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Hybrid Android Interface Practicum Mode to Develop Students' Science Process Skills

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Abstract: Science Process Skills are abilities that students must possess because they are applicable not only to science learning but also to daily life. To be familiar with scientific method activities, students must have direct experience in order to be trained in Science Process Skills. This study aims to enhance students' Science Process Skills through hybrid android interface mode practicum learning. The research data was collected using description questions previously validated by subject matter experts. This study conducted quasi-experiments using the Nonquivalent (pretest-posttest) Control Group Design method. The research participants included control and experimental groups. The research results show an increase in Science Process Skills in the experiment class as evidenced by the achievement of aspects of observation 71.25%, interpretation 78.25%, classification 86.12%, prediction 84.45%, conducting experiments or investigations 83.34%, communicating 63.33%, hypothesizing 79.63%, applying concepts 88.34%, and asking questions 82.43%. It shows that the practicum mode of the hybrid Android interface can develop Science Process Skills.

Keywords: Hybrid Android Interface; Practicum Mode; Science Process Skills

Introduction

According to the 2018 Program for International Student Assessment (PISA) study, Indonesia was ranked 74th, placing it in the lowest 6th rank in the field of science. The OECD has reported that 35% of Indonesian students remain in the competency level 1a group, while 17% are at a lower level. This phenomenon occurs due to the fact that the educational system still prioritizes a teacher-centered approach to learning. Level 1a pertains to the capacity of students to apply fundamental materials and procedural knowledge in order to identify or distinguish explanations of uncomplicated scientific phenomena (OECD, 2019). The poor performance in science education in Indonesia indicates that there are issues within the country's educational framework (Purnamasari *et al*., 2021).

From the results of interviews conducted with teachers and students at SMA Pasundan 7 Bandung with regard to Science Process Skills, the teachers reported that they did not explicitly incorporate Science Process Skills into their instructional practices due to their limited understanding of KPS. Subsequently, a significant proportion of the student body exhibited a lack of familiarity with the concept of KPS, and had not received any prior instruction on the subject matter. In addition to the omission of KPS process instruction, the educational approach remains teacher-centric, thereby limiting students' autonomy in knowledge acquisition. The implementation of practicum can be completed within a single semester owing to the restricted availability of laboratory tools and materials.

Based on the findings of the interviews conducted during the research preparation phase, it is evident that practicum activities, particularly those related to biology

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in educational institutions, frequently encounter challenges such as time constraints, inadequate resources, and limited access to laboratory facilities. Conversely, students are obligated to confront the fourth industrial revolution, which will persist in conjunction with technology. In order for students to engage in competitive learning, it is imperative for educators to implement a learner-centred approach, such as the practicum method. The educational domain of 21st century skills has been outlined in Permendikbud No. 21 of 2016, which pertains to content standards concerning the proficiencies that students should possess. Among these proficiencies, the domain of skills is included. The acquisition of these skills can be facilitated through practical, experiential learning methods such as conducting investigations and experiments (Rusmiyati & Yulianto, 2009).

The scientific processes refer to the procedures that are employed in scientific inquiry to cultivate the science process skills of students. These skills are acquired through various activities, including but not limited to observation, communication, hypothesis formulation, and analysis. The significance of KPS lies primarily in the pragmatic approach that recognises the interdependence between scientific knowledge and the investigative methodology employed. The pursuit of scientific knowledge entails not only the acquisition of information but also the ability to effectively gather and synthesise data in order to draw informed conclusions. KPS, or knowledge processing skills, is a skill set that can be utilized throughout one's lifetime for both academic and practical purposes, including survival skills (Rustaman, dkk, in Purnamasari *et al*., 2021). KPS is the ability of students to apply the scientific method, in understanding, developing science and discovering knowledge (Guswita et al., 2018).

Several studies have been conducted to explore strategies for addressing deficiencies in science process skills. According to a study conducted by (Sari et al., 2019) practicum-based learning has been found to enhance both science process skills and scientific attitudes. Research (Gaffar & Sugandi, 2019) on the effectiveness of virtual practicum-based learning tools to improve high school students' science process skills in invertebrate material found that virtual practicum-based learning is more effective in increasing KPS compared to conventional learning. (Royani *et al*., 2018) conducted research on the effect of the practicum-based direct learning model on science process skills and students' critical thinking abilities. Indicating that practicum-based direct learning models have an effect on science process skills and critical thinking skills. The practicum method is one of the learning methods that can enhance affective, cognitive, and psychomotor skills (Abrahams & Millar, 2008). In accordance with the opinion (Saputri, 2021) practicum or experiments are among the activities used to attain science process skills.

Science process competencies are also known as KPS. According to (Rustaman, 2007), cognitive skills are required for students to use their minds to carry out process skills; psychomotor skills involve the use of tools, measurements, and assembling tools; and affective skills allow students to interact with one another during learning activities. In (Yumuşak, 2016) in order for students to consider and acquire information scientifically, facilities and methods are required to support activities or direct experience in developing science process skills. The indicators used are adapted from (Rustaman, 2007) and include observation, interpretation, classification, prediction, undertaking experiments or investigations, communication, hypothesising, concept application, and questioning.

The researcher attempts to provide a solution based on this description by conducting a hybrid Android interface mode practicum that incorporates real and virtual practica. Real practicum is practicum that is conducted directly, and its purpose is to train students' skills. However, due to a lack of equipment and materials in the laboratory, researchers submit an application to support the continuity of practicum so that students can conduct practicum. In this process, the actual practicum will examine smell, colour, pH, and temperature, whereas the virtual practicum will examine turbidity and B3 waste. Virtual laboratories or internships can simulate something intricate or expensive, allowing students to still conduct these experiments (Simamora *et al*., 2022)

Based on the aforementioned description, the researcher will conduct research on the hybrid android interface practicum mode in an effort to develop science process skills and scientific attitudes towards environmental concepts.

Method

This study employs a quasi-experimental design based on the non-equivalent (pretest-posttest) control group design (Creswell, 2019) with a control group and an experimental group. The sample consisted of sixty students from senior high schools in Bandung. Even semester, academic year 2022/2023.

The next step in this research is to start developing an Android-based application that will be used in a virtual practicum. In the laboratory of the Hydrology and Water Environment Agency, accurate data to ascertain pollutant substances were obtained from water sample trials, including Cikapundung river water, waste water, and well water, which were then validated and tested to a limited extent.

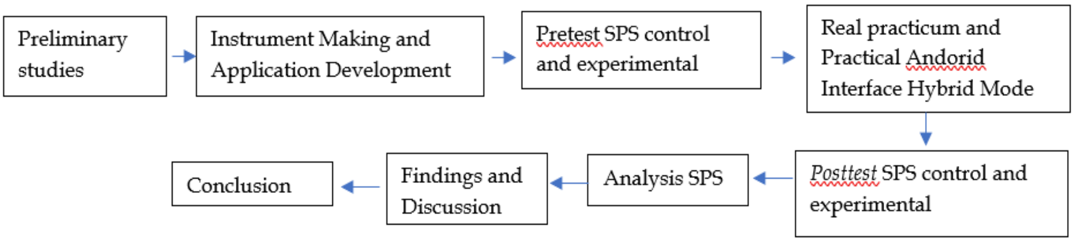

Figure 1. Research Flow

In the course of training science process skills, four meetings are held. The meeting is described in the following section.

Table 1. Learning Process

Meeting	Trained Aspects
First Meeting (3xlesson hours)	Observation, Hypothesis, interpretation
Second Meeting (3xlesson hours)	Hypotheses, predictions, ask questions and plan experiments
Third Meeting (3xlesson hours)	Communicating, interpreting, asking questions, predicting, applying concepts, classifying, planning experiments, and conducting experiments
Fourth Meeting (3xlesson hours)	Communicating, interpreting, asking questions, predicting, applying concepts, classifying, planning experiments, and conducting experiments

Result and Discussion

Science Process Skills

Pretest and posttest results

The reslts of the measurement of science process skills through the pretest and posttest of the control class students and the experimental descriptive statistical tests were carried out as follows:

Table 2. Descriptive Statistic

	Min Score.	Max Score	Mean	Std. Dev	Varians
Pre. Kont	16.41	59.70	36.16	11.41	130.37
Post. Kont	40.29	74.62	55.58	8.76	76.781
Pre. Eks	14.92	55.22	41.54	9.72	94.48
Post. Eks	62.68	88.05	78.35	6.20	38.40

Based on Table 2, the pretest data for the control and experimental classes have been analysed with descriptive statistics, with the following results: The minimum score on the pre-test for the control group was 16.41, the maximum score was 59.70, the mean score was 36.16, the standard deviation was 11.41, and the variance was 130.37. whereas the experimental class ranges from 14.92 to 55.22, has a mean of 41.54, a standard deviation of 9.72, and a variance of 94.48. The analysis is then continued with the prerequisite test; the results indicate a normal and homogeneous data distribution; and the T test provides a score of 0.055, indicating a probability value greater than 0.05. It can be concluded that H_0 is accepted, indicating that there is no significant difference between the control and experimental classes' pretest results. Therefore, the initial abilities of both classes are equal. This is expected because neither class has received instruction. The posttest descriptive statistical data for the control group had a score range of 34.33, a mean of 55.58, a minimum of 40.29, a maximum of 74.62, and a standard deviation of 8.76, whereas the experimental group had a range of 25.37, a minimum of 62.68, a maximum of 88.05, and a standard deviation of 6.19. The analysis was then continued with a test requiring a normal and homogeneous distribution, followed by the T test, which yielded a score of 0.000. This indicates a probability value less than 0.05, thereby rejecting the null hypothesis that there is no significant difference between the control and experimental posttest scores. This demonstrates that the hybrid Android interface practicum mode can enhance science process skills. Moreover, it appears that the average pre- and post-test scores for both the experimental and control groups have changed. The average posttest score for both divisions was higher than the average pretest score.

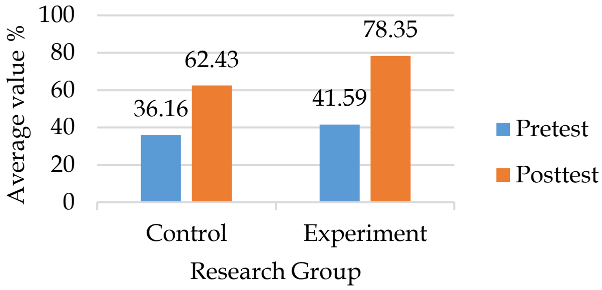

Figure 2. Science Process Skills Results

According to the findings presented in Figure 2, students were administered a pretest to assess their initial knowledge prior to engaging in the learning process. The pretest questions were designed to gauge their baseline understanding of the subject matter. This procedure was conducted in both the control and experimental groups. The control group's pretest outcomes yielded an average score of 36.16, whereas the experimental group's pretest outcomes yielded an average score of 41.59. Subsequently, the students are provided with educational instruction over the course of four sessions. The posttest questions are designed to assess the knowledge of students following their practicum learning in the hybrid Android interface mode. The mean score of the control group was 62.34. Despite the lack of hands-on experience in the experimental class, the teacher facilitates the development of science process skills through activities, resulting in improved posttest scores. The experimental group's posttest score of 78.35 demonstrated a significant improvement from their pretest score. Students receive training in using the scientific method through a hybrid Android interface practicum mode that involves direct experience. It is in line with the idea (Subiantoro,2014) stating that students develop and apply science process skills through practicum to acquire knowledge.

Practising KPS through practicum is an effort to help students gain success in learning. In addition, this requires students to gain direct experience so that they are able to develop the skills they have in their learning (Arsih et al., 2018). In accordance with (Anita, 2022) assertion , practicum has the potential to enhance the skill set of students. According to Rustaman, 2011 dalam (Suryaningsih, 2017) suggests that through practical training, students gain more confidence in their knowledge acquisition beyond what they receive from teachers and textbooks. This experience can enhance their learning, foster a scientific mindset, and improve their long-term memory retention. This study incorporates both real and virtual practicums as a means of providing comprehensive training to students. The limitations brought about by a lack of laboratory supplies and resources are the focus of the virtual practicums. Furthermore, the virtual practicums are believed to enhance the learning experience by fostering greater enthusiasm and effectiveness among students, as noted by (Špernjak & Šorgo, 2018). Furthermore, (Ishafit, 2019) thinks that a virtual practicum offers a significant virtual encounter in comprehending crucial scientific concepts, principles, and procedures. Additionally, students are afforded the chance to replicate experiments with varying objectives. The implementation of KPS can be enhanced through the provision of worksheets that are tailored to incorporate KPS elements, thereby enabling students to cultivate their competencies (Yulasti et al., 2018, Ritmayanti, 2017).

In order to assess the effect of practicum activities conducted in the hybrid android interface mode on students' Science Process Skills (KPS), N-Gain calculations were employed to quantify the observed increase in said skills. Figure 3 presents the N-Gain category recapitulation results.

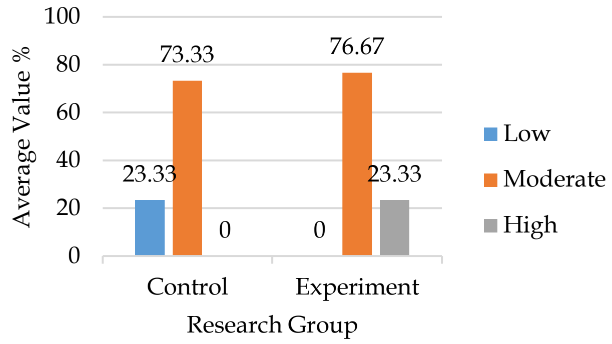

Figure 3. Skills Improvement Categories Student Science Process

The results in section 3. indicate that the control group's average score increased by one person who did not experience an increase, 15 people experienced a low increase with an average of 50%, and 14 people experienced a moderate increase with an average of 46.67%. In the experimental group, 23 individuals demonstrated a moderate increase with an average of 76.67%, while seven individuals demonstrated a high increase with an average of 23.33%. Both control and experimental groups exhibited an increase in Ngain, with the experimental group demonstrating a more significant increase than the control group.

The hybrid android interface mode has led to an improvement in students' Science Process Skills (KPS) through practicum learning. Consistent with (Hidayah, 2014) research, practicum instructions can enhance students' science process skills, resulting in a moderate average N-gain of 0.6. (Murniati et al., 2018) found that the developed practicum instructions demonstrated a high level of proficiency in science process skills. From these data, the two classes experienced an increase. However, in the experimental class, some students experienced an increase in the high category, while for the control class, it was only limited to the moderate category. With these data, learning with the practicum mode of the hybrid Android interface significantly affects the increase in skills of The Science Process (KPS).

Science Process Skills Data in this study consisted of 9 aspects: Observation, Interpretation, Classification, Prediction, Communicating, Hypothesizing, conducting experiments or investigations, applying concepts and Asking Questions measured using description questions. The following describes the achievement of aspects of science process skills.

Table 3. Skill Aspect Achievement Science Process Before Learning

KPS Aspects	Control %	Category	Experiment %	Category
Observation	44.17	Fair	45.83	Fair
Interpretation	37.78	Bad	45.00	Fair
Classification	37.78	Bad	43.33	Fair
Prediction	36.67	Bad	48.34	Fair
Communicating	27.50	Bad	36.24	Bad
Hypothesizing	30.46	Bad	38.89	Bad
Conducting Experiments or Investigations	41.11	Fair	41.67	Fair
Applying Concepts	41.67	Fair	43.34	Fair
Asking Questions	37.09	Bad	35.84	Bad

Table 3 displays the Science Process Skills indicator achievement results. The control class comprises three aspects categorised as Enough and six aspects categorised as Bad. The experimental class exhibits six aspects categorised as adequate and three aspects categorised as poor. It occurs due to students' lack of prior learning and their status as novices. The data indicates a lack of understanding among students regarding science process skills, as evidenced by the categories within each indicator. Insufficient practicum implementation in schools, caused by inadequate laboratory facilities and the use of laboratories as classrooms, can result in students' unfamiliarity with practicum. (Jack,2013) attributed the low Science Process Skills of students to factors such as inadequate scientific background and laboratory infrastructure. Additionally, Nirwana *et al*., (2014) identified inappropriate learning methods as a cause of low KPS, which hinder the development of these skills. teachers have not been able to make KPS instruments (Diella & Ardiansyah, 2019). The achievement of indicators after conducting learning is in Table 4.

Table 4. Achievement of KPS Indicators After Learning

KPS Aspect	Control %	Category	Experiment %	Category
Observation	60.84	Fair	71.25	Good
Interpretation	61.30	Good	78.25	Good
Classification	62.28	Good	86.12	Very Good
Prediction	62.22	Good	84.45	Very Good
Communicating	47.08	Fair	63.33	Good
Hypothesizing	53.80	Fair	79.63	Good
Conducting Experiments or Investigations	55.00	Fair	83.34	Very Good
Applying Concepts	53.89	Fair	88.34	Very Good
Asking Questions	48.89	Fair	82.43	Very Good

Table 4 displays the results pertaining to the attainment of the Science Process Skills metric. The control group exhibited 6 indicators that were deemed adequate and 3 indicators that were categorized as good. Conversely, the experimental group demonstrated a marked improvement, as evidenced by 4 indicators that were classified as good and 5 indicators that were rated as very good. The experimental group experienced a notable alteration as a result of the differential learning opportunities provided to the two groups. Specifically, the experimental group received instruction through a combination of riil practicum and an android interface hybrid mode practicum.

The situation can be attributed to the fact that the students had completed their practicum utilizing the hybrid Android interface mode. The pedagogical approach involves providing practical training to students through direct observation of trains, thereby equipping them with the skills to apply the scientific method in problem-solving. The assertion that the practicum method facilitates the development of skills related to formulating hypotheses, designing experiments, data collection, and data interpretation is substantiated by (Agustina et al., 2021). The subsequent text delineates each facet of science process skills.

Observation Skills

The experimental class demonstrated a higher level of achievement in the observation skill aspect than the control class. In this particular skill, the control and experimental classes are assigned identical tasks. Specifically, they are required to investigate an environmental issue within the vicinity of their respective residences. They conduct observations on sites that are deemed to be contaminated or unclean. Subsequently, the participants are prompted to explain the observed phenomenon, to enhance their attentiveness towards contaminated surroundings. In training to determine pollution causes, the experimental class is directed to a real problem in the field so that they are better trained in the observation process. It can be seen from the answers they answered in the control class; only a few students answered close to alternative answers, even though they only mentioned them without giving specific explanations, while in the experimental class, almost all answered according to the alternative answers, "the condition of the water is clear, namely the color of the water is clear, and it is not colored, while the condition of turbid water is colored and turbid water "this is evidenced by the results of an average score in the control class of 60.84% in the good category and in the experimental class of 71.25 in the good category. The data shows that most students do not experience difficulties in observing.

Observation, according to (Agustina et al., 2018), is an observation activity that directly involves the five senses in an action. In the view of (Roa & Fajardo, 2022) , practicing good observation entails direct observation of the environment in which people live. Practicum is one of the best vehicles for building observing abilities; therefore, an increase in the experimental class is a natural result of this study's usage of practicum. Furthermore, when students have good observation abilities, it affects their interest, making the learning process more relevant (Susanti et al., 2019). In this study, the practicum was carried out not only in real but virtually. (Saputri, 2021)(Saputri, 2021) in her research stated that virtual practicum with the help of PhET simulation could increase student observation with a score of 0.49 in the medium category, and (Suansah, 2015) stated that observation skills are a basic skill that every individual must possess.

Interpretation skills

The experimental class outperforms the control class in terms of interpretive skills. During the training procedure, students are shown a graph showing the Cikapundung River's pollutant load in recent years. Then they interpreted which year had the highest pollution load, and students were provided data in tabular form to assess their interpretive skills. The results can be seen from the average score in the control class obtaining a score of 61.30% in the good category, while the experimental class obtained a score of 78.28%. Both belong to the good category; although both have the same category, the experimental class obtains a higher score; this is natural considering the experimental class's ability to interpret the data collected. According to Solpa et al., (2022) states that interpretation skills will develop if students are able to conclude the results of the investigations that have been carried out. (Dimyati, 2009 in (Khairunnisa et al., 2020) state that the interpretation of observed data draws tentative conclusions from the data recorded. Research (Saputri, 2021) showed that virtual practicum with the help of PhET simulation could improve interpretation skills with a score of 0.42 with the medium category.

Classification Skills

The experimental class performed better in terms of the classification aspect than the control class. Students practice this skill by categorizing the causes of polluted rivers into physical and chemical categories. In the process of evaluating this aspect's accomplishment, the results of the control class provided some of the requested information, such as "color physics, B3 chemistry, and biology, specifically bacteria." While the majority of the experimental class responded similarly to alternative questions. They responded, "Physical factors, including color, temperature, pH, and turbidity; chemical factors, including zinc and copper; and biological factors, including bacteria." Observed from the posttest data, the control group achieved 62.28 percent results in the good category, while the experimental group achieved 84.45 percent results in the very good category; thus, the experimental group scored higher. This is evident when their learning process develops a deeper understanding of classification. (Lestari & Diana, 2018) mentioned that classification describes observations obtained separately, determining differences, similarities, and determining characteristics; in the learning process, students are more flexible in determining this through practicum methods that provide time to identify these things, so it is reasonable if the experimental class gets a very good category. Increased classification skills occur as a result of students conducting experiments using PhET-based virtual applications (Utami & Adilla, 2022).

Prediction Skills

The experimental class performed better on the prediction aspects than the control class, as evidenced by the responses of the experimental and control classes. In the control group, they responded differently than the alternative response, "The water will be polluted, smelly, and harmful." In contrast, the experimental group responded similarly to the alternative response, "The water will be polluted because B3 waste is increasing each year." The average posttest score for the control group was 62.22 percent in the good category, whereas the experimental group averaged 84.45 percent in the very good category. This increase is strongly associated with students' observation capacity (Susanti et al., 2019). When pupils are adept at observing objects, they will also be adept at predicting the underlying causes of what they observe. Increased prediction skills occur as a result of students conducting experiments using PhET-based virtual applications (Utami & Adilla, 2022).

Communication Skills

The experimental group outperformed the control group in terms of communication achievement. The responses of the control and experimental courses demonstrate this. In the control group, they responded differently than the alternatives: "Don't include the x or y axis, they only draw from changing to tables/graphs," whereas the experimental group responded similarly to the alternatives: "Change tables into graphs, or change graphs into tables, such things that make the experimental group score higher." The average posttest score for the control group was 47.08% in the good category, whereas the experimental group averaged 53.33% in the good category. During the learning process, the experimental class asked more questions about communication practice, whereas the control class appeared to comprehend but did not know what the x and y axes were. It is supported by research (Agustina & Saputra, 2016) indicating that practical communication skills include the ability to convey information verbally or through images or tables. It indicates that students have communication skills if they can transform tables into graphs or communicate orally. Communication skills are very important for students because they can improve other skills (Firdaus & Subekti, 2021). Supported by Wahyudi dan Lestari, (2019) states that communication skills can be done by presenting pictures, diagrams, graphs, tables, maps or words or descriptions.

Hypothesize Skills

The experimental cohort is more successful in the hypothesized aspect than the control group. The responses of the control and experimental courses demonstrate this. Some students in the control group responded with queries containing the words why and whether such as "Why is COD a pollutant?" The source of the contamination of the Cikapundung river is B3 waste, whereas the experimental class provided answers similar to the alternatives give answers in the form of statements. This increases the experimental class. The average posttest score of the control group was 53.80% in the good category, whereas the experimental group averaged 79.63% in the good category. The aforementioned statement aligns with the findings of Agustina *et al*., (2021) research, which suggests that the practicum approach facilitates the development of skills related to formulating hypotheses, designing experiments, gathering data, and analyzing data.

Planning an Experiment or Investigation

The achievement of planning an experiment or investigation of the experimental class is higher than that of the control class. This can be seen from the answers of the control and experimental classes. Some of the students in the control class answered, "only provide answers to solutions without including tools, materials?". While the experimental class answered close to alternative answers, "providing answers in the form of solutions containing tools, materials and work steps". This makes the experimental class higher. It can be seen from the posttest average score of the control class obtaining 55.00% in the good category. In comparison, the experimental class obtained an average score of 83.84% in the very good category. According to (Rahmasiwi et al., 2015), there is a correlation between an upsurge in hypothesis submissions and a rise in the planning of experiments. Proficient students in hypothesis formulation will strategize experiments to verify the validity of said hypotheses. (Yunita & Nurita, 2021) assert that in the context of training planning experiments, educators must create avenues for learners to articulate their thoughts and perspectives.

Applying the Concept

The achievement aspect of the experimental class's application of the concept is greater than that of the control class. The responses of the control and experimental courses demonstrate this. Some students in the control group did not comprehend the concept's application. While the experimental class responded in a manner similar to the alternative answer, "applying concepts to new experiences to explain what occurred," This increases the experimental class. The average posttest score of the control group was 53.89 percent in the good category, whereas the experimental group averaged 88.34 percent in the very excellent category. Demonstrates that the practicum method in the hybrid Android interface mode permits students to elucidate newly encountered concepts. It is supported by (Rustaman, 2007), which states that if students can explain new events using previously acquired concepts, they employ the learned principles. According to Fitriana *et al*., (2019) Students with the skills to apply good concepts will find it easy to solve new problems based on their learning outcomes. This is in line with Solpa *et al*., (2022) students who have the skills to apply concepts will be trained to solve problems in everyday life.

Asking Question

In the experimental class, asking queries resulted in better results than in the control group. This is evident from the responses of the control and experimental classes; some control class pupils responded, "2 questions?" While the experimental class provided an answer close to the alternative, "answering three questions," This increases the experimental class. The average posttest score of the control group was 48.89% in the good category, whereas the experimental group averaged 82.43% in the excellent category. Improving observational abilities is correlated with asking more questions (Rahmasiwi et al., 2015). When students master observation skills, they will naturally be skilled in observing, allowing them to ask inquiries about what they observe if something is not understood.

In practicing Science Process Skills for four meetings, students were given instructions to observe the environment around their house in the first meeting. This trains students' observational abilities; then, students work on student worksheets that contain indicators of hypotheses and interpretations. At the second meeting, the SPS indicators trained were hypotheses, predictions, and asking questions listed in the student worksheets and planning experiments; then, in the third and fourth meetings, students were trained on SPS indicators, namely communicating, data interpretation, asking questions, predictions, applying concepts, classifying, planning an experiment, conducting an experiment. All of these exercises are trained using the practicum method, which is student-centered; with learning that trains the scientific method, students can improve observing skills and record data.

Conclusion

The study's findings led to the conclusion that Science Process Skills (SPS) abilities can be enhanced through practicum activities in the hybrid Android interface mode. The augmentation of nine facets subsequent to the acquisition of knowledge is evident. This is corroborated by Dewi et al., (2019) research, which posits that practicum has the potential to enhance students' science process skills and scientific disposal. Furthermore, the outcomes of the enhancement are influenced by the frequency of meetings conducted, which enhances students' familiarity with the capabilities of KPS. During the learning process, students in both the control and experimental classes underwent practicum. However, the practicum in the control class solely involved riil, whereas the experimental class conducted a hybrid android interface mode practicum that combined both real and virtual applications. This approach was novel for students, particularly those in SMA Bandung, and served as a primary point of interest. In addition to its novelty, this practicum approach fostered greater student engagement. By increasing KPS abilities, students are expected to be able to solve problems scientifically, because KPS is not only beneficial for students and teachers in the school environment but is also beneficial for the general public to solve their problems (Aktamis & Ergin, 2008).

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Conflicts of Interest

No conflicts of interest

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