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**ORIGINAL RESEARCH**

# PROFILE OF MEDICAL STUDENTS' METACOGNITIVE SELF-REGULATED LEARNING STRATEGIES IN PBL GROUP DISCUSSION DURING THE LIMITED FACE-TO-FACE LEARNING PERIOD

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## ABSTRACT

**Background:** The change in the learning environment, from fully online to limited face-to-face could affect the use of metacognitive self-regulated learning (SRL) strategies in carrying out Problem-Based Learning (PBL) group discussions as one of the main learning methods in the faculty of medicine in Indonesia or elsewhere. The study aimed to describe the profile of metacognitive SRL strategies in conducting PBL group discussions during the limited face-to-face learning period.

**Methods:** This was a descriptive quantitative observational study conducted at The Faculty of Medicine, Universitas Jenderal Soedirman during the implementation of limited face-to-face learning in the even semester of 2021/2022. Undergraduate students selected by total sampling were asked to fill in a questionnaire that was adapted from the MSLQ. The frequency of a learning strategy application for each of 22 examples of metacognitive SRL strategies differed into: never; rarely; frequently; or always.

**Results:** The response rate was 57.93% (199 students). Most (70.4%) of the respondents were women and had an average of 19.6 years old. Learning strategies with the largest proportion of "always" and "frequently" applied (44.58% - 65.38%) were related to identifying reading/learning needs; learning from peer feedback; and keeping focus. Learning strategies with the largest proportion of "rarely" and "never" (30.12% - 53.13%) were related to monitoring and evaluating achievement and applying reflective learning.

**Conclusion:** The profile of the implementation of learning strategies during the limited face-to-face learning period has been identified. Efforts need to be made to improve students' abilities in implementing learning strategies that are rarely and never used.

**Keywords:** metacognitive, learning strategy, limited face-to-face learning, self-regulated learning

**PRACTICE POINTS**

- Most of the students have already gained a certain level of familiarity with using learning strategies related to reading/learning needs identification; learning from peer feedback; and keeping focus. The implementation of those strategies should be appreciated and maintained.
- Most of the students less or never applied some learning strategies related to the monitoring and evaluation of achievements and the application of reflective learning. The institution may prioritize analyzing the underlying factors involved, then take some appropriate intervention approaches, such as improving what has already been done and training both the students and the tutors.

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## INTRODUCTION

After two years of experiencing the Covid-19 pandemic, in 2022 we have come to the opportunity to enter the new normal era. In Indonesia, the government instructed schools and universities to deliver *Pembelajaran Tatap Muka Terbatas (PTMT)* or limited face-to-face learning to accommodate both the learning needs fulfillment and infection prevention health protocol compliance. The shifting method adopted required students to take turns in periodically carrying the learning methods offline, while at the same time, others joined online. This change in the learning environment, from fully online to limited face-to-face, could affect the use of self-regulated learning (SRL) strategies in carrying out Problem-Based Learning (PBL) group discussions[1] as one of the main learning methods in the faculty of medicine in Indonesia or elsewhere.

SRL is a process by which students use different strategies to regulate their cognition, motivation, behaviour, and context.[2] It involves an individual student's active, goal-directed, self-control of behaviour, motivation, and cognition for academic tasks. According to Broadbent[3], college students used the same SRL strategies, which consist of cognitive, metacognitive, and resource management learning strategies, regardless of the characteristic of learning environments, but differed only in frequency and intensity. In this study, we focused on metacognitive learning strategies.

Metacognition refers to the awareness, knowledge, and control of cognition. Metacognitive learning strategies are learning strategies that help students control and regulate their own cognition. Three general processes that make up metacognitive learning strategies or self-regulatory activities are planning (setting goals); monitoring (of one's comprehension); and regulating or fine-tuning (e.g., adjusting reading speed depending on the task). Planning activities such as goal setting and task analysis help to activate, or prime, relevant aspects of prior knowledge that make organizing and comprehending the material easier. Monitoring activities include tracking one's attention as one read, and self-testing and questioning: these assist the learner in understanding the material and integrating it with prior knowledge. Regulating or

fine-tuning refers to the fine-tuning and continuous adjustment of one's cognitive activities. Regulating activities are assumed to improve performance by assisting learners in checking and correcting their behaviour as they proceed on a task.[4]

Many studies show that PBL group discussions encourage students to apply cognitive, metacognitive and resource management SRL strategies. Metacognitive SRL strategies applied in PBL include: revising ideas and realizing deficiencies in one's knowledge or the need for some information while discussing and listening to friends' opinions; planning and monitoring; analysing and discussing problems in order to be aware of knowledge gap, to determine strengths and weaknesses, to control the learning process and to develop self-regulation abilities; and evaluating self and others.[5–7] Therefore, we intended to look for the profile of medical students' metacognitive self-regulated learning strategies in PBL group discussions during the limited face-to-face learning period.

## METHODS

This was a descriptive quantitative observational study conducted at The Faculty of Medicine, Universitas Jenderal Soedirman (FK Unsoed), Central Java, Indonesia during the implementation of limited face-to-face learning in the even semester of the 2021/2022 academic year. In there, limited face-to-face learning was applied to lectures and PBL group discussions, while, other learning methods and assessment methods were conducted fully offline.

One hundred and ninety-nine undergraduate students (57.93% of the total batch 2019, 2020, 2021 students) were willing to participate in the study. The respondents were given an online questionnaire that consisted of 22 examples of metacognitive learning strategies that were spread across 3 general processes of self-regulation activity of metacognition, namely planning, monitoring, and fine-tuning[4]. The questionnaire used was an adaptation of the Motivated Strategies for Learning Questionnaire (MSLQ)[8]. We only used the learning strategy section, especially the metacognitive self-regulation sub-component. This questionnaire was intended to determine the frequency of application

of various examples of metacognitive learning strategies. Therefore, learning strategy statements in Learning and Study Strategy Inventory (LASSI)[9] and Academic Self-Regulated Learing Scale (A-SRL-S)[10] that were related to the understanding of metacognitive self-regulation in MSLQ (i.e., strategies that help students control and regulate their own cognition) were also added. These were: statements from goal setting, self-evaluation and planning and organization sub-scales of A-SRL-S, and from test strategies, self-testing, and selecting the main idea sub-scales of LASSI. This was done through discussion and agreement between authors with master medical education degree (author 1 and 2) while making table of conformity between learning strategies statements in learning strategies sub-components of the MSLQ, LASSI, A-SRL-S (Table 1).

The use of the three SRL measurement instruments supported the construct validity and content validity of this questionnaire. All three instruments have good validity and reliability.[8,9,11] Likewise, the results of Magno's research[12] show that the three have a similar construct. The face validity of the questionnaire was tested by the researcher asked 9 students (3 students from each batch) separately to interpret the meaning of each statement in the questionnaire. The researcher found that all of the students had proper understanding about each of the statements in the questionnaire. During the data collection process which were conducted through zoom meetings, the researcher guided the filling by first explaining the meaning of each statement and providing examples whenever needed to clarify and prevent misunderstandings by the respondents. Respondents were asked to perceive the frequency of application of each learning strategy statement in preparing and carrying out PBL tutorial during limited face-to-face learning period. They were asked to select one of the answer choices, namely: never apply the strategy; rarely applied the strategy (or consistently used the strategy only in 1 to 2 out of 6 blocks during the semester); frequently applied the strategy (or consistently used the strategy only in 3 to 5 out of 6 blocks during the semester); or always applied the strategy throughout the semester. Those who did not have the chance to join the zoom meetings can replay the recorded sessions at any time as needed. They could also use the WhatsApp group discussion or private chat whenever any clarification was needed.

**Table 1. Learning Strategies Sub-Components Conformity in MSLQ, LASSI, A-SRL-S**

| Learning Strategies Sub-Components in | | |
|---|---|---|
| **MSLQ (Pintrich, 2004)** | **LASSI (Cano, 2006)** | **A-SRL-S (Magno, 2010)** |
| rehearsal | information processing | memory strategy |
| elaboration | test strategies | |
| **metacognitive self-regulation** | **test strategies** | **goal setting** |
| **metacognitive self-regulation** | **self-testing** | **self-evaluation** |
| peer learning | study aid | seeking assistance |
| Help-seeking | | |
| time and study environment | time management | environmental structuring |
| | test strategies | |
| **metacognitive self-regulation** | **selecting main idea** | **planning and organization** |
| time and study environment | test strategies | |
| effort regulation | concentration | learning responsibility (in the motivation component) |
| organization | - | - |
| critical thinking | - | - |

The data was analyzed univariately. For each metacognitive learning strategy statement, the researcher recorded student answers based on the frequency of their application. Results are presented in numbers (n) and proportions (percentage of the number of answers per total respondent from the three batches). In order to provide information regarding the intervention priority that can be carried out by the institution, we also presented the results in each batch on 1) learning strategies that need to be maintained. This would be learning strategies with the largest proportion of answers in the implementation frequency types of "always" and "frequently" and learning strategies with the least proportion of answers in the implementation frequency types of "rarely" and "never"; 2) learning strategies that need to be improved or trained. This would be learning strategies with the least proportion of answers in the implementation frequency types of "always" and "frequently" and learning strategies with the largest proportion of answers in the implementation frequency types of "rarely" and "never". The Ethical clearance had been granted by Ethical Committee, FK Unsoed No. 013/KEPK/PE/V/2022.

**RESULTS AND DISCUSSIONS**

The total population of batch 2019, 2020 and 2021 was 359 students. Based on Slovin formula,[13] using margin of error 0.05, the minimal sample size calculated was 190. Thus, although the response rate was only 199 or 57.93 %, this was already over the minimal sample size. Most (70.4%) of the respondents were women and had an average of 19.6 years old. The profile of metacognitive learning strategies application by all of the respondents as shown in Table 2. In order to provide information regarding interventions priority that can be carried out by the institution, we divided the results into learning strategies need to be maintained (Table 3) and learning strategies need to be improved or trained (Table 4). Table 3 showed learning strategies with the largest proportion of answers in the implementation frequency types of "always" and "frequently" and learning strategies with the least proportion of answers in the implementation frequency types of "rarely" and "never" . This implied, although grossly, that the students have already gained a certain level of familiarity with using these learning strategies, thus the implementation should be appreciated and maintained. Table 4 showed learning strategies with the least proportion of answers in the implementation frequency types of "always" and "frequently" and learning strategies with the largest proportion of answers in the implementation frequency types of "rarely" and "never". This implied that the institution may prioritize to analyse factors that have caused these learning strategies were less or never being applied by the students, then take some appropriate intervention approaches, such as improvement or training.

**Table 2. Metacognitive Learning Strategies Application by All of the Respondents**

| no | Metacognitive learning strategies | always | | frequently | | rarely | | never | | total | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % | n | % | n | % |
| | sub-scale: planning | | | | | | | | | | |
| 1 | Read the BPM to find out the learning achievements of the appropriate lecture topics. | 86 | 43.22% | 59 | 29.65% | 46 | 23.12% | 8 | 4.02% | 199 | 100.00% |
| 2 | Read the material at a glance first (scanning) to find out the composition of the material to be read before then reading it in its entirety. | 101 | 50.75% | 61 | 30.65% | 28 | 14.07% | 9 | 4.52% | 199 | 100.00% |
| 3 | Establish early on learning goals to direct activities in each learning period. | 47 | 23.62% | 55 | 27.64% | 68 | 34.17% | 29 | 14.57% | 199 | 100.00% |
| | sub-scale: monitoring | | | | | | | | | | |
| 4 | Asking yourself to make sure you understand what you have learned (self-assessment). | 44 | 22.11% | 76 | 38.19% | 58 | 29.15% | 21 | 10.55% | 199 | 100.00% |

| no | Metacognitive learning strategies | Types of application frequency | | | | | | | | | |
|----|-----------------------------------|--------|-------|-----------|-------|--------|--------|-------|--------|-------|---------|
| | | **always** | | **frequently** | | **rarely** | | **never** | | **total** | |
| | | n | % | n | % | n | % | n | % | n | % |
| 5 | Raise questions while reading the material to help focus on which references need to be read further in the PBL group discussion. | 41 | 20.60% | 71 | 35.68% | 60 | 30.15% | 27 | 13.57% | 199 | 100.00% |
| 6 | Trying not just to read, but to think about what should be learned from the reading material. | 77 | 38.69% | 67 | 33.67% | 48 | 24.12% | 7 | 3.52% | 199 | 100.00% |
| 7 | Identifying concepts that are not well understood while studying. | 49 | 24.62% | 91 | 45.73% | 50 | 25.13% | 9 | 4.52% | 199 | 100.00% |
| 8 | When you encounter confusion while reading material, you already have the intention to re-read it in order to understand it better. | 45 | 22.61% | 70 | 35.18% | 64 | 32.16% | 20 | 10.05% | 199 | 100.00% |
| 10 | While participating in activities on campus, trying to focus, not thinking about other things so as not to miss important things. | 73 | 36.68% | 93 | 46.73%* | 30 | 15.08% | 3 | 1.51% | 199 | 100.00% |
| 15 | Monitor/record progress points in work being done (not only at the end of work) | 16 | 8.04% | 46 | 23.12% | 58 | 29.15% | 79 | 39.70% | 199 | 100.00% |
| 18 | Evaluate achievement at the end of each study session | 55 | 27.64% | 50 | 25.13% | 65 | 32.66% | 29 | 14.57% | 199 | 100.00% |
| 20 | Conducting reflection in action, namely while attending lectures/discussions, while adding critical incidents in a simple reflection log/diary. | 20 | 10.05% | 38 | 19.10% | 63 | 31.66% | 78 | 39.20% | 199 | 100.00% |
| | **sub-scale: fine-tuning** | | | | | | | | | | |
| 9 | Trying to change the way of reading a material to better understand it. | 56 | 28.14% | 77 | 38.69% | 47 | 23.62% | 19 | 9.55% | 199 | 100.00% |
| 11 | Changing the way of learning to suit Block's demands and the lecturer's teaching style. | 48 | 24.12% | 51 | 25.63% | 67 | 33.67% | 33 | 16.58% | 199 | 100.00% |
| 12 | Responds/listens seriously to comments/evaluations/feedback from others on self-performance or work results. | 109 | 54.77% | 74 | 37.19% | 15 | 7.54% | 1 | 0.50%# | 199 | 100.00% |
| 13 | Ask for other people's opinions on the results of the work before submitting it to the lecturer, so that what is collected is the best version. | 30 | 15.08% | 44 | 22.11% | 57 | 28.64% | 68 | 34.17% | 199 | 100.00% |
| 14 | Ask for opinions from people who are more competent about self-performance. | 35 | 17.59% | 43 | 21.61% | 49 | 24.62% | 72 | 36.18% | 199 | 100.00% |
| 16 | Evaluate achievement at the end of each study session | 37 | 18.59% | 51 | 25.63% | 75 | 37.69%* | 36 | 18.09% | 199 | 100.00% |
| 17 | Open to changes based on feedback received. | 116 | 58.29%* | 72 | 36.18% | 9 | 4.52%# | 2 | 1.01% | 199 | 100.00% |
| 19 | Compile a simple reflection log/diary in preparation for lectures/group discussions/exams. | 28 | 14.07% | 44 | 22.11% | 63 | 31.66% | 64 | 32.16% | 199 | 100.00% |
| 21 | Conducting reflection on action, namely reflecting on experiences related to the learning process while attending lectures/discussions/examinations, what has and has not gone well, what are the causes and consequences, what are the next steps. | 29 | 14.57% | 55 | 27.64% | 66 | 33.17% | 49 | 24.62% | 199 | 100.00% |
| 22 | Discuss the development of a simple reflection log/diary with other people (close friends/academic advisor lecturers/tutors) | 15 | 7.54%# | 32 | 16.08%# | 51 | 25.63% | 101 | 50.75%* | 199 | 100.00% |

*the largest proportion in the related type of application frequency; # the least proportion in the related type of application frequency

**Table 3. Metacognitive Learning Strategies Need to be Maintained**

| Proportion | Batch | No. | Metacognitive learning strategies | Sub-scale | % |
|---|---|---|---|---|---|
| Largest % in "always" | 2019 | 2 | Read the material at a glance first (scanning) to find out the composition of the material to be read before then reading it in its entirety. | planning | 48.44 |
| | | 17 | Open to changes based on feedback received. | fine-tuning | 48.44 |
| | 2020 | 12 | Responds/listens seriously to comments/evaluations/ feedback from others on self-performance or work results. | fine-tuning | 65.38 |
| | | 17 | Open to changes based on feedback received. | fine-tuning | 65.38 |
| | 2021 | 12 | Responds/listens seriously to comments/evaluations/ feedback from others on self-performance or work results. | fine-tuning | 61.45 |
| | | 17 | Open to changes based on feedback received. | fine-tuning | 61.45 |
| Largest % in "frequently" | 2019 | 12 | Responds/listens seriously to comments/evaluations/ feedback from others on self-performance or work results. | fine-tuning | 53.13 |
| | 2020 | 10 | While participating in activities on campus, trying to focus, not thinking about other things so as not to miss important things. | monitoring | 51.92 |
| | 2021 | 7 | Identifying concepts that are not well understood while studying. | monitoring | 44.58 |
| Least % in "rarely" | 2019 | 17 | Open to changes based on feedback received. | fine-tuning | 4.69 |
| | 2020 | 17 | Open to changes based on feedback received. | fine-tuning | 3.58 |
| | 2021 | 17 | Open to changes based on feedback received. | fine-tuning | 4.82 |
| | | 12 | Responds/listens seriously to comments/evaluations/ feedback from others on self-performance or work results. | fine-tuning | 4.82 |
| Least % in "never" | 2019 | 12 | Responds/listens seriously to comments/evaluations/ feedback from others on self-performance or work results. | fine-tuning | 0,00 |
| | | 17 | Open to changes based on feedback received. | fine-tuning | 1.56 |
| | 2020 | 17 | Open to changes based on feedback received. | fine-tuning | 0.00 |
| | | 12 | Responds/listens seriously to comments/evaluations/ feedback from others on self-performance or work results. | fine-tuning | 1.92 |
| | 2021 | 12 | Responds/listens seriously to comments/evaluations/ feedback from others on self-performance or work results. | fine-tuning | 0.00 |
| | | 17 | Open to changes based on feedback received. | fine-tuning | 1.20 |

From the table 3, there were 5 metacognitive learning strategies need to be maintained. These were: 1) Read the material at a glance first (scanning) to find out the composition of the material to be read before then reading it in its entirety; 2) Identifying concepts that are not well understood while studying (both are related to reading/learning needs identification); 3) Open to changes based on feedback received; 4) Responds/listens seriously to comments/evaluations/feedback from others on self-performance or work results (both are related to learning from peer feedback); 4) While participating in activities on campus, trying to focus, not thinking about other things so as not to miss important things (related to keeping focus).

**Table 4. Metacognitive Learning Strategies Need to be Improved or Trained**

| Proportion | Batch | No. | Metacognitive learning strategies | Sub-scale | % |
|---|---|---|---|---|---|
| **Largest % in "rarely"** | 2019 | 16 | Evaluate achievement at the end of each study session | fine-tuning | 50.00 |
| | 2020 | 16 | Evaluate achievement at the end of each study session | fine-tuning | 46.15 |
| | 2021 | 5 | Raise questions while reading the material to help focus on which references need to be read further in the PBL group discussion. | monitoring | 30.12 |
| **Largest % in "never"** | 2019 | 22 | Discuss the development of a simple reflection log/diary with other people (close friends/academic advisor lecturers/tutors) | fine-tuning | 53.13 |
| | 2020 | 22 | Discuss the development of a simple reflection log/diary with other people (close friends/academic advisor lecturers/tutors) | fine-tuning | 51.92 |
| | | 15 | Monitor/record progress points in work being done (not only at the end of work) | monitoring | 48.19 |
| | 2021 | 22 | Discuss the development of a simple reflection log/diary with other people (close friends/academic advisor lecturers/tutors) | fine-tuning | 48.19 |
| **Least % in "always"** | 2019 | 21 | Conducting reflection on action, namely reflecting on experiences related to the learning process while attending lectures/discussions/examinations, what has and has not gone well, what are the causes and consequences, what are the next steps. | fine-tuning | 6.25 |
| | | 20 | Conducting reflection in action, namely while attending lectures/discussions, while adding critical incidents in a simple reflection log/diary. | fine-tuning | 6.25 |
| | 2020 | 20 | Conducting reflection in action, namely while attending lectures/discussions, while adding critical incidents in a simple reflection log/diary. | monitoring | 3.85 |
| | 2021 | 15 | Monitor/record progress points in work being done (not only at the end of work) | monitoring | 6.02 |
| **Least % in "frequently"** | 2019 | 16 | Evaluate achievement at the end of each study session | fine-tuning | 12.50 |
| | 2020 | 22 | Discuss the development of a simple reflection log/diary with other people (close friends/academic advisor lecturers/tutors) | fine-tuning | 13.46 |
| | 2021 | 20 | Conducting reflection in action, namely while attending lectures/discussions, while adding critical incidents in a simple reflection log/diary. | monitoring | 16.87 |

From the table 4, there were 6 metacognitive learning strategies need to be improved or trained. These were: 1) Evaluate achievement at the end of each study session; 2) Raise questions while reading the material to help focus on which references need to be read further in the PBL group discussion; 3) Discuss the development of a simple reflection log/diary with other people (close friends/academic advisor lecturers/tutors); 4) Monitor/record progress points in work being done (not only at the end of work) (All of the four are related to monitoring and evaluation of achievements); 5) Conducting reflection on action, namely reflecting on experiences related to the learning process while attending lectures/discussions/examinations, what has and has not gone well, what are the causes and consequences, what are the next

steps; and 6) Conducting reflection-in-action, such as documenting critical incidents happened during discussions in a simple reflection log/diary (Both are related to reflective learning application).

The previous study by Ariezaputra[14] conducted in a fully online learning period found similar themes in that most students always be open to learning from peer evaluation and rarely did the self-assessment. The differences with our results were in the specific statements with the largest proportion. Ariezaputra found that most students never monitor/record progress points in learning as part of monitoring sub-scale, while our study found that most students never discuss the progress of a simple reflective log as part of fine-tuning sub-scale. This supports what Broadbent[3] has found that the SRL strategies in offline, fully online, and partially online learning environments such as in limited face-to-face learning period are only different in terms of the frequency and intensity of its use.

Data on learning strategies that were "always" and "frequently" used imply affirmation that these strategies need to be maintained. On the other hand, data on learning strategies that were "rarely" and "never" implemented indicate the need for training these learning strategies through various learning methods, taking into account individual characteristics and learning environment as well as learning methods for students to achieve desirable outcomes. English & Kitsantas[1] argued that students need support in harnessing their internal drive to learn. Therefore, PBL tutors can provide such support by consciously cultivating behaviors, goals, beliefs, and strategies that lead to SRL. In so doing, the faculty may look at the result of this research, and put priority on learning strategies with the largest proportion as "rarely" and "never" applied, as well as learning strategies with the least proportion as "always" and "frequently" applied.

## a. The metacognitive learning strategies that need to be maintained

### 1) Identifying reading/learning need

In batch 2019, Read the material at a glance first (scanning) to find out the composition of the material to be read before then reading it in its entirety as part of planning sub-scale and Identifying concepts that are not well understood while studying as part of monitoring sub-scale had the largest proportion of "always" applied, but not for batch 2020 and 2021. As the most senior students, the batch 2019 students might have learned from their experience that this strategy had helped them in preparing for group discussion. Dolmans and Schmidt[15] found that for first-year students, decisive factors that guide their study were reference literature and content covered in course tests and lectures. However, senior students reported relying more on the discussion in the tutorial group. Comparable to this study, batch 2019 as the most senior students will try to be better prepared for PBL because they were also likely to benefit from the other group members' learning. This scanning first strategy might have helped them in doing so.

### 2) Learning from peer feedback

No student chose implementation frequency as "never" for the learning strategy Responds/listens seriously to comments/evaluations/feedback from others on self-performance or work results as part of the fine-tuning sub-scale. Thus, we can assume that this learning strategy must have been applied by students, regardless of the type of implementation frequency. This was also matched to the finding that the learning strategy was the most frequently applied strategy by the batches 2020 and 2021 students and the second most frequently applied strategy by the batch 2019 students. Another strategy that was always applied by all batches was Open to changes based on feedback received, which was part of fine-tuning.

Those two "always" applied learning strategies could have become students' learning habits since they were conducted consistently. Students might have understood the benefit of evaluation from peers for their learning progress. As stated by Butler & Winne[16] in integrative models of feedback and self-regulated learning, advice could serve as a form of feedback and, as such, should support learners' performance by informing and guiding self-regulatory reflection. External information may prompt learners to reconsider how they have defined the task at hand, to re-examine whether they have set effective goals

or selected appropriate strategies for improvement, or to question whether they have accurately self-evaluated their performance. In this study, the questionnaire only records whether students have an openness to receive input from their friends. This study did not explore further whether students have taken advantage of the feedback received for informing and guiding self-regulatory reflection.

Most students who have implemented these strategies, need to be appreciated and encouraged to continue the good study habit. However, the two strategies were also listed as strategies with the least proportion of "rarely" and "never" applied. This meant that even though the number is small, there were students who only rarely, even never apply it. These students need to be reminded that much of learning happens through observing others, and peers are an important source of information to guide learning behavior. Thus, a willingness to give and receive feedback from friends and use it for the personal learning process needs to be fostered. However, as students who did group discussions online from their homes might encounter the feeling of isolation due to internet connection problems, this condition might hinder them from observing others to give and receive feedback.[17]

### 3) Keeping focus

While participating in activities on campus, trying to focus, not thinking about other things so as not to miss important things, which was part of the monitoring sub-scale, was the most frequent strategy carried out by the 2020 class, the second most frequently carried out by the 2019 class, and the third most frequently carried out by the 2021 batch. Having the largest proportion of "frequently" applied indicate that this strategy was not consistently carried out as a learning habit. However, students still need to be appreciated and encouraged to apply them consistently as learning habits. As mentioned by Mergendoller et al.,[18] to effectively engage in PBL, students must become responsible for their learning and actively participate in the processes of constructing knowledge and making meaning. The student's role in PBL is to take responsibility for their learning and make meaning of the knowledge and

concepts they encounter. To do this effectively, it is clear that students in the PBL environment must be motivated to learn and be able to focus their efforts and attention appropriately, monitor and evaluate their progress, and seek help as needed.[1]

This strategy also implied students' efforts to be able to participate well, to anticipate and overcome critical incidents that can interfere with their focus and group functioning. In the preliminary study, respondents said that students who joined online had more flexibility in doing information searching in the middle of the discussion process than their offline peers. However, internet connection problems often hindered online students from following the discussion properly and contributing timely. Online students might feel isolated, anxious, and demotivated as worsened by little awareness from their offline peers and tutor of their presence. This support what Baden has said that the lack of interaction as a typical component of PBL and the individualistic nature of online learning can lead to feelings of isolation which can reduce interest in discussion, thus threatening group functioning.[19] On the other hand, offline group students might feel compelled to prepare themselves better because they will be dealing directly with the tutor. Moreover, as mentioned by Dolmans et al. students who do PBL offline on campus can be affected by biological environmental factors, including group dynamics and the PBL room's physical environment. Those factors may lead to critical incidents.[20]

### b. The metacognitive learning strategies that need to be improved or trained

Metacognitive learning strategies with the largest proportion of "rarely" and "never" applied indicates several possible underlying causes, such as students not knowing how to implement the strategy, feeling less comfortable or not compatible with the strategy, or being forced not to apply it due to unfavourable conditions, such as limited time and energy, even though they were aware of the benefits.

### 1) Monitoring and evaluation of achievements

Monitor/record progress points in work being done (not only at the end of work) and Raise questions

while reading the material to help focus on which references need to be read further in the PBL group discussion, both as part of monitoring, were the most rarely applied by batch 2021 students. This implied a lack of critical thinking applied to planning further action, which in this case, reading. Although critical thinking has been taught in Learning How to Learn Block in semester 1, to be able to use it, moreover to use it for regulating cognition such as monitoring, needs a lot of practice and a longer time for internalization. It could also be possible that critical thinking processes inhibited by poor time management as relatively new medical students. The time management problem could also hinder students to apply a deep learning approach, thus applying superficial learning by simply reading passively anything given to them without the intention to inform further action. This was in accord with Dolmans and Schmidt[15] that for first-year students, decisive factors that guide their study were reference literature and content covered in course tests and lectures.

Less implementation of monitoring strategies could be affected by lack of goal setting. This was supported by the result in Table 2 that Establish early on learning goals to direct activities in each learning period as part of planning sub-scale got the least proportion as "always" and "frequently" applied, as well as the largest proportion as "rarely" and "never" applied in the overall respondents. As mentioned by Pintrich et al.[2], target goal setting involves the setting of task-specific goals that can be used to guide cognition in general and monitoring in particular. It is most often assumed to occur before starting a task. The goal may be specific learning outcomes, duration of learning, and eventual performance. Based on this understanding, students might perceive that goal setting was irrelevant for PBL group discussion since the learning objectives were already set in the curriculum, there was a certain duration for each PBL session, and everyone should perform their best. Nevertheless, goal setting can occur at any point during the performance. Different kinds of goals set ahead can be adjusted and changed at any time during task performance as a function of monitoring, control, and reflection processes. Without individual or group goals set at the beginning of group discussion, the group has

no criterion against which to assess, monitor, and guide both self and group's cognition. Therefore self-assessment training is needed since it will provide the students with information about the learning goals and how to progress towards them,[21] as well as increases students' self-efficacy as one of the major predictors of student performance.[22]

## 2) Applying reflective learning

Learning strategies with the largest proportion of "rarely" and "never" applied indicate the need for improvement or training on how to implement those strategies according to individual learning styles. This could be done by increasing the teaching portion of the related topic in the Learning how to learn block, or informally by increasing the effectiveness of the guiding role of tutors, senior students, etc. It could also be done indirectly, such as by conducting time management training that enables them to implement the learning strategies, or by encouraging the creation of an appropriate learning environment.

Evaluate achievement at the end of each study session as part of fine-tuning got the largest proportion of "rarely" applied for batch 2019 and 2020 students. Similarly, we also found self-evaluation/ reflective learning-related strategies as the largest proportion of "never" applied as well as the least proportion of "frequently" and "always" applied in the 3 batches. Those strategies were Discuss the development of a simple reflection log/diary with other people (close friends/academic advisor lecturers/tutors) as part of fine-tuning, Conducting reflection-on-action, namely reflecting on experiences related to the learning process while attending lectures/ discussions/examinations, what has and has not gone well, what are the causes and consequences, what are the next steps, and Conducting reflection-in-action, such as documenting critical incidents happened during discussions in a simple reflection log/diary as part of monitoring. These results implied that reflective learning was not implemented consistently in group discussions.

Reflective learning has been taught in the second block of semester 1, which was in the Learning How to Learn Block. They learned in the reflective learning lecture topic that students should assess

their thinking and monitor their understanding before, during, and after a problem-solving or decision-making process; be aware of their improvements, and acknowledge where they need to develop cognitive skills or correct faulty thinking patterns. Students were encouraged to apply it at the debriefing session at the end of each PBL session, in which they were asked to reflect on what had gone well and what needed improvement. It was expected that reflective activity drives and supports the development of thinking skills as well as makes it a learning habit. However, it seems that from the following block and so on, this desirable learning habit was not consistently practiced, or even discontinued. This could be because the tutors were mostly clinicians, yet different from the previous two blocks. They might be less accustomed to debriefing sessions. Moreover, due to the much denser content that must be discussed in PBL, students often run out of time and had no time to carry out a debriefing session at the end of PBL or did it independently.

Therefore, we urge that Faculty take some breakthroughs in teaching and implementing ways to nurture reflective learning, especially in PBL group discussions. These can be in form of allowing students to practice reflective activities according to their learning style, practicing the simplest reflective activity, or practicing time management so that they can apply the learning strategy. Reflection activities do not have to be in the form of compiling reflection logs and discussing them. Research evidence suggests that continually prompting students to explain their hypotheses, reasoning, and processes helps them make connections between learning activities, goals, and processes, which also involve reflection processes. Tutors may practice giving two types of reflection prompts, namely activity prompts and self-monitoring prompts, that may be beneficial in encouraging autonomy and providing an explicit place for reflection at multiple points in a project.[23]

It could also be possible that the students have understood the benefit of conducting debriefing or writing a reflective diary. Some students might take advantage due to the conformity to his/her learning styles or personalities, so they could always or quite often apply them even though most of their friends

didn't. Meanwhile, most of the other students can be helped to overcome the possible obstacles they have or will be encountered, by introducing and guiding how to implement the strategy according to their learning style, practicing the simplest reflective activity, or practicing time management which enabled them to apply the learning strategy.

Related to strategies that need to be trained above, the tutors need to encourage students' awareness to seriously compile their logbook, not merely to fulfil the requirements for participating in group discussions. The logbook should not only contain a summary of what they have read in preparation for the discussion but more importantly, students' critical questions regarding the material. Students can later ask those questions in the discussion or use them as a form of goals that are set at the beginning, then used for the function of monitoring, control, and reflection processes. On the other hand, tutors also need to improve their consistency in reviewing the logbook and providing timely feedback, as well as allocating time at the end of the discussion to facilitate reflection by group members. In general, journaling, discussion, and self-evaluation all provide opportunities for metacognition.[24] PBL tutors can provide support for the development of students' self-directed learning by consciously cultivating behaviors, goals, beliefs, and metacognitive strategies.

### Limitations of the study

This study used self-report questionnaire data, which can be influenced by the perceptions of respondents. However, this had been anticipated by the data collection methods as described above. Data on the metacognitive learning strategies were limited to the examples presented in the questionnaire since there were no other metacognitive learning strategies added by the respondents. Moreover, as Broadbent found that college students used the same SRL strategies regardless of the characteristic of learning environments but differed only in frequency and intensity,[3] this study only recorded the implementation frequency or quantity of particular metacognitive learning strategies without considering the intensity or quality of the implementation.

The data on the usage of metacognitive learning strategies was bound to the characteristic of a limited face-to-face learning context, which was a combination of scheduled online and offline learning methods based on quota restriction and a fully offline assessment method. We did not search for the frequency and intensity of specific learning strategies used during online and offline activities. The metacognitive learning strategies used may also be different in another learning context which has an arrangement or formulation specifically for online and offline activities such as the implementation of the flipped classroom in blended learning. Online assessment methods can also drive different metacognitive learning strategies usage.

## CONCLUSION

The profile of the implementation of learning strategies during the limited face-to-face learning period has been identified. There were learning strategies that need to be maintained and improved as well as those need to be trained. Efforts need to be made to improve students' abilities in implementing learning strategies that are rarely and never used.

## RECOMMENDATION

We offer some recommendations for those who will conduct a similar study. Firstly, the questionnaire developed should include examples of metacognitive SRL strategies that might be applied in their specific learning environment, such as specific learning method delivered. Secondly, qualitative or mixed-method design can be used to determine, not only on how often (related to the frequency), but also on how much (related to the intensity or quality) the students use certain metacognitive learning strategies. For example, not only how often students are opened to feedback, but also how they use it to inform and guide self-regulatory reflection. Thirdly, further study may also have two aims. First, it may search for the frequency and intensity of specific learning strategies used during online and offline PBL group discussions as well as lectures. It can also aim at finding the profile of several possible underlying causes the students rarely or even never applied some learning strategies.

Regarding the impact of this study, faculty may prioritize conducting efforts to improve students' abilities in implementing metacognitive SRL strategies that are rarely and never used as found in this study. This can be done through lectures or training, both for the students and for the tutors whose role is to support students' self-regulated learning development.

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## COMPETING INTEREST

The authors declare that there are no competing interests related to the study.

## AUTHORS' CONTRIBUTION

*Catharina Widiartini* – developing a research proposal, collecting data, data analysis, and publication manuscript

*Miko Ferine* – developing research proposal and publication manuscript

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