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PPG Goes to Bulungan: Numeracy, Joyful Learning, Design Thinking and Learning Media Workshop for Elementary and Junior High School Teachers

Shinta Wulandari[1], Jero Budi Darmayasa*[2], Hariaty Hamid[3], Azwar Anwar[4], Winarno[5], Firima Zona Tanjung[6], Nur Pangesti Apriliyana[7]

[1,2,3,4]Jurusan Pendidikan Matematika, Universitas Borneo Tarakan, Indonesia, fkip@borneo.ac.id

[5,6]Jurusan Pendidikan Bahasa Inggris, Universitas Borneo Tarakan, Indonesia, fkip@borneo.ac.id

[7]Jurusan Pendidikan Bahasa Indonesia, Universitas Borneo Tarakan, Indonesia, fkip@borneo.ac.id

*jeromat@borneo.ac.id

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Abstract

PPG Goes to Bulungan is a community service program aiming to strengthen the capacity of elementary and junior high school teachers in Bulungan Regency in designing lessons that foster students' numeracy skills, joyful learning environments, application of design thinking principles, and utilization of innovative learning media. This initiative responds to the national urgency of improving the quality of basic education as aligned with the Merdeka Curriculum and regulations from the Minister of Education, Culture, Research, and Technology regarding graduate and process standards. The program was implemented through participatory and collaborative workshops combining theory and hands-on practice. Results revealed increased teacher understanding of numeracy concepts and joyful learning, enhanced ability to apply design thinking to educational challenges, and improved skill in developing interactive media. This activity positively impacted teachers' professional competence and contributed to educational transformation in remote areas.

Keywords: Numeracy, Joyful Learning, Design Thinking, and Instructional Media

Abstrak

PPG Goes to Bulungan merupakan kegiatan pengabdian kepada masyarakat yang bertujuan untuk meningkatkan kapasitas guru SD dan SMP di Kabupaten Bulungan dalam merancang pembelajaran yang berorientasi pada peningkatan kemampuan numerasi, menciptakan suasana belajar yang menggembirakan (joyful learning), menerapkan pendekatan design thinking, serta memanfaatkan media pembelajaran yang inovatif. Kegiatan ini dilatarbelakangi oleh urgensi peningkatan kualitas pendidikan dasar dan menengah seiring tuntutan Kurikulum Merdeka dan Permendikbudristek terkait standar lulusan dan proses pembelajaran. Metode pelaksanaan kegiatan berupa workshop interaktif yang mengintegrasikan teori dan praktik, dengan pendekatan partisipatif dan kolaboratif. Hasil kegiatan menunjukkan bahwa peserta mengalami peningkatan pemahaman terhadap konsep numerasi dan penerapannya, mampu merancang pembelajaran dengan suasana joyful, serta terampil menggunakan prinsip-prinsip design thinking dalam merancang solusi pembelajaran berbasis media interaktif. Kegiatan ini memberikan dampak positif terhadap kompetensi profesional guru dan berkontribusi dalam mendukung transformasi pendidikan di wilayah 3T.

Kata Kunci: *Numerasi, Pembelajaran Menyenangkan, Desain Berpikir, Media Pembelajaran.*

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Introduction

Numeracy, Joyful Learning, Design Thinking, and Learning Media are competencies, learning approaches, learning concepts, and means to improve the quality of learning that are strategic issues in the field of education (Audia & Mastoah, 2025; Bender-Salazar, 2023; Donasari, Rofiah, & Qurroti, 2023; Kandia et al., 2023). Numeracy skills are basic skills that must be possessed by students after completing elementary and secondary education. This is in line with the mandate of article 6 point (h) of the Indonesian Minister of Education and Culture Regulation Number 5 of 2022 concerning Graduate Competency Standards for Early Childhood Education, Elementary Education, and Secondary Education, namely "Graduates of elementary education must be able to demonstrate numeracy skills in reasoning using concepts, procedures, facts, and mathematical tools to solve related problems" (Permendikbudristek, 2022). Not limited to elementary education, numeracy skills are also a requirement for graduates of secondary education. Therefore, strengthening the capabilities of Elementary School and Junior High School teachers in designing learning that facilitates improving students' numeracy skills is an important activity to implement.

In addition, the latest policy by the Ministry of Primary and Secondary Education puts forward the concept of deep learning. Deep learning is put forward in three learning atmospheres. This is stated in the definition of deep learning as an approach that glorifies by emphasizing the creation of a learning atmosphere and a conscious learning process (mindful), meaningful (meaningful), and joyful (joyful) through intellectual (intellectual), heart (ethics), feeling (aesthetic), and sports (kinesthetic) holistically and integrated (Suyanto, et al: 2025). Furthermore, in the academic manuscript of deep learning, it is described that joyful learning is a positive, challenging, enjoyable, and motivating learning atmosphere (Suyanto, et al: 2025). Therefore, when compared with the learning atmosphere in Indonesian Minister of Education and Culture Regulation Number 16 of 2022 concerning Process Standards at Early Childhood Education, Elementary Education, and Secondary Education Levels, joyful learning represents half of the learning atmosphere expected in the independent curriculum which includes six learning atmospheres such as inspiring, interactive, fun, challenging, motivating, and providing space for initiative (Mendikbudristek, 2022). It is clear that there is an overlap between the concept of joyful learning and the learning atmosphere in the Independent Curriculum, namely a challenging, fun, and motivating learning atmosphere.

To create a joyful learning atmosphere and achieve adequate numeracy skills for elementary and secondary education graduates, conscious efforts are needed from various parties, including in the utilization of problem-solving approaches and supporting facilities. Of course, the relevance of both will also affect the learning atmosphere of students in the classroom. This relevance can be realized through the provision of the Design Thinking concept for elementary and junior high school teachers. Design Thinking is an approach to solving problems that emphasizes empathy, collaboration, and creativity (Djamaris, 2023). As class teachers, elementary school teachers certainly need to think harder in planning learning for problem solving by their students. Individual differences that are very inevitable in the classroom, clearly, give rise to a fact or procedure that is a problem for one student, but not for other students. Regarding the facts in the class, Djamaris said that there are five principles of Design Thinking including; (1) Empathy; (2) Defining Problems; (3) Ideation; (4) Prototype;

and (5) Testing and Iteration in which must be integrated by a teacher skillfully with empathy, collaboration, and creativity in order to solve the learning problems that students face.

After the teacher knows the learning outcome (e.g. numeracy skills), the expected learning atmosphere (e.g. joyful learning), and the ability to solve learning problems (e.g. by implementing Design Thinking), the next step is that the teacher needs earning media that can help deliver content to students. Therefore, the existence of learning media is very important in supporting the success of the teaching and learning process. Learning media is anything that can be used to convey messages (learning materials) so that it can stimulate students' attention, interest, thoughts, and feelings in learning activities to achieve learning goals (Kristanto, 2016). Various types of learning media can be used to support the teaching and learning process, including in the form of graphics, three-dimensional media, projection media, audio/video media, digital media, and multimedia. The selection of the type of media to be developed or selected in learning must certainly be adjusted to the character of the material, students, and the school environment or ecosystem. For example, schools that do not yet have internet network facilities can use learning media that accommodate the needs of students and the availability of resources in the school.

Seeing the interconnectedness, a teacher should continue to learn and collaborate to be able to win the hearts of students in the learning process. As in planning learning, teachers need to know what the goal is, how to identify and solve learning problems, what kind of learning atmosphere to create, and what learning media need to be prepared. Although basically teachers can learn anytime and anywhere, especially through various digital platforms, offline learning (training, seminars, workshops) is still very much needed. Therefore, a program for disseminating or sharing knowledge and technology by lecturers is needed as a form of implementing one of the obligations of higher education, namely the Community Service program.

Therefore, the Teacher Professional Program (PPG) team of the Faculty of Teacher Training and Education, Borneo Tarakan University, considers it important to introduce four concepts such as Numeracy, Joyful Learning, Design Thinking, and Learning Media in implementing interesting learning to be a topic in the Community Service (PkM) program. So that a PkM activity was carried out called PPG Goes to Bulungan. The purpose of this program is to disseminate concepts and good practices on Numeracy learning, Joyful Learning, Design Thinking, and the development of learning media for elementary and junior high school teachers in Bulungan Regency.

Method

PPG Goes to Bulungan is a community service activity targeting Elementary School and Junior High School teachers in Bulungan Regency, North Kalimantan Province. This activity carries the theme "PPG Goes to Bulungan: Be Smart, Be Creative, Be Innovative". The activity is designed in the form of a workshop with a fairly large team of lecturers. Therefore, the team is divided into four small groups with different themes. The 2 groups reviewed in this article are the Numeracy and Joyful Learning Team and the Design Thinking and Learning Media Team.

The PPG Goes to Bulungan activity is carried out in several stages, starting from preparation to reflection and evaluation. The stages are explained in Table 1 below.

***Table 1**. Stages of PPG Goes to Bulungan Activities*

Stages	Explanations
Preparation	PPG as one of the study programs at the Faculty of Teacher Training and Education, Borneo Tarakan University has various academic agendas. In general, various activities carried out are included in the Tri Dharma of Higher Education activities. The presence of this study program must have an impact on society. Therefore, the PPG Goes to Bulungan activity was carried out which targeted Elementary and Junior High School Teachers in Bulungan Regency. This activity was initiated directly by the Head of the PPG Study Program, namely Mrs. Dr. Shinta Wulandari, S.Si., M.Pd. In the preparation stage, the Head of the Study Program formed a team consisting of the PPG management team and lecturers outside the management who had expertise in the field that would be conveyed to partners. Furthermore, a preparatory meeting was held to determine the theme, form a small team, take care of administration, communication with partners, and division of tasks.
Departure to PkM Location	The PPG Study Program of Borneo Tarakan University is located on Tarakan Island, a small island separated from the mainland of Kalimantan. Meanwhile, Bulungan Regency is located on the main island of Kalimantan. Therefore, for the implementation of the PPG Goes to Bulungan activity, extra departure preparation is needed, because it cannot be reached by land. The team's departure was coordinated by the transportation team, one of which was Mr. Winarno, M.Pd. The transportation team prepared Speedboat tickets from Tarakan to Bulungan and vice versa, as well as local transportation during activities in Bulungan Regency.
Implementation of PkM	The core activity of PPG Goes to Bulungan was held on January 30, 2025. The activity was held in the Hall of the Bulungan Regency Education and Culture Office. The activity began with a speech and opening by the Head of the Education and Culture Office, accompanied by the Head of Elementary Education and the Dean of FKIP UBT. Furthermore, the first material was delivered by the Dean of FKIP, followed by Numeracy and Joyful Learning material and activities guided directly by Dr. Jero Budi Darmayasa, S.Pd., M.Pd.Si and accompanied by Mrs. Hariaty Hamid, S.Si., M.Pd and Mr. Azwar Anwar, S.Pd., M.Pd. After the Numeracy and Joyful Learning activities, the Design Thinking and Learning Media Team immediately took over with the delivery of material and implementation of activities guided by Mrs. Dr. Shinta Wulandari, S.Si., M.Pd. and accompanied by Mrs. Dr. Firima Zona Tanjung, S.S., M.Pd., Mr. Winarno, M.Pd., and Mrs. Nur Pangesti Apriliani, S.Pd., M.Pd. This activity was carried out in parallel with two other teams so that participants took turns participating in the workshop activities in each team.

Reflection Evaluation	&	After the core activities were completed, reflection and evaluation activities were carried out. This activity aims to identify the weaknesses and strengths of the implementation of the activity, so that it can be used as material for improvement in similar activities in the future. The reflection and evaluation activities were guided by the Head of the PPG Study Program. The reflection activity was carried out by sharing several questions regarding the effectiveness of the program both in terms of substance and technical aspects. In general, the participants' responses were that the activities in terms of substance were very beneficial for the development and innovation of learning for them. Technically, the duration of the implementation of the activity was good, namely one working day.

As part of the Tri Dharma (three obligations) of Higher Education, this activity is part of the Community Service obligation with the main objective of disseminating science and technology. Therefore, according to the duties of the lecturer in the field of community service, this activity is considered successful because it can be implemented and the community service material can be delivered both in the form of science and technology to the target (community), in this case 53 elementary and junior high school teachers in *Bulungan* Regency.

Results and Discussion

The main activity of the implementation of PkM PPG Goes to *Bulungan* was carried out for one full day starting from 08.00 to 16.00 WITA. The opening ceremony was attended by the Head of the *Bulungan* Regency Education and Culture Office, Head of Elementary Education, Dean of the Faculty of Teacher Training and Education, Borneo Tarakan University, and teachers. The following is the documentation with the entire implementing team and workshop participants from the opening to the completion of each team's activities.

***Figure 1**. Workshop Opening Activities*

As previously stated, there were 4 small teams in this workshop. The four teams had different workshop materials. The process and results of the workshop from two teams are discussed in this article. The two small teams are the Numeracy and Joyful Learning Teams led by Dr. Jero Budi Darmayasa and the Design Thinking Team led by Dr. Shinta Wulandari. The following are the PkM process and results for the two teams:

A. Numeracy and Joyful Learning

The material presented by the first team was numeracy reinforcement and the creation of a joyful learning atmosphere. The activities were designed in an integrated manner, namely the delivery of how to theoretically create a joyful learning atmosphere. Then continued with various numeracy reinforcement activities that prioritize mastery of competencies and learning practices designed to take place in a joyful atmosphere. The order of material delivery is: material on Deep Learning, material on Numeracy, numeracy activities by applying the concept of Cartesian coordinates, numeracy activities by utilizing the concept of integer operations, and ending with reflection activities.

For numeracy competency, the speaker refers to the definition of numeracy as knowledge and skills in using various types of numbers and symbols related to basic mathematics to solve practical problems in different contexts of everyday life, analyzing information presented in various forms (graphs, tables, maps, etc.), and using interpretation to predict and make decisions (Baharuddin M.R, Sukmawati, and Christy; 2021). Referring to this definition, 2 (two) activities were created which were carried out or tested together with the teachers participating in the workshop. The two numeracy activities are:

1. Activities that utilize the concept of Cartesian coordinates.

   The first numeracy strengthening activity carried out was related to the use of the Cartesian coordinate concept. The activity offered was making a prototype or model of a geometric mural with a bird image as a model (Figure 3). In order to be able to make a bird image with a magnification of 9 times, participants were first invited to recall the Cartesian coordinate concept. The apperception process was carried out by asking participants to determine points A (2,3), B (1,5), C (5,2), D (5,5), and point D (0,4) in the perpendicular coordinate system (Figure 2).

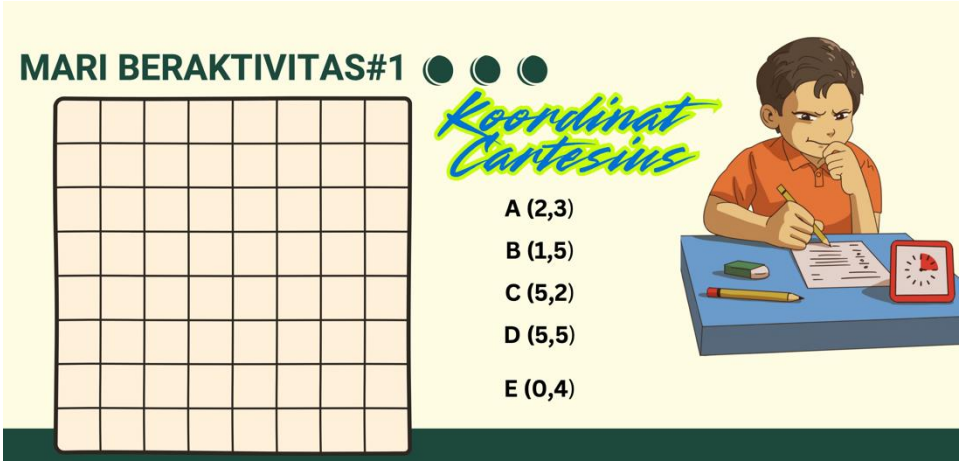

Figure 2. *Cartesian Coordinate System*

***Figure 3**. Bird drawing activity with 9 times magnification*

After the participants have placed the points correctly according to image 2, the activity continues by inviting participants to place points at each coordinate point that represents a picture of a bird. After all the points are placed, one of the participants is asked to connect the points according to the picture of the bird that is used as the initial image. To ensure that the image is enlarged 9 times, the coordinate system on the cardboard is made with a magnification of 3 times for the x-axis and 3 times for the y-axis. This means that if the size of one unit in the initial image is 1 cm, then on the cardboard (where the bird replica will be drawn) a size of 3 cm is made as one unit. The process of transferring coordinate points by workshop participants is as seen in image 4 below.

***Figure 4**. The process of moving coordinate points to produce a bird image with a magnification of 9 times.*

2. Activities that utilize the concept of Division Remainder

The second numeracy strengthening activity was carried out with workshop participants, namely the utilization of the concept of integer operations. The concept of division and remainder for integers refers to publications related to ethnomathematics. The activity about the Meeting uses Reference 6 in the Ethnomathematics article, namely determining the chances of a couple being good or bad if they continue to the marriage stage (Darmayasa, 2019). The provisions are as written in Figure 5 below.

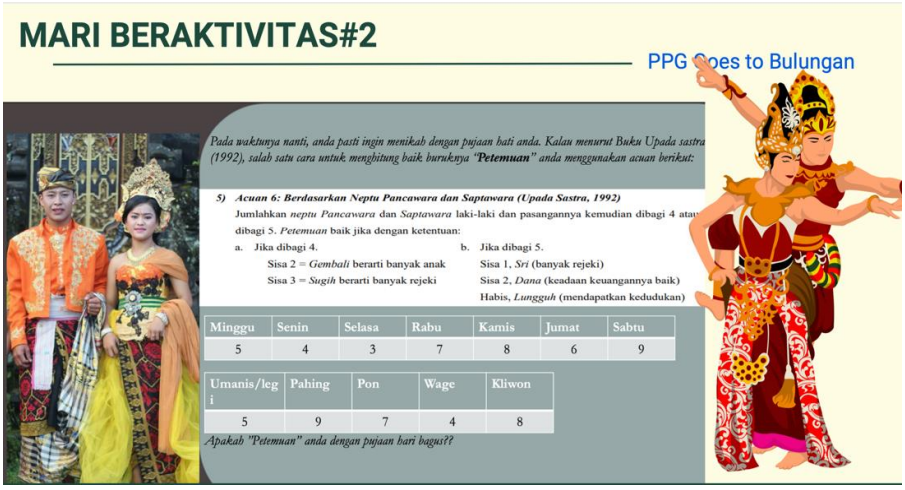

***Figure 5**. Reference 6 Petemuan opportunities good and bad if a couple continues to the next level of marriage*

The stages carried out in this activity are:

a) The facilitator quotes one of the references about Meetings in the scientific article on Ethnomathematics "*Petemuan*"
b) Participants are then asked to take one small piece of paper with a picture of a woman (Juliat) and another participant is asked to take one small piece of paper with a picture of a man (Romeo)
c) Then another participant is called to calculate whether the two people represented in the picture have a good or bad *Petemuan*
d) The results of the calculation are then explained to the other workshop participants.

B. Design Thinking and Learning Media

When talking about problems, often the root of the problem has complex causal elements. Therefore, it takes the ability to empathize, the ability to see, and dig deeper into things related to the problem so that teachers can define it accurately. Referring to the needs explained earlier, the activity was continued with the activity of studying observation techniques and in-depth interviews independently. This aims to enable teachers to define a problem more accurately based on data findings, not based on an assumption or personal perception of the world of education. The steps for Design Thinking are as follows:

- Empathize: Understand the user's needs, feelings, and experiences.
- Define: Clearly define the problem based on the insights gained from the empathy stage.
- Ideate: Think creatively to find possible solutions.
- Prototype: Create an initial model of the solution.
- Test: Try out the solution to see how it works in the real world.

The Importance of Design Thinking in Education

- Develop critical and creative thinking skills in students.
- Create more interactive and student-centered learning.
- Help teachers design relevant and innovative learning experiences.

Benefits of Design Thinking for Teachers

- Design Thinking is not only beneficial for students, but can also enrich the professional experience of teachers:

• Help teachers identify deeper problems in teaching and learning.
• Inspire innovation in teaching methods and problem solving.
• Open opportunities for collaboration with fellow teachers and external parties.

Design Thinking Practical Activities for Teachers

In accordance with the Design Thinking steps above, the workshop was carried out with the following stages:

1. Empathy Mapping (Empathy Mapping)

   Objective: To help teachers understand the feelings, needs, and challenges their learners face, in order to design more relevant and immersive learning experiences.

   Steps:

   a) Time: 10-15 minutes.
   b) Materials: Large paper or whiteboard, pencils, colored markers.
   c) Process:
      - Grouping: The facilitator divides the participants into small groups (3-5 people).
      - Select a Focus Student: The facilitator asks each group to select a participant as their "persona" (can act as a student with common problems such as low motivation, difficulty understanding the material, or even someone who is very creative).
      - Empathy Mapping: On paper or a whiteboard, create a diagram with four quadrants:
        - What do students see? (e.g., classroom environment, peers, teaching methods).
        - What do students hear? (e.g., comments from teachers, peers, or parents).
        - What do students feel? (emotions such as fear, confusion, happiness, or motivation).
        - What do students say? (e.g., comments or complaints they express).
   d) Discussion: After each group has finished mapping, they then discuss their findings and how they can design more relevant learning based on that understanding.

   Results obtained at this stage:

   Teachers better understand the world and perspectives of their students, which can help design learning that is more tailored to their needs.

2. *Brainstorming*

   Objective: To invite participants to collaborate in generating creative ideas to solve problems or challenges they face in class.

   Steps:

   a) Time: 10-15 minutes.
   b) Materials: Post-it, whiteboard, marker.
   c) Process:
      - Topic Selection: The facilitator identifies a challenge that is relevant to the audience. For example: "How can we increase student engagement in math learning?" or "What methods can be used to help students who are struggling with reading?"
      - Brainstorming: The facilitator invites participants to write down their ideas on post-its individually, without limiting creativity. Do not judge or criticize these ideas first.

- Group Ideas: Once finished, the facilitator asks participants to group similar or related ideas, and then present the best ideas to their groups.
- Discussion: The facilitator invites participants to discuss the ideas that emerged, and encourages participants to think about how these ideas can be applied in the context of their classroom.

The results obtained from this stage:
Teachers get fresh ideas to address challenges in the classroom and feel more confident in creating creative solutions.

3. *Prototyping*

Objective: To encourage teachers to design and develop learning plans that can be tested in class using the Design Thinking approach.
Steps:

a) Time: 15-20 minutes.
b) Materials: Paper, writing utensils, access to a whiteboard or presentation screen.
c) Process:
   - Topic Selection: at this stage the facilitator asks each group to choose one idea from the brainstorming session that they will use as a prototype for learning.
   - Prototype Design: Each group designs a learning plan or prototype based on the idea. This prototype can be:
     - Activity Plans: For example, teaching steps or activities designed to increase student engagement.
     - Learning Tools or Media: For example, visual aids or digital resources to support teaching.
   - Prototype Presentation: Each group presents their prototype to the other groups, explaining why they chose the approach and how they will test it in class.
   - Feedback: Provide constructive feedback, both from other participants and from you as the facilitator, to help refine the prototype.

The results obtained from this stage:
Teachers have concrete examples of how to arrange Design Thinking-based learning that are ready to be tested in their classes.

Closing Activities

After these three activities, participants are invited to think about how they can adapt the Design Thinking steps in their daily teaching. A discussion session can also be opened about the challenges they may face in implementing and how to overcome these obstacles.
Call to Action: Then at this stage the facilitator asks teachers (participants) to choose one idea or prototype that they will try to implement in the classroom in the coming weeks and share their experiences with their colleagues.

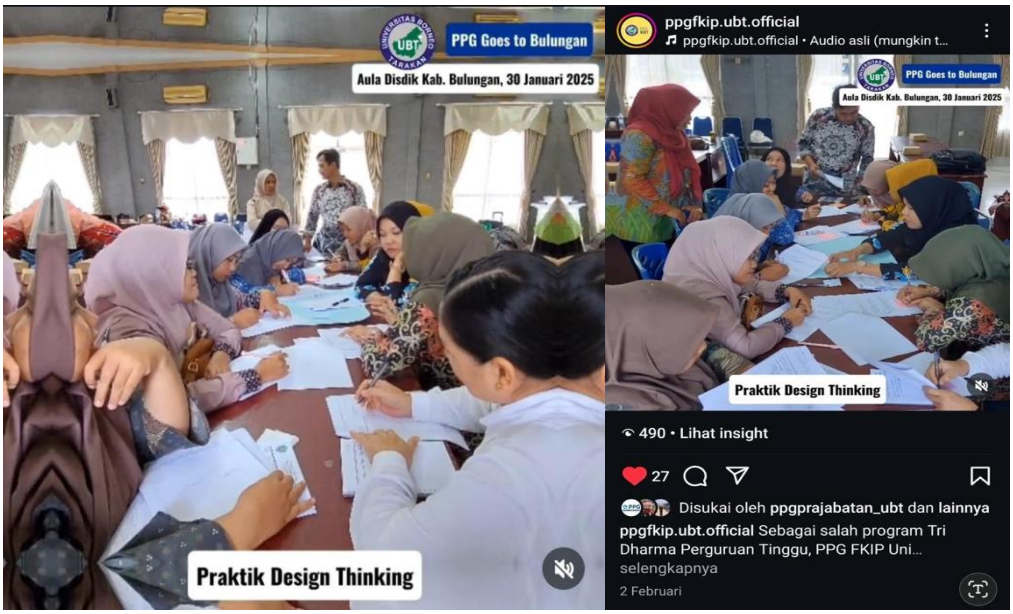

***Figure 6**. Design Thinking Practice Activities and Utilization of Learning Media*

With this practical activity, teachers participating in the workshop can experience firsthand how Design Thinking can be applied in an educational context and how they can start utilizing this method to improve learning in their classrooms.

Conclusion

The PPG Goes to *Bulungan* activity has succeeded in providing real contributions in the form of dissemination of science and technology as an effort to increase the capacity of elementary and junior high school teachers, especially in strengthening numeracy literacy, creating a pleasant learning atmosphere, understanding the Design Thinking approach, and skills in designing and utilizing innovative learning media. Through an interactive and hands-on workshop approach, participants are able to produce contextual and adaptive learning ideas to the characteristics of students and the school environment.

However, this activity has several limitations. First, the relatively short implementation time limits the in-depth study of the material and advanced practices needed by participants. Second, limited technological facilities in several partner schools hinder the optimization of the use of digital media introduced during the workshop. Third, the lack of follow-up monitoring of the implementation of the training results in the classroom has resulted in the real impact on the learning process and outcomes of students not being measured. Based on these reflections, the community service team recommends several further steps.

First, a continuous mentoring program is needed in the form of coaching clinics or peer mentoring so that teachers can implement the training results more optimally. Second, expanding the topics of community service to include formative assessment, strengthening digital literacy, and developing differentiated learning will be very relevant to support the needs of teachers in the context of the Independent Curriculum. Third, involving PPG students in similar activities will be an effective strategy to build a network of good practices between prospective teachers and teachers in the field. Thus, this activity is expected to be the starting point for long-term collaboration between universities and educational units in building a creative, adaptive, and student-centered learning ecosystem.

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