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ANALYSIS OF PROSPECTIVE MADRASAH IBTIDAIYAH MADRASAH TEACHER COLLABORATION ABILITY THROUGH THE TPACK-BASED PJBL MODEL

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ABSTRACT

Education in the 21st century requires students to possess six skills known as 6C. The learning process in postsecondary institutions is the primary factor in producing competent graduates. Implementing the TPACK-based PJBL model, the purpose of this study is to examine the communication abilities of prospective teachers. This research method is a quantitative description with a sample of 28 PGMI students in their first semester. The collection of data involved observation, questionnaires, and interviews. The data were analyzed with descriptive statistics, including data reduction, data presentation, and conclusion drawing. 57% of the group adhered to the collaborative category, and 43% of the group entered the collaborative category, according to the study's group observation findings. In addition, of the 28 students who were given a questionnaire, 15 (53.50%) had collaboration skills (average score between 80.55 and 100) and 13 (46.40%) were categorized as collaborative (average value between 75 and 77.77). This information is also supported by the findings of interviews, which indicate that the application of the TPACK-based PJBL model in science subjects enables students to complete assignments with a responsible attitude, to interact well with group members, and to manage conflicts that arise in groups when solving problems. responsibilities regarding project assignments. Individually and collectively, the collaboration skills of prospective Madrasah Ibtidaiyah teacher students improved as a result of the analysis of the application of the TPACK-based project-based learning model, according to the findings of this study.

Keywords: Analysis; Collaboration Ability; TPACK-Based PJBL Model.

INTRODUCTION

The learning process in higher education is the primary reference for producing competent graduates, one of which is able to produce 21st-century-ready future instructors. The concept of learning cannot be separated from a person's ability to comprehend and implement the concept in his life; therefore, the learning process for students is an activity undertaken in an effort to attain educational objectives (Sukmawijaya et al., 2019). Education in the 21st century requires students to possess six skills known as the 6Cs: critical thinking, collaboration, communication skills, creativity, culture, and connectivity. Therefore, students, particularly prospective teachers, must cultivate these skills, one of which is the ability to collaborate, i.e., the capacity to carry out tasks in groups or collectively.

The results of the 2018 PISA (Program for International Student Assessment) survey conducted by the OECD (Organization for Economic Cooperation and Development) demonstrated an increase with the average score of Indonesian students' literacy skills in reading reaching 371 (average score: 487), the average score in mathematics is 379 (average score: 487), and the average score in science is 389 (average score: 489) (Schleicher, 2019). The results of this survey are unquestionably relevant to the learning process carried out by educators in the classroom and must be investigated in greater detail. Relevant to the survey results, based on interviews and observations conducted with prospective madrasah primary school teacher students, it was discovered that in the learning process, some students still did not complete the group assignments given on time, and the quality of the assignments did not appear to meet the standards that had been submitted at the beginning of the lecture contract. Additionally, it can be observed that there are still a number of students who are unable to demonstrate mastery of the course material.

The project-based learning model is one method of instruction that can be used to foster students' collaboration skills. The Project-Based Learning model, according to Bagheri (Bagheri et al., 2020) is a learning model that fosters independent student learning because it enables students to identify their learning needs, set goals, search for resources, and answer questions. According to Prince and Felder (Indrawan, 2018) project-based learning begins with a task that culminates in a written or oral report to be shared later. The project-based learning model did not develop spontaneously, but rather has a theoretical foundation. The learning theory underlying the project-based learning paradigm is project-based learning, which is supported by constructivist learning theory, which is predicated on the notion that students construct their own knowledge in the context of their own experiences. Empirically, the implementation of PjBL has demonstrated that this model is capable of providing students with a constructivist - based meaningful learning process(Daryanto, 2014).

Implementing the PjBL model in the classroom is not a simple task for teachers and prospective teachers; it requires the teacher's commitment and ability to plan projects, particularly on science content, so that they are relevant to the requirements of the current curriculum. According to the findings of a study involving pre-service teachers and students, providing teachers with an understanding of the PjBL concept had an effect on their ability to manage the classroom, particularly in designing and implementing projects with minimal facilities, as well as improving the literacy skills of teachers and teachers better understanding the social world of children (Duke et al., 2021). The findings of the study indicate that combining creative teaching with PjBL enables students to achieve learning goals by motivating and supporting social relationships, particularly in technology-based science learning (Lin et al., 2021; J. K. Miller, 2021).

Using the Technological Pedagogical Content Knowledge (TPACK) method, technology integration can be incorporated into the implementation of the PJBL model.

TPACK refers to the construction of knowledge that teachers rely on to facilitate their instruction with technology, thereby making the learning process more innovative. According to Koehler (Koehler, 2014), TPACK is a design that integrates pedagogy and content with technology in the learning process. Sintawati and Indriyani (Sintawati & Indriani, 2019) asserted that education 4.0 necessitates the integration of technology into the educational process. The teacher's mastery of technology in the classroom can be determined by the technology they possess. By understanding and integrating TPACK in learning, an educator has been able to increase his competence in 21st century teaching skills, including the ability to develop critical and creative thinking skills and to use appropriate technology in learning, particularly at the primary and secondary education levels (Syafie, 2019).

Collaboration is one of the skills that students can develop through the Project-Based Learning model that supports the 21st century. Collaboration ability can be defined from multiple perspectives, including collaboration related to demonstrating the ability to work effectively and politely with different groups, exercising flexibility and the desire to assist in making decisions to achieve common goals, being accountable for collaborative work, and evaluating one another individual participation within the tim (Hosnan, 2014; Trilling, 2015).

National Research Council, Washington (Saenab, 2019) District of Columbia In addition to communication skills emphasizes that students must be taught to collaborate with others who have different cultural backgrounds and adhere to different values. In order to explore information and construct meaning, students must be encouraged to collaborate with their peers. In collaborating on projects, students need to learn to appreciate each person's strengths and talents and take on roles and adapt appropriately. Several studies that focused on the implementation of PJBL and collaboration skills found that the existence of the PJBL model could improve students' ability to collaborate in completing projects in a timely manner; additionally, good collaboration among students would indirectly result in improved interpersonal communication skills (Alfaeni et al., 2022; Oktaviani, 2022).

The primary objective of this study is to determine the influence of the previously developed learning model, namely the TPACK-based Project Based Learning model, on the collaboration skills of aspiring Madrasah Ibtaiyah teacher students. The ability to collaborate in teams, responsibilities, interactions, and patterns of collaboration are the aspects of collaboration that should be investigated in greater detail. The researcher wishes to conduct a "Analysis of Collaboration Capabilities of Prospective Madrasah Ibtidaiyah Teacher Students through the TPACK-based PJBL Model" based on the background information provided.

METHODOLOGY

This style of research is descriptive quantitative, with the goal of precisely describing a phenomena, events, symptoms, and events that occur. Forms, activities,

relationships, qualities, and similarities and contrasts amongst phenomena are all examples of phenomena (Sugiyono, 2017). This strategy is meant to present a realistic picture of prospective Madrasah Ibtidaiyah teacher students' collaborative abilities in science learning in relation to the reality that occurs in the field. The study's participants were 28 semester 1 students, and the sampling technique was purposive sampling, which took into account the various abilities of students in one class as well as the considerations of lecturers who teach science courses.

The following instruments were utilized in this study: 1) an interview sheet to determine the science teacher's response to students' cooperation abilities; and 2) student collaboration skills observation sheets to collect data. This sheet is filled out by providing a checklist on the indicators seen, as many as three indications are translated into ten descriptions that are filled out by the science instructor; 3) Questionnaire sheet to determine students' responses regarding collaboration skills in science learning. The data was collected in the form of observations of students' cooperation skills in classroom learning, which were then assessed using student collaboration skill indicators. The instrument was examined for validity utilizing a construct validity test achieved through expert testing. As reinforcement of observational data, student response questionnaires were created to collect student replies about collaboration skills. The analysis results are presented in the form of data descriptions and the level of student collaborative skills.

Data analysis was carried out using Miles and Huberman's strategic methodologies (Miles, 2014) in three stages: data reduction, data presentation, and deriving conclusions. When data was collected, analysis was performed, followed by data sorting into certain categories, notably student collaboration skills. The more complete the points produced by the data processing, the higher the percentage of student collaborative skills in science learning. Students' scores were averaged after being sorted and examined using descriptive analysis. Table 1 shows the collaborative instrument grid table adapted from Srinivas (Firsty Mariadini et al., 2021).

Table 1. Observational Guidelines for Student Collaboration Abilities

Aspek	Indikator
Positive interdependence	Each group member is involved with each other to work together to achieve a common goal.
Individual responsibility	All collaborating members in the group are responsible for carrying out the tasks that are their own part.
Interaction through eye contact	Tasks are carried out interactively with other members by providing reasoning, input, and conclusions related to the material being studied and more importantly being able to teach and support one another.
Utilization of collaborative abilities	Collaborators are encouraged and assisted to develop trust, leadership, decision making, communication, and skills in managing conflict.

The scores obtained are obtained from the results of the observation sheet recap of students' collaboration skills which are assessed so that they can be categorized. Collaboration skills criteria are based on benchmark assessments as in Table 2.

Table 2. Criteria Collaboration skills

Nilai	Kategori
80 < X ≥ 100	very collaborative
60 < X ≤ 79	Collaborative
40 < X ≤ 59	Quite Collaborative
20 < X ≤ 39	less collaborative
0 < X ≤ 19	not collaborative

(adopted Widyoko, 2009)

RESULT AND DISCUSSION

Result

This research belongs to the category of quantitative research with descriptive methods (quantitative descriptive). Through the deployment of the TPACK-based PJBL model in science courses, the purpose of this study is to investigate the collaboration skills of future Madrasah Ibtidaiyah teacher candidates. This investigation included 28 students divided into seven groups of four. The purpose of this study is to evaluate students' collaboration skills through observation activities, student questionnaires, and interviews with science course lecturers. The indicators to be studied are 1) interdependence, 2) individual responsibility, 3) interaction, and 4) the application of collaboration skills. The results of observations of the four indicators comprised of nine queries are displayed in table 3.

Table 3. Observation Results of Student Collaboration Ability

Group	Collaboration Indicator Value				Average	Categories
	Positive interdependence	Individual responsibility	Interaction through eye contact	Utilization of collaborative abilities		
1	82,57	80,75	85,25	83,9	83,11	Very Collaborative
2	78,6	80,5	76,5	78,6	78,55	Collaborative
3	87,7	75,8	82,6	87,7	83,45	Very Collaborative
4	83,57	85,25	75,8	83,57	82	Very Collaborative
5	84	78,8	85,25	84	78,95	Collaborative
6	76,5	82,57	78,8	82,6	79,11	Collaborative
7	82,6	80,4	82,57	82,6	82	Very Collaborative

According to table 3, four groups (57%) are highly collaborative, namely group 1 (82.5%), group 3 (83.45%), group 4 (82.0%), and group 7 (82.6%). The remaining three groups (43%) were classified as collaborative, namely group 2 (78.55%), group 5 (78.95%), and group 6 (79.11%). In addition to observing collaborative groups,

researchers administered a questionnaire to students to assess their collaboration skills; the results of the questionnaire are presented in Table 4.

Table 4. Data from the Student Collaboration Questionnaire

Respondents	**Totals**	**Average**	**Categories**
Respondents 1	34	94,44	Very Collaborative
Respondents 2	31	86,11	Very Collaborative
Respondents 3	27	75	Collaborative
Respondents 4	31	86,11	Very Collaborative
Respondents 5	36	100	Very Collaborative
Respondents 6	27	75	Collaborative
Respondents 7	29	80,55	Very Collaborative
Respondents 8	28	77,77	Collaborative
Respondents 9	36	100	Very Collaborative
Respondents 10	29	80,55	Very Collaborative
Respondents 11	27	75	Collaborative
Respondents 12	33	91,66	Very Collaborative
Respondents 13	27	75	Collaborative
Respondents 14	27	75	Collaborative
Respondents 15	27	75	Collaborative
Respondents 16	27	75	Collaborative
Respondents 17	31	86,11	Very Collaborative
Respondents 18	36	100	Very Collaborative
Respondents 19	28	77,77	Collaborative
Respondents 20	31	86,11	Very Collaborative
Respondents 21	28	77,77	Collaborative
Respondents 22	28	77,77	Collaborative
Respondents 23	30	83,33	Very Collaborative
Respondents 24	28	77,77	Collaborative
Respondents 25	31	86,11	Very Collaborative
Respondents 26	32	88,88	Very Collaborative
Respondents 27	28	77,77	Kolaboratif
Respondents 28	31	86,11	Very Collaborative

Table 4 displays data on cooperation abilities from 28 students who completed a questionnaire with 9 items based on four collaboration ability markers. According to the questionnaire answers, 15 (53.5%) pupils have collaboration abilities with an average score of 80.55% - 100%. According to other data, 13 students (46.4%) are in the collaborative category, with an average score of 75% - 77.77%.

Following the collection of observational data and questionnaires regarding students' abilities to collect data, interviews with lecturers in charge of natural science courses were conducted. Respondents were asked nine questions that were part of the

collaboration capacity indicator, which was related to indicator 1, namely positive interdependence. It also looks fantastic." Furthermore, for indicator 2, namely individual responsibility, "there are rules, namely all assignments are collected online and students are asked to make videos and upload them on social media, it can be seen that all members in the group have a sense of responsibility to complete the task together - the same." Regarding indicator 3, interaction, respondents noted that "from each given project assignment it is seen that the group is seriously preparing, as evidenced by the products and project reports collected." "When students work on assignments in their groups, indirectly performance and individual attitudes will be seen when they interact to complete assignments properly and on time, attitudes such as having a spirit of leadership, self-confidence, being able to make appropriate decisions through group discussion activities, and most importantly, the group leader has begun to be able to manage the group" is conveyed for indicator 4.

Discussion

The research findings indicate that the implementation of the TPACK-based project-based learning model has a positive effect on the collaboration skills of student teacher candidates at Madrasah Ibtidaiyah. Observations of the groups revealed that 57 percent of the groups fell into the collaborative category, while 43 percent of the groups fell into the collaborative category. Collaboration skills are the ability of students to exchange thoughts or ideas with other students at the same level with learning concepts that have the characteristics of students having different perceptions and beliefs, which makes students creative and able to communicate with one another to reach individual conclusions (Ganefri et al., 2020).

15 students (53.50%) have collaboration skills (very collaborative) and 13 students (46.40%) have collaboration skills (collaborative). Therefore, student collaboration skills are quite collaborative. Several factors influence collaborative success, including 1) forming, which is a basic skill in forming groups for learning; 2) functioning, which is a skill in managing a group so that work can run efficiently; 3) formulating, which is the skill of comprehending concepts and strategies; and 4) fermenting or (developing), which is the skill of stimulating reconceptualization by students, including cognitive, conflict, and searching for information to communicate (Sufajar & Qosyim, 2022). These factors will have indirect effects on the collaboration skills of students, particularly in scientific education.

In collaboration skills, there are four indicators that can be used to assess students' collaboration skills, such as positive communication or interdependence between individuals in the group; this is particularly important when students complete project assignments; the lecturer stated that the majority of group members already have good communication with one another. Together with others, discuss the steps necessary to complete the assignment on time and with quality results. This is pertinent to research on the collaborative ability of science teachers when accomplishing online assignments (Firsty Mariadini et al., 2021) discovered that when team members

communicate effectively, the ensuing assignments are of a higher quality and are submitted on time.

Other indicators, namely interactive, demonstrate that technology through the project-based learning model enables students to complete tasks interactively in groups, either directly or by using various online features and applications, one of which is the ability to create effective learning videos. According to research conducted by Denies Alfaini (Alfaeni et al., 2022), there was an increase in student motivation to learn, as evidenced by the students' responses when studying through the project-based learning model aided by Zoom; students became more active because they were able to discuss with their group colleagues beforehand, utilizing web-based features, present the outcomes of completed initiatives. Sari et al (Sari et al., 2017) found that the development of PJBL-based LKPD with appealing features was able to enhance students' abilities in terms of project collaboration and communication.

Collaboration ability is indirectly associated with a person's character, specifically the student's commitment to completing tasks by being accountable to other team members. Based on the results of the interviews, it was determined that the majority of individuals were able to collaborate with their group members, as evidenced by their ability to make decisions based on joint deliberation when completing projects, to discuss and consider the interests of other members, and to manage conflicts that arose within the group. According to Hamid et al (Montessori et al., 2023), character is the foundation of a person's or personality's thinking, acting, and carrying out their role in accordance with the given mandate, such that there is a correlation between attitude indicators and collaborative character towards descriptors.

The implementation of the TPACK-based PJBL model had a positive effect on the collaboration abilities of prospective Madrasah Ibtadaiyah teacher students, as determined by the results of student observations, student questionnaires, and lecturer interviews. Good collaboration skills are characterized by a sense of responsibility for completing the assigned project, the ability to interact to discuss and complete tasks, and the formation of an attitude of being able to respect group opinions and effectively manage group conflicts.

CONCLUSION

The analysis of the application of the TPACK-based project-based learning model has a positive effect on the collaboration abilities of prospective Madrasah Ibtaiyah teacher students, according to the findings of this study. 57% of the groups fell into the collaborative category, while 43% of the groups fell into the collaborative category, according to the results of group observations. In addition, of the 28 students who were administered the questionnaire, 15 (53.5% of the total) had collaboration skills (average score between 80.55 and 100) and 13 (46.4%) were classified as collaborative (average value between 75 and 77.77). This data is also supported by interview results indicating

that the application of the TPACK-based PJBL model in science courses enables students to complete assignments with a responsible attitude, with good interaction among group members, and with the ability to manage conflicts that arise within the group while completing the assignments. assignment duty.

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