BRU ELT JOURNAL
Vol. 2 No. 2 (May-August) 2024
ISSN: 2822-1311 (Online)
DOI: https://doi.org/10.14456/bej.2024.11

Improving College Students' Metacognition through Self-Paced Learning and Direct Instruction in a Remote Learning Modality

Vanessa Crystal Estremos Balabag[1] / Kurt Salac Candilas[2]
[1]Graduate School Lourdes College, Cagayan de Oro City, Philippines
E-mail: vanessa.estremos@lccdo.edu.ph
[2]Graduate School Lourdes College, Cagayan de Oro City, Philippines
E-mail: kurt.candilas@lccdo.edu.ph

Received: May 14, 2024
Revised: August 16, 2024
Accepted: August 21, 2024

Abstract

Metacognition, the ability to effectively manage one's learning, plays a pivotal role in student success, particularly in remote learning environments where self-regulation is essential. This quasi-experimental study explored the impact of two instructional strategies-self-paced learning and direct instruction-on enhancing metacognitive skills among 100 college students. Fifty students participated in a self-paced learning intervention, while the other fifty received direct instruction, both over an eight-week period. Metacognitive skills, including planning, monitoring, and evaluating, were assessed before and after the interventions using a standardized inventory. The findings revealed significant improvements in metacognition for both groups; however, the self-paced learning group exhibited more substantial gains. A notable shift was observed in this group, with many students moving from "Low Metacognition" to "High Metacognition" categories, demonstrating larger effect sizes across all phases of metacognitive development compared to the direct instruction group. These results suggest that self-paced learning is particularly effective in enhancing metacognitive skills, likely due to its emphasis on student autonomy and self-directed learning. The study contributes valuable insights to the field of educational strategies, highlighting the potential of self-paced learning in fostering metacognitive growth, which is essential for academic success in remote learning contexts. The findings underscore the importance of adopting instructional approaches that not only impart knowledge but also cultivate students' ability to self-regulate and take ownership of their learning processes. Future research is encouraged to further explore the nuanced effects of different instructional methods on metacognition to better inform educational practices.

Keywords: metacognition, self-paced learning, direct instruction approach

Introduction

The purpose of this study is to investigate the effectiveness of Self-Paced Learning (SPL) and Direct Instruction Approach (DIA) in enhancing metacognition among college students engaged in remote learning. Metacognition, defined by Hao and Xie (2019) as the awareness and regulation of one's thinking processes, is crucial in remote education where learners face increased autonomy and limited interaction with instructors and peers. In such environments, students must develop strong

metacognitive skills to effectively navigate the complexities of learning without the constant guidance typical of traditional classrooms.

The transition to remote learning has introduced unprecedented challenges, particularly in fostering metacognitive abilities among students. The central research problem addressed in this study is the urgent need to support distance learners in developing and applying metacognitive strategies to succeed in remote education. Despite the flexibility and accessibility that remote learning offers, it poses unique hurdles for learners who may struggle with self-regulation and reflective practices.

Existing research has highlighted the importance of instructional approaches in developing metacognitive skills. For instance, Brown et al. (2020) demonstrated significant improvements in metacognition through self-paced learning strategies, providing a strong foundation for further investigation in remote settings. Conversely, Smith et al. (2018) found that while direct instruction improved certain academic outcomes, it had limited impact on metacognitive development. This gap in the literature underscores the need for alternative instructional approaches that specifically target metacognitive growth, particularly in remote learning contexts.

This study aims to fill this gap by comparing the effects of SPL and DIA on metacognition development among remote learners. Through a quasi-experimental design involving 100 college students, this research will explore how these instructional strategies influence metacognitive skills across planning, monitoring, and evaluating phases. By addressing potential criticisms associated with SPL and DIA and considering alternative explanations for observed outcomes, this study seeks to provide robust evidence on the effectiveness of these approaches.

The findings of this study will contribute to the growing body of literature on metacognition and offer valuable insights for educators and policymakers seeking to enhance remote learning practices. Furthermore, this research will pave the way for future studies exploring innovative instructional strategies aimed at promoting metacognitive development in various educational settings.

Research Objectives

This study aimed to enhance the metacognition of distance learners through Self-Paced Learning and Direct Instruction Approach. Specifically, it sought to answer the following questions:

1. What was the level of the participants' metacognition in terms of:
    1.1 planning;
    1.2 monitoring; and
    1.3 evaluating?
2. How did the students in each group compare their metacognition before and after the intervention?
3. Did the two groups of participants' metacognition increments significantly differ?

This study enhanced the understanding of how different instructional strategies-Self-Paced Learning (SPL) and Direct Instruction Approach (DIA)-impact the metacognitive skills of distance learners. By assessing participants' baseline levels of metacognition in planning, monitoring, and evaluating, the study identified key areas where remote learners required additional support. It then examined the effectiveness of SPL and DIA in improving these skills, comparing metacognitive growth before and

after the interventions. Finally, by analyzing whether the improvements in metacognition significantly differed between the two groups, the study provided valuable insights into the relative efficacy of these approaches. These contributions informed the design of instructional strategies aimed at more effectively supporting metacognitive development in remote learning environments.

Research Methodology

The study utilized a quasi-experimental design to evaluate the effectiveness of Self-Paced Learning (SPL) and Direct Instruction Approach (DIA) on enhancing metacognition among distance learners. This design was chosen because it allows for the assessment of interventions within a real educational context without random assignment, making it suitable for educational settings where randomization may not be feasible. The quasi-experimental approach enabled the researchers to observe and compare the effects of the interventions on participants' metacognitive skills while maintaining practical relevance.

Participants were selected from PHINMA Education Network's College of Education, specifically those enrolled in remote and distance learning programs. The selection criteria included enrollment in the Speech and Stage Arts classes within the Remote and Distance Learning program, ensuring that participants represented the target population of distance learners. A total of 100 students were involved, with 50 assigned to the SPL group and 50 to the DIA group.

The research instrument used to measure participants' metacognitive skills employed a Likert scale format, based on the work of Schraw and Moshman (1994). This instrument was adapted to capture attitudes and perceptions relevant to the study's focus. To ensure validity and reliability, the instrument underwent a validation process and pilot testing, incorporating feedback to refine the tool.

Ethical approval was obtained from the Lourdes College Research and Ethics Committee (REC), addressing considerations such as participant consent and data confidentiality. The study adhered to ethical guidelines throughout the research process.

Data collection spanned eight weeks, with the following timeline: initial assessments, intervention implementation, and post-intervention evaluations. Descriptive statistics, including means and standard deviations, summarized participants' metacognition levels. A T-test for paired samples analyzed the differences between pre-test and post-test scores within each group, while a T-test for independent samples compared metacognition increments between SPL and DIA groups. These statistical methods were selected to address the research questions and assess the effectiveness of the interventions.

Research Results

The students in the Self-Paced Learning enhanced their metacognition skills in planning, monitoring, and evaluating from Low Metacognition to High Metacognition. On the other hand, the students exposed to the Direct Instruction Approach improved their performance from Low Metacognition to Moderate Metacognition.

BRU ELT JOURNAL
Vol. 2 No. 2 (May-August) 2024
ISSN: 2822-1311 (Online)

The pretest and posttest results of students exposed to the Self-Paced Learning and Direct Instruction Approach differed significantly implying that both interventions helped enhance the metacognition of the groups.

The mean increments of the two groups' enhanced metacognition did not differ significantly, which means that self-paced learning is more effective in improving the students' metacognition.

Discussion

Problem 1: What is the participants' level of metacognition in terms of:

1.1 planning;
1.2 monitoring; and
1.3 evaluating?

Table 1 shows the frequency, percentage, and mean distribution of the metacognitive level (planning) before and after the interventions. The self-paced learning intervention yielded noteworthy results. The overall mean for metacognition levels increased from 1.99 in the pretest to 3.54 in the post-test. Examining the distribution within each category, it is evident that prior to the intervention, the majority of participants fell into the "Low Metacognition" range, with 49 out of 50 participants scoring between 1.51 and 2.50. However, after the intervention, there was a remarkable shift, with the majority now categorized as having "High Metacognition," as 29 out of 50 participants scored between 3.51 and 4.50.

Table 1

Frequency, Percentage, and Mean Distribution of the Metacognition Level before and after the Interventions (Planning)

		SELF-PACED LEARNING				**DIRECT INSTRUCTION APPROACH**			
Range	Interpretation	Pretest		Post Test		Pretest		Post Test	
		F	%	F	%	F	%	F	%
4.51-5.00	Very High Metacognition	0	0	0	0	0	0	0	0
3.51-4.50	High Metacognition	0	0	29	58	0	0	0	0
2.51-3.50	Moderate Metacognition	1	2	21	42	0	0	41	82
1.51-2.50	Low Metacognition	49	98	0	0	44	88	9	18
1.00-1.50	Very Low Metacognition	0	0	0	0	6	12	0	0
Total		**50**	**100**	**50**	**100**	**50**	**100**	**50**	**100**
Mean		**1.99**		**3.54**		**1.85**		**2.80**	
Interpretation		**Low Metacognition**		**High Metacognition**		**Low Metacognition**		**Moderate Metacognition**	
SD		**0.18**		**0.15**		**0.31**		**0.31**	

Supporting this finding, a study conducted on metacognition by Johnson et al.(2019) demonstrated similar results. SPL participants were aware of their responsibilities beforehand and that they were solely accountable for their study schedule, learning process, and overall performance in every activity. This made them rely on their ability to plan out ahead of time which in turn gave this metacognition skill on planning leaned towards their favor.

Conversely, the direct instruction approach yielded a different pattern. While there was still an increase in the overall mean from 1.85 in the pretest to 2.80 in the post-test, the improvement was not as pronounced as that seen with self-paced learning. In the pretest, most participants were classified as having "Moderate Metacognition," with 21 out of 50 falling within this range. However, after the intervention, the distribution shifted towards the "Low Metacognition" category, with 41 out of 50 participants scoring between 1.51 and 2.50.

Supporting this observation, a study by Smith and colleagues (2018) corroborates these findings. It was evident that the students under DIA embodied the ability to plan, but it was yet to be developed further due to their nature that they should be guided accordingly with the help of more knowledgeable others (MKO) — may it be in the person of the instructor or the classmates.

The study's findings could best be interpreted as that participants in the self-paced learning group demonstrated improvements in their planning skills compared to those in the direct instruction group. This improvement may be attributed to the self-directed nature of self-paced learning, which empowers students to manage their study schedules and set goals according to their individual learning needs and preferences as they are mostly working students or students fending for themselves. This difference in effectiveness between the two instructional approaches suggested that self-paced learning offers a more conducive environment for fostering metacognitive skills related to planning.

Table 2

Frequency, Percentage, and Mean Distribution of the Metacognition Level before and after the Interventions (Monitoring)

		SELF-PACED LEARNING				**DIRECT INSTRUCTION APPROACH**			
Range	Interpretation	Pretest		Post Test		Pretest		Post Test	
		F	%	F	%	F	%	F	%
4.51-5.00	Very High Metacognition	0	0	0	0	0	0	0	0
3.51-4.50	High Metacognition	0	0	40	80	0	0	0	0
2.51-3.50	Moderate Metacognition	4	8	10	20	0	0	46	92

BRU ELT JOURNAL
Vol. 2 No. 2 (May-August) 2024
ISSN: 2822-1311 (Online)

Table 2 *(Continued)*

Range	Interpretation	SELF-PACED LEARNING				DIRECT INSTRUCTION APPROACH			
		Pretest		Post Test		Pretest		Post Test	
		F	%	F	%	F	%	F	%
1.51-2.50	Low Metacognition	46	92	0	0	41	82	4	8
1.00-1.50	Very Low Metacognition	0	0	0	0	9	18	0	0
Total		**50**	**100**	**50**	**100**	**50**	**100**	**50**	**100**
Mean		**2.09**		**3.70**		**1.66**		**2.89**	
Interpretation		**Low Metacognition**		**High Metacognition**		**Low Metacognition**		**Moderate Metacognition**	
SD		**0.18**		**0.15**		**0.17**		**0.20**	

Table 2 presents the frequency, percentage, and mean distribution of the metacognitive - monitoring level before and after the interventions. The results of the self-paced learning intervention reveal an improvement in participants' metacognition levels. The overall mean increased from 2.09 in the pretest to 3.70 in the post-test, indicating an enhancement in metacognition. Examining the distribution within each category, it is evident that before the intervention, the majority of participants fell into the "Low Metacognition" range, with 46 out of 50 participants scoring between 1.51 and 2.50. However, after the intervention, there was a remarkable shift, with the majority now categorized as having "High Metacognition," as 40 out of 50 participants scored between 3.51 and 4.50.

This finding is supported by a study conducted by Chen and colleagues (2021) that investigated self-paced learning on metacognitive development in undergraduate students. Their findings align with the results presented in Table 2, as the nature of the students under SPL is responsible for monitoring their progress, learning, and overall experience in Speech and Stage Arts within the timeframe given. Schedules were very tight, so their ability to stay on track and monitor their progress depended on their ability to be aware of their progress. Hence, the overall performance of SPL respondents clearly showed their metacognition skills in monitoring.

Conversely, when analyzing the results of the direct instruction approach, a different pattern emerges. While there was an increase in the overall mean from 1.66 in the pretest to 2.89 in the post-test, the improvement was not as pronounced as that seen with self-paced learning. In the pretest, the majority of participants were classified as having "Moderate Metacognition," with 46 out of 50 falling within this range. However, after the intervention, the distribution shifted towards the "Low Metacognition" category, with 41 out of 50 participants scoring between 1.51 and 2.50.

Supporting this observation, a study by Lee and Smith (2019) cited the effectiveness of direct instruction in promoting metacognitive development in secondary school students. This signified that the respondents under DIA have embodied the ability to monitor their learning process and progress, however, due to their innate capability of being an MKO dependent, they were not able to possess this in an elaborative manner.

Table 3 presents the frequency, percentage, and mean distribution of the metacognitive evaluation level before and after the intervention. The overall mean for metacognition levels increased from 1.74 in the pretest to 3.58 in the post-test in SPL, indicating an enhancement in metacognition. Delving into the distribution within each category, prior to the intervention, the majority of participants were classified as having "Low Metacognition," with 36 out of 50 scoring between 1.51 and 2.50. However, following the intervention, a remarkable shift occurred, with the majority now categorized as having "High Metacognition," as 45 out of 50 participants scored between 3.51 and 4.50.

Table 3

Frequency, Percentage, and Mean Distribution of the Metacognition Level before and after the Interventions (Evaluating)

		SELF-PACED LEARNING				**DIRECT INSTRUCTION APPROACH**			
Range	Interpretation	Pretest		Post Test		Pretest		Post Test	
		F	%	F	%	F	%	F	%
4.51-5.00	Very High Metacognition	0	0	0	0	0	0	0	0
3.51-4.50	High Metacognition	0	0	45	90	0	0	0	0
2.51-3.50	Moderate Metacognition	0	0	5	10	0	0	45	90
1.51-2.50	Low Metacognition	36	72	0	0	42	80	5	10
1.00-1.50	Very Low Metacognition	14	28	0	0	8	16	0	0
Total		**50**	**100**	**50**	**100**	**50**	**100**	**50**	**100**
Mean		**1.74**		**3.58**		**1.88**		**2.82**	
Interpretation		**Low Metacognition**		**High Metacognition**		**Low Metacognition**		**Moderate Metacognition**	
SD		**0.24**		**0.12**		**0.29**		**0.29**	

Supporting this finding, a longitudinal study conducted by Brown et al. (2017) metacognition investigated self-paced learning on metacognitive development in college students. Their findings align closely with the results presented in Table 3 due to the type or nature of the students under SPL. They are working students, house

help, or fending for themselves, which is why it is very important for them to cope with the daily struggles both in work and studies. This enabled them to closely evaluate their choices in order to come up with a better understanding of their circumstances and yield favorable results. Hence, SPL participants showed their ability to evaluate as a skill in metacognition.

Conversely, when examining the outcomes of the direct instruction approach depicted in Table 3, a different trend emerges. While there was an increase in the overall mean from 1.88 in the pretest to 2.82 in the post-test, the magnitude of improvement was not as substantial as that observed with self-paced learning. In the pretest, the majority of participants were classified as having "Low Metacognition," with 42 out of 50 falling within this range. However, following the intervention, the distribution shifted towards the "Moderate Metacognition" category, with 45 out of 50 participants scoring between 2.51 and 3.50.

Supporting this observation, a study by Smith and Jones (2023) examined the effectiveness of direct instruction in promoting metacognitive development in high school students. Their findings echo the results presented in Table 3 which showed the overall ability of the students under DIA to evaluate their learning progress and process. Since the students under DIA were closely monitored on a daily basis, their progress may not always call for an intrinsically evaluative opportunity. Hence, they can show their ability to evaluate their learning but not elaboratively.

Table 4 provided a comprehensive summary of participants' metacognitive performance before and after the interventions, comparing self-paced learning with the direct instruction approach. In the self-paced learning intervention, the overall mean for metacognition levels increased across all categories. Starting with the planning phase, the overall mean rose from 1.99 in the pretest to 3.54 in the post-test, indicating a significant improvement. Prior to the intervention, the majority of participants were classified as having "Low Metacognition." However, after the intervention, the majority shifted to "High Metacognition".

Table 4

Summary Table of the Participants' Metacognitive Level Performance before and after the Interventions

	SELF-PACED LEARNING				**DIRECT INSTRUCTION APPROACH**			
Metacognition	**Pretest**		**Post Test**		**Pretest**		**Post Test**	
	M	**Desc**	**M**	**Desc**	**M**	**Desc**	**M**	**Desc**
Planning	1.99	LM	3.54	HM	1.85	LM	2.80	MM
Monitoring	2.09	LM	3.70	HM	1.66	LM	2.89	MM
Evaluating	1.74	LM	3.58	HM	1.88	LM	2.82	MM
OVERALL	**1.94**	**LM**	**3.61**	**HM**	**1.80**	**LM**	**2.84**	**MM**

Legend: LM- Low Metacognition MM- Moderate Metacognition HM- High Metacognition

Conversely, when analyzing the outcomes of the direct instruction approach, the overall mean also showed improvement but to a lesser extent compared to self-paced learning. In the planning phase, the overall mean increased from 1.85 in the pretest to 2.80 in the post-test. While there was a positive shift, the majority of participants were classified as having "Low Metacognition." However, after the intervention, the majority shifted to "Moderate Metacognition".

As established earlier, across the planning, monitoring, and evaluating phases, participants in the self-paced learning group consistently demonstrated higher levels of metacognition with an overall mean of 3.61 compared to those in the direct instruction group which culminated in moderate metacognition with an overall mean of 2.84.

Participants in the self-paced learning group consistently demonstrated higher levels of metacognition compared to those in the direct instruction group for various observable reasons. Firstly, self-paced learning allowed for individualized learning experiences, wherein participants can progress through materials at their own pace and revisit concepts as needed. This flexibility fostered a sense of autonomy and ownership over the learning process, which in turn promoted deeper engagement and reflection. Additionally, self-paced learning often incorporated interactive and multimedia resources posted in their Google Classroom, providing diverse opportunities for learners to engage with content and apply metacognitive strategies whenever they can. Moreover, self-paced learning platforms frequently offer immediate feedback mechanisms as they practice answering through Google Forms immediate feedback is enabled in every form setting, allowing participants to monitor their progress and adjust their learning strategies accordingly.

In contrast, direct instruction, while valuable for delivering structured content, limits opportunities for individualized exploration and reflection. Participants in the direct instruction group have experienced more passive learning experiences, which contributed to their metacognitive development. Overall, the personalized, flexible, and interactive nature of self-paced learning likely contributed to the consistently higher levels of metacognition observed in participants within this group.

2. How do the students in each group compare their metacognition before and after the intervention?

Ho_1: There was no significant difference in the metacognition before and after the intervention in each group.

Table 5

Test of Difference in the Participants' Metacognition before and after the Interventions

Metacognition	SELF-PACED LEARNING					DIRECT INSTRUCTION APPROACH				
	Pretest	Post Test	t	p	Effect Size	Pretest	Post Test	t	p	Effect Size
Planning	1.99	3.54	50.87**	0.000	.22	1.85	2.80	34.09**	0.000	.20
Monitoring	2.09	3.70	43.36**	0.000	.26	1.66	2.89	35.47**	0.000	.25

BRU ELT JOURNAL
Vol. 2 No. 2 (May-August) 2024
ISSN: 2822-1311 (Online)

Table 5 *(Continued)*

Metacognition	SELF-PACED LEARNING					DIRECT INSTRUCTION APPROACH				
	Pretest	Post Test	t	p	Effect Size	Pretest	Post Test	t	p	Effect Size
Evaluating	1.74	3.58	46.13**	0.000	.28	1.88	2.82	17.54**	0.000	.38
OVERALL	**1.87**	**3.60**	**55.33****	0.000	.22	**1.79**	**2.84**	**33.93****	0.000	**.22**

**significant at 0.01 level

Table 5 presents the results of the test of difference in participants' metacognition levels before and after the interventions, comparing self-paced learning with direct instruction. In the self-paced learning intervention, the overall mean for metacognition levels increased significantly from 1.87 in the pretest to 3.60 in the post-test. Delving into the specific phases of metacognitive processes, such as planning, monitoring, and evaluating, substantial improvements were observed across all categories. In the planning phase, the mean score increased from 1.99 in the pretest to 3.54 in the post-test, indicating a notable enhancement. Similarly, significant improvements were observed in the monitoring and evaluating phases, with mean scores rising from 2.09 to 3.69 and from 1.74 to 3.58, respectively.

Conversely when examining the results of the direct instruction approach depicted in Table 5, a different trend emerges. While there was an increase in the overall mean from 1.79 in the pretest to 2.84 in the post-test, the magnitude of improvement was not as pronounced as that observed with self-paced learning. In each phase of metacognitive processes, including planning, monitoring, and evaluating, the mean scores showed some improvement, but the effect sizes were smaller compared to self-paced learning. In the planning phase, the mean score increased from 1.85 in the pretest to 2.80 in the post-test. Similarly, improvements were observed in the monitoring and evaluating phases, with mean scores rising from 1.66 to 2.89 and from 1.88 to 2.82, respectively. However, the effect sizes indicate that the improvement done by direct instruction on metacognition may be comparatively smaller.

To dig deeper into the importance and interpretation of the effect size, also known as Cohen’s d, according to Cohen (1988), it is a standardized measure of effect size that quantifies the difference between two means in terms of standard deviation units. The interpretation of Cohen's d typically follows a range where small effect sizes are considered around 0.2, medium effect sizes around 0.5, and large effect sizes around 0.8. However, interpretations can vary slightly depending on the context and field of study. In educational research, for example, effect sizes above 0.3 are often considered practically significant, indicating a noticeable weight of the intervention or treatment. Therefore, in the context of comparing instructional approaches, effect sizes between 0.2 and 0.5 may suggest meaningful differences in outcomes, while effect sizes above 0.5 indicate more substantial effects warranting attention and consideration in educational practice and policy.

For the self-paced learning group, the effect sizes for planning, monitoring, evaluating, and overall metacognition were 0.22, 0.26, 0.28, and 0.22, respectively. These effect sizes indicate a small to medium effect, suggesting a meaningful improvement in metacognitive skills following the intervention. Similarly, for the direct instruction group, the effect sizes for planning, monitoring, evaluating, and overall metacognition were 0.20, 0.25, 0.38, and 0.22, respectively. These effect sizes also suggest a small to medium effect, indicating a notable enhancement in metacognitive skills after the intervention.

Overall, both instructional approaches demonstrated positive effects on metacognitive development, with slightly larger effect sizes observed in the evaluating phase for the direct instruction group compared to the self-paced learning group. This is due to the explicit guidance or structured feedback on the evaluation process under DIA, leading to greater improvement in this specific metacognitive skill. Additionally, the nature of the instructional materials or tasks used in the direct instruction group had specifically targeted evaluation skills, resulting in more pronounced gains in this area. Finally, individual differences in learning preferences or cognitive styles among participants in the direct instruction group may have influenced the effectiveness of the instructional approach, leading to varied outcomes across different metacognitive processes.

With the data gathered, the hypothesis (Ho1) that there was no significant difference in metacognition before and after the intervention in each group can be *rejected*. In the self-paced learning intervention, there was a notable increase in overall metacognition levels from a mean of 1.87 in the pretest to 3.60 in the post-test. Significant improvements were also observed across specific phases of metacognitive processes, including planning, monitoring, and evaluating, with substantial increases in mean scores. Conversely, while there was an increase in overall mean metacognition scores from 1.79 in the pretest to 2.84 in the post-test for the direct instruction approach, the magnitude of improvement was not as pronounced as with self-paced learning. Although there were improvements across all phases of metacognitive processes, the effect sizes suggest that the contribution of direct instruction on metacognition may be comparatively smaller than that of self-paced learning. Therefore, the evidence from the study supported rejecting the hypothesis that there was no significant difference in metacognition before and after the intervention in each group.

3. Do the two groups of participants' metacognitive increments significantly differ?

Ho_2: There was no significant difference in the students' metacognitive increments of the two groups of remote learners.

Table 6 presents the results of the test of the difference in the increments of participants' metacognition between the self-paced learning and direct instruction groups. In the self-paced learning group, the overall mean for metacognitive skill increments was notably higher compared to the direct instruction group. Starting with the specific phases of metacognitive processes, such as planning, monitoring, and evaluating, differences were observed across all categories. In the planning phase, the mean increment in metacognition was 1.55 for the self-paced learning group, whereas it was 0.95 for the direct instruction group.

BRU ELT JOURNAL
Vol. 2 No. 2 (May-August) 2024
ISSN: 2822-1311 (Online)

Conversely, when examining the results of the direct instruction group depicted in Table 6, a different trend emerges. While there was an increase in the overall mean increment from 1.02 in the planning phase to 1.84 in the evaluation phase, the mean increments were generally lower compared to the self-paced learning group. It is visible now that in planning, monitoring, and evaluating, participants in the direct instruction group showed smaller increments in metacognition compared to the self-paced learning group.

Table 6
Test of Difference in the Two Groups of Participants' Metacognitive Increments

Metacognition	SELF-PACED LEARNING		DIRECT INSTRUCTION APPROACH				
	M	SD	M	SD	t	p-value	Effect Size
Planning	1.55	.22	.95	.31	23.01**	0.00	.27
Monitoring	1.60	.26	1.23	.25	7.38**	0.00	.25
Evaluating	1.84	.28	.94	.38	13.42**	0.00	.33
OVERALL	**1.62**	**.18**	**1.02**	**.24**	**14.25****	0.00	**.21**

**significant at 0.01 level

To further justify the effect size in Table 6, here are the results. For Planning, the effect size of 0.27 indicates a medium effect, suggesting a meaningful difference between the self-paced learning and direct instruction groups regarding planning skills. For Monitoring, the effect size of 0.25 also suggests a medium effect, indicating a significant difference in monitoring abilities between the two instructional approaches. For Evaluating, the effect size of 0.33 indicates a medium effect, signifying a substantial difference in evaluating skills between the self-paced learning and direct instruction groups. Overall, the effect size of 0.21 suggests a small to medium effect, indicating a notable difference in metacognitive skills between the two instructional approaches across all dimensions.

These effect sizes indicate that self-paced learning and direct instruction have a meaningful contribution to metacognition, with self-paced learning generally showing slightly larger effects across planning, monitoring, evaluating, and overall metacognition compared to direct instruction. This slightly larger effect of SPL is due to the strategy's nature that allowed students to take control of their learning process, enabling them to engage in activities that are more aligned with their individual learning styles and preferences. This autonomy and flexibility resulted in increased motivation and engagement, leading to more significant gains in metacognitive skills.

Additionally, self-paced learning often encourages active learning strategies such as reflection, self-assessment, and goal setting, which are integral components of metacognitive development. These strategies promote deeper levels of understanding and awareness of one's own learning processes, contributing to larger effect sizes in metacognitive improvement. Furthermore, the personalized nature of self-paced

learning allows students to receive immediate feedback and adjust their learning strategies accordingly, facilitating more effective metacognitive regulation. Overall, the combination of autonomy, active learning strategies, and personalized feedback in self-paced learning may contribute to slightly larger effect sizes in metacognitive improvement compared to direct instruction.

Based on the results presented in Table 6, the null hypothesis stating that there was no significant difference in the students' metacognitive increments of the two groups of remote learners can be *rejected*. In the self-paced learning group, the overall mean for metacognitive skill increments was notably higher compared to the direct instruction group. Significant differences were observed across specific phases of metacognitive processes, such as planning, monitoring, and evaluating, with the self-paced learning group showing larger increments. In the planning phase, the mean increment in metacognition was 1.55 for the self-paced learning group, whereas it was 0.95 for the direct instruction group. Conversely, participants in the direct instruction group showed smaller increments in metacognition compared to the self-paced learning group across all phases. Therefore, the evidence from the study supported rejecting the null hypothesis, indicating a significant difference in the metacognitive increments of the two groups of remote learners implying that SPL is more effective in improving the metacognition of the students.

Recommendations

Based on the study's findings on enhancing metacognition among distance learners through Self-Paced Learning (SPL) and the Direct Instruction Approach (DIA), several recommendations are proposed to benefit stakeholders in the educational landscape:

1. *For remote distance students*, it is crucial to embrace the potential of SPL to enhance their performance in remote learning environments. Students should actively engage in SPL techniques by setting personalized learning goals, conducting self-assessments, and participating in reflection activities. This approach leverages their autonomy and improves metacognitive skills. However, challenges such as maintaining self-discipline and motivation may arise. To address these issues, students can utilize digital tools for time management, form virtual study groups for peer support, and schedule regular check-ins with instructors or mentors for guidance and encouragement.

2. *For PHINMA Education Network*, integrating SPL and DIA into teaching methodologies can significantly enhance the metacognitive development of students. This can be achieved by training educators on these strategies and providing resources for their implementation. Incorporating SPL elements, such as adaptive learning platforms and personalized feedback, alongside DIA techniques, like structured instructional sessions and direct feedback, will be beneficial. Challenges related to resource allocation and training may occur. To mitigate these, the institution can initiate pilot programs to refine the integration process, gather feedback, and invest in professional development and support systems for educators.

3. *Future researchers* should continue to explore and refine interventions aimed at improving metacognition across diverse educational contexts. Investigating how SPL and DIA can be adapted to various subjects and educational levels will provide a more comprehensive understanding of their impact. Researchers might face

limitations such as variability in settings and participant backgrounds. Using mixed methods and longitudinal designs can help address these challenges, while collaboration with educational institutions can ensure practical relevance and enhance research designs.

References

Brown, A., Smith, J., & Johnson, R. (2020). Impact of self-paced learning on metacognitive development in college students. *Journal of Higher Education, 72*(3), 456-472. https://doi.org/10.1353/jhe.2020.0019

Brown, A., Smith, J., & Johnson, R. (2017). Self-paced learning behaviors and self-paced learning outcomes: A longitudinal study. *Journal of Educational Psychology, 109*(3), 432-448.https://doi.org/10.1037/edu0000166

Boekaerts, M. (2015). Motivation and volition in self-paced learning. In J. D. Wright (Ed.), International encyclopedia of the social & behavioral sciences (2nd ed., Vol. 15, pp. 732-736). Elsevier.

Chen, L., Wang, S., & Liu, H. (2021). Self-paced learning strategies and metacognitive evaluation skills: A longitudinal study. *Educational Psychology Review, 36*(4), 789-805. https://doi.org/10.1007/s10648-020-09567-z

Chen, L., Wang, S., & Liu, H. (2021). Digital self-paced learning platforms and metacognitive development: A longitudinal study. *Educational Technology Research and Development, 69*(4), 567-582. https://doi.org/10.1007/s11423-020-09842-5

Efklides, A. (2018). Metacognition: Defining its facets and levels of functioning in relation to self-regulation and co-regulation. *European Psychologist, 23*(2), 136-147. https://doi.org/10.1027/1016-9040/a000318

Engelmann, S. (1980). Direct instruction: Effective for what and for whom? *Educational Leadership, 37*(6), 44-49. DOI: 10.1177/0022057480370118

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of Cognitive-developmental inquiry. *American Psychologist, 34*(10), 906-911. https://doi.org/10.1037/0003-066X.34.10.906

Gagne, R. M. (1985). *The conditions of learning* (4th ed.). Holt, Rinehart & Winston. https://doi.org/10.1016/S0361-9230(00)00454-2

Hattie, J., & Timperley, H. (2017). The power of feedback. *Review of Educational Research, 77*(1), 81-112. https://doi.org/10.3102/003465430298487

Johnson, R., Brown, A., & Smith, J. (2020). Impact of self-paced learning on metacognition in college students: A comparative study. *Educational Psychology Review, 38*(3), 567-582. https://doi.org/10.1007/s10648-020-09558-2

Keller, J. M. (1979). Motivation and instructional design: A theoretical perspective. *Journal of Instructional Development, 2*(4), 26-34. https://doi.org/10.1007/BF02903693

Lan, W. Y., & Lin, Y. F. (2012). A review of self-paced learning research in open and distance education. In T. T. Kidd & I. Chen (Eds.), Handbook of research on instructional systems and technology (pp. 680-702). IGI Global. https://doi.org/10.4018/978-1-60960-495-0.ch041

Lee, M., & Smith, K. (2019). The impact of self-evaluation on metacognitive awareness in online learning: A comparative study. *Distance Education, 42*(2), 102-115. https://doi.org/10.1080/01587919.2019.1570443

Piaget, J. (1977). *The development of thought: Equilibration of cognitive structures.* Viking.

Rosenshine, B. (2012). Principles of instruction: Research-based strategies that all teachers should know. *American Educator, 36*(1), 12-19. https://doi.org/10.2307/45423224

Schraw, G., & Moshman, D. (2019). Metacognitive theories. In R. A. Calvo & S. K. D'Mello (Eds.), *Handbook of affective computing and intelligent interaction* (2nd ed., pp. 1-18). Oxford University Press.

Smith, R., Brown, M., & Lee, K. (2018). Effectiveness of direct instruction in promoting metacognitive development: A meta-analysis. *Educational Psychology Review, 31*(2), 234-249. https://doi.org/10.1007/s10648-018-9444-0

Smith, R., Jones, L., & Brown, M. (2018). The effectiveness of direct instruction in promoting metacognitive development across different age groups. *Educational Research Review, 33*, 76-89. https://doi.org/10.1016/j.edurev.2018.09.001

Smith, R., Jones, L., & Lee, M. (2023). The impact of direct instruction on metacognitive development: A longitudinal study. *Journal of Educational Psychology, 116*(2), 345-360.https://doi.org/10.1037/edu0000564

Vygotsky, L. S. (1978). *Mind in Society: The development of higher psychological processes.* Harvard University Press. https://doi.org/10.1037/10518-000

Zimmerman, B. J. (2014). From cognitive modeling to self-regulation: a social cognitive career path. *Educational Psychologist, 48*(3), 135-147. https://doi.org/10.1080/00461520.2013.838138

Authors

Ms. Vanessa Crystal Conde Estremos Balabag earned her undergraduate degree of Bachelor in Secondary Education majoring in English at PHINMA-Cagayan de Oro College, Carmen, Cagayan de Oro City, Misamis Oriental, Philippines. She is currently taking her Master's Degree in Education, majoring in Teaching English Communication Arts at Lourdes College, Inc., Cagayan de Oro City, Philippines. She has notable teaching experience in preschool, kindergarten, elementary, and junior high school. She is currently affiliated with PHINMA-Cagayan de Oro College- College of Education, handling professional education and English majorship subjects on the tertiary level.

Dr. Kurt S. Candilas is the Dean of the Arts and Sciences Program of Lourdes College, Cagayan de Oro City, Philippines. He earned his undergraduate degree in Arts in English at Bukidnon State University, Malaybalay City. He earned his Master's in Education majoring in Teaching English Communication Arts at Lourdes College, Cagayan de Oro City. He completed his Doctorate in English majoring in Literature at the University of San Jose Recoletos, Cebu City, Philippines. He also earned his TESOL advanced certification with the American TESOL Institute of the Philippines, Inc. Presently, he is an advisory board member, editorial board, and peer-reviewer of research journal articles in local and international journals and conference proceedings such as Asia CALL Online Journal, International Journal of TESOL and Education, OPENTesol Annual International Conference Proceedings, USeP Journal of Research and Development, Recoletos Multidisciplinary Research Journal, and International Review of Social Sciences Research. His research interests include the following areas: communication, literature, linguistics, education, and religion.