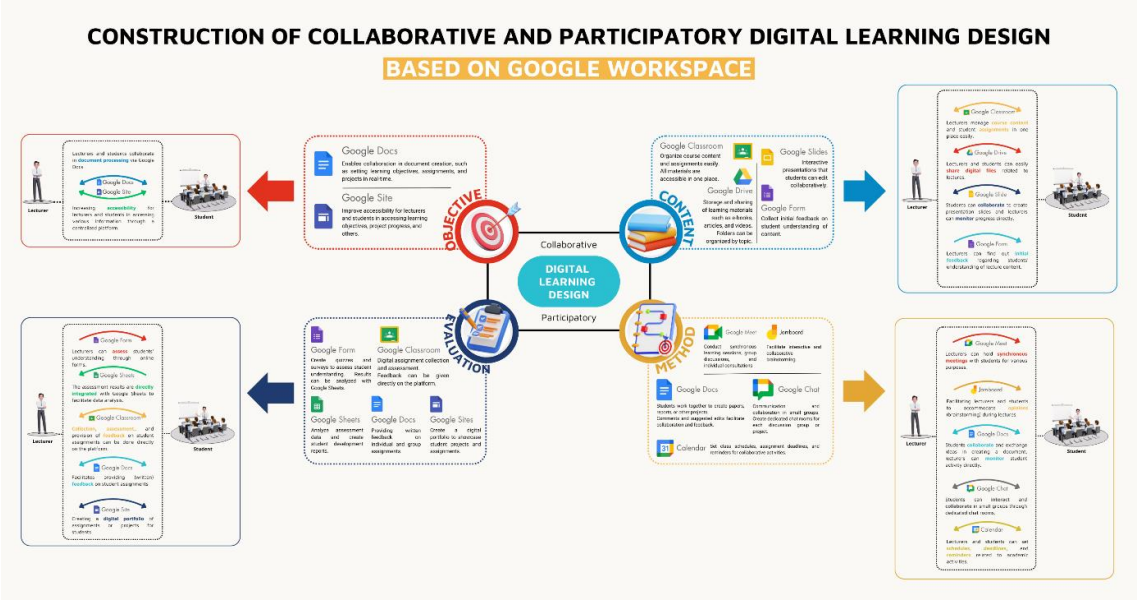


Figure 3. Collaborative digital learning design based on Google Workspace

D. Conclusion

This research succeeded in developing a Google Workspace-based collaborative-participatory digital learning design that effectively increases student interaction, collaboration, and participation in higher education. Through the Design-Based Research (DBR) method, this design integrates various Google Workspace features, such as Google Docs, Google Slides, Google Forms, Google Meet, and Google Classroom, into a learning component that includes objectives, materials, strategies, and evaluations. The study results show that using Google Workspace not only increases student engagement and motivation to learn but also facilitates a more objective and efficient assessment process. Thus, optimizing the use of digital technology in learning can answer the challenges of the world of work and industry in the digital era. This learning design is expected to be a model applied in various universities to improve education quality and student skills' relevance.

E. Acknowledgment

We would like to express our deepest appreciation to all parties who have provided support and contribution to the completion of this research. Thank you to *Lembaga Penelitian dan Pengabdian kepada Masyarakat* (LPPM) of Universitas Pendidikan Indonesia (UPI) for the facilities and resources to fund this research under contract number 314/UN40.LP/PT.01.03/2024. We would also like to express our gratitude to all respondents who have taken the time to participate in this study. We would like to thank our family and friends who have always provided support and motivation in completing this research.

References

Akcil, U., Uzunboylu, H., & Kinik, E. (2021). Integration of technology to learning-teaching processes and google workspace tools: A literature review. In *Sustainability (Switzerland)* (Vol. 13, Issue 9). MDPI. https://doi.org/10.3390/su13095018

Akpur, U. (2020). Critical, Reflective, Creative Thinking and Their Reflections on Academic Achievement. *Thinking Skills and Creativity*, *37*. https://doi.org/10.1016/j.tsc.2020.100683

Alenezi, M. (2023). Digital Learning and Digital Institution in Higher Education. *Education Sciences*, *13*(1). https://doi.org/10.3390/educsci13010088

Almulla, M. A. (2023). Constructivism learning theory: A paradigm for students' critical thinking, creativity, and problem solving to affect academic performance in higher education. *Cogent Education*, *10*(1). https://doi.org/10.1080/2331186X.2023.2172929

Anderson, T., & Shattuck, J. (2012). Design-based research: A decade of progress in education research? *Educational Researcher*, *41*(1), 16–25. https://doi.org/10.3102/0013189X11428813

Bjelobaba, G., Savić, A., Tošić, T., Stefanović, I., & Kocić, B. (2023). Collaborative Learning Supported by Blockchain Technology as a Model for Improving the Educational Process. *Sustainability (Switzerland)*, *15*(6). https://doi.org/10.3390/su15064780

Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2020). Mapping research in student engagement and educational technology in higher education: a systematic evidence map. In *International Journal of Educational Technology in Higher Education* (Vol. 17, Issue 1). Springer. https://doi.org/10.1186/s41239-019-0176-8

Børte, K., Nesje, K., & Lillejord, S. (2023). Barriers to student active learning in higher education. *Teaching in Higher Education*, *28*(3), 597–615. https://doi.org/10.1080/13562517.2020.1839746

Boud, D., & Bearman, M. (2024). The assessment challenge of social and collaborative learning in higher education. *Educational Philosophy and Theory*, *56*(5), 459–468. https://doi.org/10.1080/00131857.2022.2114346

Chatterjee, S., & Bhattacharjee, K. K. (2020). Adoption of artificial intelligence in higher education: a quantitative analysis using structural equation modelling. *Education and Information Technologies*, *25*(5), 3443–3463. https://doi.org/10.1007/s10639-020-10159-7

Fadhli, R., Suharyadi, A., Firdaus, F. M., & Bustari, M. (2023). Developing a digital learning environment team-based project to support online learning in Indonesia. *International Journal of Evaluation and Research in Education*, *12*(3), 1599–1608. https://doi.org/10.11591/ijere.v12i3.24040

Findler, F., Schönherr, N., Lozano, R., Reider, D., & Martinuzzi, A. (2019). The impacts of higher education institutions on sustainable development: A review and conceptualization. In *International Journal of Sustainability in Higher Education* (Vol. 20, Issue 1, pp. 23–38). Emerald Group Holdings Ltd. https://doi.org/10.1108/IJSHE-07-2017-0114

Glazunova, O. G., Hurzhii, A. M., Korolchuk, V. I., & Voloshyna, T. V. (2023). Selection of Digital Tools for Organizing Students' Group Work in Distance Education. *Information Technologies and Learning Tools*, *94*(2), 87–101. https://doi.org/10.33407/itlt.v94i2.5211

González-Lloret, M. (2020). Collaborative tasks for online language teaching. *Foreign Language Annals*, *53*(2), 260–269. https://doi.org/10.1111/flan.12466

Gopinathan, S., Kaur, A. H., Veeraya, S., & Raman, M. (2022). The Role of Digital Collaboration in Student Engagement towards Enhancing Student Participation during COVID-19. *Sustainability (Switzerland)*, *14*(11). https://doi.org/10.3390/su14116844

Guaman-Quintanilla, S., Everaert, P., Chiluiza, K., & Valcke, M. (2023). Impact of design thinking in higher education: a multi-actor perspective on problem solving and creativity. *International Journal of Technology and Design Education*, *33*(1), 217–240. https://doi.org/10.1007/s10798-021-09724-z

Hakim, D. R., & Pertiwi, K. R. (2023). Development of Innovative Student Worksheet Using Google Sites for Reproductive System Material. *Jurnal Penelitian Pendidikan IPA*, *9*(9), 7484–7490. https://doi.org/10.29303/jppipa.v9i9.4429

Hew, K. F., Huang, W., Du, J., & Jia, C. (2022). Using chatbots to support student goal setting and social presence in fully online activities: learner engagement and perceptions. *Journal of Computing in Higher Education*. https://doi.org/10.1007/s12528-022-09338-x

Ingaldi, M., Ulewicz, R., & Klimecka-Tatar, D. (2023). Creation of the university curriculum in the field of Industry 4.0 with the use of modern teaching instruments - Polish case study. *Procedia Computer Science*, *217*, 660–669. https://doi.org/10.1016/j.procs.2022.12.262

Järvelä, S., Nguyen, A., & Hadwin, A. (2023). Human and artificial intelligence collaboration for socially shared regulation in learning. *British Journal of Educational Technology*, *54*(5), 1057–1076. https://doi.org/10.1111/bjet.13325

Jonbekova, D., Serkova, Y., Mazbulova, Z., Jumakulov, Z., & Ruby, A. (2023). How international higher education graduates contribute to their home country: an example from government scholarship recipients in Kazakhstan. *Higher Education Research and Development*, *42*(1), 126–140. https://doi.org/10.1080/07294360.2021.2019200

Kemdikbudristek. (2020). *Buku-Panduan-Indikator-Kinerja-Utama-PTN* (Vol. 1).

Kuleto, V., Ilić, M., Dumangiu, M., Ranković, M., Martins, O. M. D., Păun, D., & Mihoreanu, L. (2021). Exploring opportunities and challenges of artificial intelligence and machine learning in higher education institutions. *Sustainability (Switzerland)*, *13*(18). https://doi.org/10.3390/su131810424

Matee, G. L., Motlohi, N., & Nkiwane, P. (2023). Emerging perspectives and challenges for virtual collaborative learning in an institution of higher education: a case of Lesotho. *Interactive Technology and Smart Education*, *20*(1), 73–88. https://doi.org/10.1108/ITSE-06-2021-0110

Meijer, H., Hoekstra, R., Brouwer, J., & Strijbos, J. W. (2020). Unfolding collaborative learning assessment literacy: a reflection on current assessment methods in higher education. *Assessment and Evaluation in Higher Education*, *45*(8), 1222–1240. https://doi.org/10.1080/02602938.2020.1729696

Mercader, C., & Gairín, J. (2020). University teachers' perception of barriers to the use of digital technologies: the importance of the academic discipline. *International Journal of Educational Technology in Higher Education*, *17*(1). https://doi.org/10.1186/s41239-020-0182-x

Mezmir, E. A. (2020). Qualitative Data Analysis: An Overview of Data Reduction, Data Display and Interpretation. *Research on Humanities and Social Sciences*. https://doi.org/10.7176/rhss/10-21-02

Mhlongo, S., Mbatha, K., Ramatsetse, B., & Dlamini, R. (2023). Challenges, opportunities, and prospects of adopting and using smart digital technologies in learning environments: An iterative review. *Heliyon*, *9*(6). https://doi.org/10.1016/j.heliyon.2023.e16348

Muktamar, B. A., Kardini, N. L., Elshifa, A., Adiawaty, S., & Cicik Wijayanti, T. (2023). The Role of Quality Human Resources in Developing Missions of Future Universities in Indonesian Higher Education. *Munaddhomah: Jurnal Manajemen Pendidikan Islam*, *4*(1), 49–59. https://doi.org/10.31538/munaddhomah.v4i1.342

Munna, A. S. (2023). Instructional leadership and role of module leaders. *International Journal of Educational Reform*, *32*(1), 38-54. https://doi.org/10.1177/10567879211042321

Munna, A. S., & Kalam, A. (2021). Teaching and learning process to enhance teaching effectiveness: a literature review. In *International Journal of Humanities and Innovation (IJHI)*, *4*(1), 1–4. https://doi.org/10.33750/ijhi.v4i1.102

Newman, S., & Latifi, A. (2021). Vygotsky, education, and teacher education. *Journal of Education for Teaching*, *47*(1), 4–17. https://doi.org/10.1080/02607476.2020.1831375

Nsabayezu, E., Iyamuremye, A., Mbonyiryivuze, A., Niyonzima, F. N., & Mukiza, J. (2023). Digital-based formative assessment to support students' learning of organic chemistry in selected secondary schools of Nyarugenge District in Rwanda. *Education and Information Technologies*, *28*(9), 10995–11025. https://doi.org/10.1007/s10639-023-11599-7

Nurkhin, A., & Rohman, A. (2023). Using Google Workspace for Education to Engage Accounting Students. *Jurnal Pendidikan Ekonomi Dan Bisnis (JPEB)*, *11*(01), 80–88. https://doi.org/10.21009/jpeb.011.1.7

Oguguo, B., Ezechukwu, R., Nannim, F., & Offor, K. (2023). Analysis of teachers in the use of digital resources in online teaching and assessment in COVID times. *Innoeduca. International Journal of Technology and Educational Innovation*, *9*(1), 81–96. https://doi.org/10.24310/innoeduca.2023.v9i1.15419

O'Neill, G., & Short, A. (2023). Relevant, practical and connected to the real world: what higher education students say engages them in the curriculum. *Irish Educational Studies*. https://doi.org/10.1080/03323315.2023.2221663

Pereira, F. A., & Mugnaini, R. (2023). Mapping the use of Google Scholar in evaluative bibliometric or scientometric studies: A bibliometric review. *Quantitative Science Studies*, *4*(1), 233–245. https://doi.org/10.1162/qss_a_00231

Priatna, T., Maylawati, D. S. adillah, Sugilar, H., & Ramdhani, M. A. (2020). Key success factors of e-learning implementation in higher education. *International Journal of Emerging Technologies in Learning*, *15*(17), 101–114. https://doi.org/10.3991/ijet.v15i17.14293

Qureshi, M. A., Khaskheli, A., Qureshi, J. A., Raza, S. A., & Yousufi, S. Q. (2023). Factors affecting students' learning performance through collaborative learning and engagement. *Interactive Learning Environments*, *31*(4), 2371–2391. https://doi.org/10.1080/10494820.2021.1884886

Qureshi, M. I., Khan, N., Raza, H., Imran, A., & Ismail, F. (2021). Digital Technologies in Education 4.0. Does it Enhance the Effectiveness of Learning? *International Journal of Interactive Mobile Technologies*, *15*(4), 31–47. https://doi.org/10.3991/IJIM.V15I04.20291

Radović, S., Hummel, H. G. K., & Vermeulen, M. (2023). The mARC instructional design model for more experiential learning in higher education: theoretical foundations and practical guidelines. *Teaching in Higher Education*, *28*(6), 1173–1190. https://doi.org/10.1080/13562517.2021.1872527

Rahman, N. F., Masdar, M. I., Ilmiani, A. M., Habibie, F., & Samdouni, S. (2022). Transformation of Arabic Assessment in Indonesia: Conventional Assessment Toward Digital Assessment. *Al-Ta'rib : Jurnal Ilmiah Program Studi Pendidikan Bahasa Arab IAIN Palangka Raya*, *10*(2), 199–212. https://doi.org/10.23971/altarib.v10i2.4510

Romero-Hall, E., & Cherrez, N. J. (2023). Teaching in times of disruption: Faculty digital literacy in higher education during the COVID-19 pandemic. *Innovations in Education and Teaching International*, *60*(2), 152–162. https://doi.org/10.1080/14703297.2022.2030782

Sofi-Karim, M., Bali, A. O., & Rached, K. (2023). Online education via media platforms and applications as an innovative teaching method. *Education and Information Technologies*, *28*(1), 507–523. https://doi.org/10.1007/s10639-022-11188-0

Sombria, K. F. J., Celestial, D. L., Grace Jalagat, C. M., & Valdez, A. G. (2022). *Online Learning Through Google Classroom: Effects on Students Critical Thinking Skills in Chemistry*. https://doi.org/10.17509/ajsee.v3i2.49794

Szymkowiak, A., Melović, B., Dabić, M., Jeganathan, K., & Kundi, G. S. (2021). Information technology and Gen Z: The role of teachers, the internet, and technology in the education of young people. *Technology in Society*, *65*. https://doi.org/10.1016/j.techsoc.2021.101565

Thalib, N., Situmorang, P. L., Arianti, J., Oktariani, M., & Damayanti, D. (2023). Implementation of Digital Tools in Classroom Management: a Study of Student's Engagement in Merauke Musamus University. *Indo-MathEdu Intellectuals Journal*, *4*(2), 1097–1109. https://doi.org/10.54373/imeij.v4i2.265

Tuma, F. (2021). The use of educational technology for interactive teaching in lectures. In *Annals of Medicine and Surgery* (Vol. 62, pp. 231–235). Elsevier Ltd. https://doi.org/10.1016/j.amsu.2021.01.051

UNESCO. (2023). *ChatGPT and Artificial Intelligence in higher education Quick start guide*. http://en.unesco.org/open-access/terms-use-ccbysa-en

Vara, N., Mirzabeigi, M., Sotudeh, H., & Fakhrahmad, S. M. (2022). Application of k-means clustering algorithm to improve effectiveness of the results recommended by journal recommender system. *Scientometrics*, *127*(6), 3237–3252. https://doi.org/10.1007/s11192-022-04397-4

Wang, M., & Zhou, C. (2023). How Does Graduate Training Promote Sustainable Development of Higher Education: Evidence from China's "Double First-Class" Universities' Programs. *Sustainability (Switzerland)*, *15*(2). https://doi.org/10.3390/su15020944

Widana, I.W. (2020). The Effect of Digital Literacy on the Ability of Teachers to Develop HOTS-based Assessment. *Journal of Physics: Conference Series*, *1503*(1). https://doi.org/10.1088/1742-6596/1503/1/012045

Xia, C., Li, X., & Cao, S. (2023). Challenges for the government-controlled higher education system in China. *International Journal of Educational Development*, *97*. https://doi.org/10.1016/j.ijedudev.2022.102721

Yang, X. (2023). A Historical Review of Collaborative Learning and Cooperative Learning. *TechTrends*, *67*(4), 718–728. https://doi.org/10.1007/s11528-022-00823-9