Enhancing 'How to Learn' Skills: Its Impacts on Academic Performance and Students' Motivation

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Abstract
In the current situation of the Covid-19 pandemic, remote learning requires students to learn independently to find information and understand the concept of subject matter. However, distractions like scrolling on social media have been a common issue faced by students during remote learning. This challenge leads to procrastination and affects the quality of their learning experience. Students must have "learning how to learn" skills to help them enhance the quality of their learning (Oakley, 2018). This study examines how "learning how to learn" skills promote significant results in students' academic performance and motivation. Classroom Action Research (CAR) design (Sagor, 2004), involving participants from multi-age classes (grade 8 and 9) as one age group; there were three (3) classes with 53 students in total. Participants were categorized as high achievers and only low achievers who received the intervention to see if the techniques could improve their performance. The intervention took place for 6 (six) months with 2 (two) days of initial sessions and 2 (two) days of evaluation sessions. The result shows that 'how to learn skills' improves students' academic performance in mathematics. Their self-reflection regarding their learning techniques being used was shown to a high percentage of being 'fully understood' when they applied the Pomodoro technique, and the Chunking technique was shown to be less preferable for students. Overall, the 'how to learn skills' has helped improve students' academic performance and accommodated students' ability in time and ideas management.

Keywords**:** How to Learn Skills, Academic Performance, Student's Motivation, Directed Learning

Introduction

During the Covid-19 pandemic, students were required to study remotely. Most schools conduct the learning by combining both synchronously and asynchronously through several learning media. Synchronous learning provides sessions where teachers and students meet virtually in real-time. The main advantage of the asynchronous session is students can receive immediate feedback and use natural language (Blau et al., 2017) meanwhile, asynchronous session allows students to learn at their own pace (van der Keylen et al., 2020), unfortunately not all students use this opportunity to get the maximum benefit of their learning due to lack of learning skills. In asynchronous sessions, students are required to have self-study skills to stay on track and achieve the learning goals by having enough motivation throughout the learning (cf. Hartnett, 2015). Besides, students encounter several issues during asynchronous learning such as social media distraction and gaming temptation. Those activities are chosen by the students as a way out of their stress and confusion in learning the topic without teacher assistance. The number of students who procrastinate has improved and it leads to learning loss.

Asynchronous sessions will be effective if the students are responsible for their learning and possess adequate learning skills. To escalate the quality of the learning experience, how to learn skills are essential to be equipped by the students. Learning 'how to learn skills is the ability to pursue and persist in learning, to organize one's learning, including through effective management of time and information, both individually and in groups. Learning how to learn skills is beneficial for students to gain a deeper understanding of the content and be more empowered to take risks in learning. The skill will lead the students to establish goals, determine essential information, find patterns, chunk the information, prioritize their work and seek help when is necessary. As a result of this skill, students will be self-directed learners.

Based on Oakley and Sejnowski (2018), to improve students' memory and learning quality, students can use the Pomodoro technique, chunking, and many more learning skills. The Pomodoro is a technique where the students set a timer to 25 minutes, turn off all interruptions or distractions, and focus. After that, they are allowed to give themselves a self-reward for 5-10 minutes break, such as watching a video, playing games, or listening to their favorite song. The reward is the important part of the whole Pomodoro process because when an individual is looking forward to a reward, the brain helps the person focus better. This technique is effective to solve procrastination as well. Moreover, the other learning skill used is the chunking method. Chunking is the mental leap that helps students unite bits of information together through meaning. This method makes the information that is chunked to be easier to remember and also helps the brain run more efficiently.

Therefore, most of the research focuses on the general approach of learning skills improvement, and few of them examine specific learning skills implemented by the learner in mathematics. The current study aimed to investigate the effectiveness of the learning skills implemented by the learner during asynchronous sessions in Mathematics lessons and the Pomodoro technique and Chunking technique and their impact on students' motivation and academic performance. Lastly, the variable of students' achievements and motivations are limited to Mathematics subjects at a certain level of secondary education, hence the results of this study are not meant to generalize the correlation of students' achievements and motivations concerning learning skills.

1. Theoretical Framework

1.1 Remote learning

Remote learning that occurs during the Covid-19 pandemic can be identified as emergency remote learning as it is not usual for distance learning but happens in an unusual situation. Some emergencies can happen at the local, national, and global levels, such as natural disasters (such as floods, earthquakes, eruptions, and hurricanes), war (terrorist attacks, local, national, or global war), and pandemics (HIV, Malaria, Tuberculosis, and Covid-19). There are main differences between mainstream remote learning and the emergency one, like a massive situation where sudden changes in some aspects of the learning format have affected students and teachers throughout the process. A massive change due to emergencies is defined as emergency remote learning (Hodges et al., 2022). Different contexts and countries implement different policies to manage the emergency remote teaching to make sure the learning experience continues and better accommodate students' needs and situations.

As societies are made up of layers and diverse socio-economic and geospatial features, in most cases, governments prepare various platforms to reach as large a group as possible, ensuring the deliverability of all aspects of society. In an emergency, remote teaching, electrical supplies, and internet connection are the main ways to be able to access the service (education and learning session). The internet connection may be one of the cases that even in a prosperous country like the United State, over 3 million children are reported to be non-Internet linked at home or the Service is unsuitable for engaging in online learning forums (Hodges et al., 2020). Hence, in most cases, the government also provides services through Radio, Television, and smartphones for young children's learning and other public media initiatives for parents and caregivers.

1.2 Learning Skills Theories

Students' facing difficult challenges during remote learning where distraction or interruptions are uncontrollable. There are two types of interruption that need to be addressed:

a) Internal: These interruptions are triggered by the students e.g. "I want to play games" or "I need to check my social media".
b) External: Triggered by other entities. E.g., "request from friends

To address the distraction issue, learning how to learn skill is necessary to equip the students. Learning how to learn is essential when teachers are no longer a main source of information and knowledge.

Pomodoro technique

The Pomodoro technique is a learning skill that helps students break their procrastination habit that is caused by distraction. This technique will help the students be more focused on their learning. Pomodoro Technique was found by an Italian student Francesco Cirillo who faced difficulties such as managing distractions during the learning process (Ahmed, Chambers, Frontz, & Voida, 2014)

According to Oakley (2018) here are the steps to implement the Pomodoro technique:

1. Shut off all distractions such as your phone, the TV, your music or anything that gets in the way of your ability to focus. Find a quiet place to study where you will not be interrupted or consider noise-canceling earphones to remove all distraction.
2. Set the timer for 25 minutes.
3. Get going and focus on the task as well as you can for 25 minutes.
4. After 25 minutes, reward yourself. Watch a dance video or listen to your favorite song or chat with friends for five or ten minutes.

Neuroscientists have discovered that the brain works in two different ways called the focused mode and the diffuse mode. Both modes are essential in helping the students to learn. When students' brain is in focus mode, students put specific parts of the brain to work. Which parts of the brain that are working depend on what students' doing. When students are trying to learn something new, they must first focus intently on it to "turn on" those parts of the brain and get the learning process started. Break time after the focused mode is called a diffused mode. Diffuse mode is when students' minds are relaxed and free. Students think about nothing in particular. It turns out that the brain must go back and forth between focused and diffuse modes to learn effectively.

The goal of the Pomodoro technique is to encourage consciousness, concentration, and clarity of thought through effective time management (Wang et.al, 2010). The Pomodoro technique can improve the productivity of individuals including students' productivity to complete their work or learn independently.

Chunking technique

Chunking is a strategy to break down information into bite-sized pieces so the brain can more easily digest new information (Malamed, 2015). Gobet et al. (2001) differentiate between two main meanings of chunking concerning memory: deliberate chunking and automatic chunking. Deliberate chunking is conscious, explicit, intermittent, goal-directed, and strategically intended to structure the material to memorize. Therefore, automatic chunking is unconscious, implicit, and continuous. Chunking has been found as one of the crucial elements of human cognition mechanism and plays a significant role in how internal cognitive processes are linked to the external environment (Gobet and Lane, 2012).

Chunking up is looking for a more generalized understanding. For instance: a car is a form of transportation, transportation is a movement, and movement is part of existence. Chunking down is getting more detail about high-level information that the students already have. The goal is to move the information from general to specific. For example, Probability is the general topic and can be chunked down into likely, less likely, and more likely that the event might happen. However, chunking sideways involves finding other examples at the same level of information. When the students chunk sideways, the students are going to mention or remember one member of a class to another member of the same class, for example, cars to planes trains to boats. Chunking helps students identify keywords and ideas, develops their ability to paraphrase, and makes it easier for them to organize and synthesize information (Maharani, 2021).

1.3 Students' Motivation

When students feel more motivated to learn, they perform better academically, show improved classroom behavior, and gain a higher sense of self-esteem (Hattie, 2011, P. 252; Usher et al., 2021 p.1). Data shows that many students lack motivation which increases every year from middle school to high school. It can be seen from the number of absenteeism as they get older. It seems that a motivation crisis is happening and real.
Based on Ryan and Deci (2000), there are 4 elements to nurture intrinsic motivation:

a) Self-autonomy: Having a degree of control over what needs to happen and how it can be done
b) Competence: feeling that one has the ability to be successful in doing it
c) Relatedness: doing the activity helps the students feel more connected to others, and the feel cared about by people who they respect
d) Relevance to their present lives and/or to their future

Jones (2018) proposed instructional design that aims to nurture students' intrinsic motivation using the MUSIC model.

MUSIC component	Statements to consider
eMpowerment	• The design gives students choices, control, or freedom to make decisions within the course.
Usefulness	• The design will lead students to believe that the course content, assignments, or activities are useful for their future.
Success	• The design will allow students to believe that they can achieve at a high level on the coursework if they put forth effort.
Interest	• The design will lead students to believe that the instructional methods or coursework are interesting and enjoyable.
Caring	• The design will help students believe that the instructor or others in the course care about whether they succeed in the course or care about their well-being.

Table. 1 Students' Intrinsic Motivation using the MUSIC Model

It is contrary to Morgan's (1984) that intrinsic motivation was not lessened or enhanced by conditions such as praise, positive connections, freedom of choice and rewards associated with competent performance.

2. Methodology

2.1 Research Design

This study employs a Classroom Action Research (CAR) design with participants from multi-age classes (grades 8 and 9) as one age group with total of 3 classes in this age group. Participants were categorized as high achievers and low achievers, as this research aims to help students who have a low academic performance enhance their academic skills. A total of 27 students participated in this study. CAR is a systematic process, and relevant classroom context, and it focuses on teaching practices (O'Connor et.al., 2006). The research was done

through these main steps; planning, implementing, developing, and reflecting (Mertler and Charles, 2005 in O'Connor et.al., 2006). The planning stage included the literature review and preparing the materials (pre-test, self-reflection, learning guide module, students' motivation survey, and post-test). The implementing stage consisted of; a pre-test session, introduction to learning techniques sessions, and practicing learning techniques in mathematics (Data Analysis and Probability topics) for the duration of 6 (six) week lessons. In the developing stage, it took place the development of self-reflection and students' motivation survey, post-test, and re-evaluating of the current materials from the implementation stage. Lastly, in the reflecting stage, the correlation and elaboration of results were made to find specific reasons and further steps to create better teaching practices. Below is the research's flow:

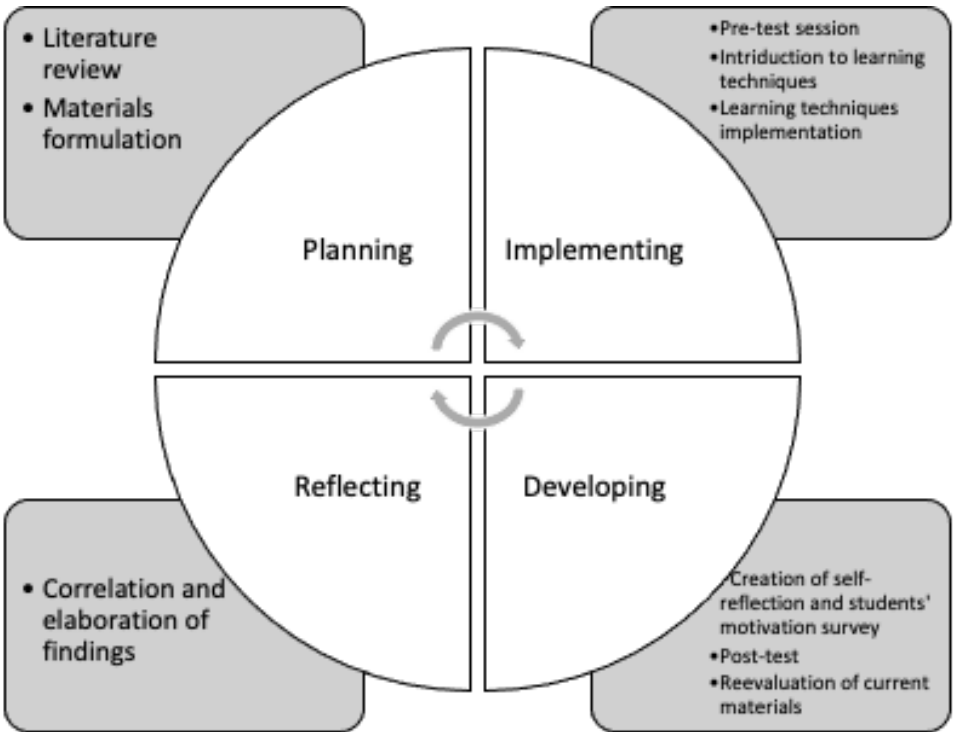

Figure 1: Research Flow

(Source: own elaboration)

2.2 Sample: Participants and Setting

The population of this study is 53 students from 3 different classes in grades 8 and 9. The samples were chosen based on a purposive sampling technique with specific criteria to specifically address the issues in mathematics class. Students with overall low performance in some topics were chosen to participate in this study. The context of this research is mathematics class on the topic of Data Analysis and Probability.

2.3 Instruments: Survey and Materials

Self-reflection was formulated to help students to track their learning journey when implementing Pomodoro and Chunking. It contains a self-assessment of their understanding (fully and partially) of specific topics with specific learning techniques in a checklist format. This self-reflection was adopted from a study on personalized learning: growing self-directed learners (Zmuda & Kallick, 2017, 2021).

The learning motivation survey consists of 18 (eighteen) items with 6 (six) on the Likert scale, covering students' self-assessment of their extrinsic and intrinsic motivation toward specific learning topics. The numeral six indicated 'strongly agree', a five indicated 'agree', a four indicated 'somewhat agree', a three indicated 'somewhat disagree', two indicated 'disagree' and one indicated 'strongly disagree'. The survey was adopted from research on motivating students by design (Jones, 2018). All the statements require students to fill in what they believe in for some learning contexts.

The learning guide contained both Pomodoro and Chunking learning techniques which showed specific steps to follow and practice during their independence studies.

2.4 Data Collection and Data Analysis

The pre-test was given before the formulation of intervention and implementation to help the researcher categorize students who needed improving their performance in Mathematics (specifically for the topic of Data Analysis and Probability). Afterward, the collected data which include pre-test results, self-monitoring of learning skills implementation, self-assessment survey on motivation, and post-test were analysed using qualitative (narrative coding) and quantitative (Pearson correlation) approaches.

3. Results

3.1 Students' self-reflection of Learning Skills (Pomodoro and Chunking techniques) used during asynchronous session

Learning skill	Self-reflection	Percent
Pomodoro technique	Partially understand	26%
	Fully understand	67%
Chunking	Partially understand	33%
	Fully understand	11%

Table 2. Students' self-reflection
(a direct benefit of implementing Pomodoro and Chunking technique)

The self-reflection form aims to raise students' awareness of their progress in implementing the technique. The table shows that most students implement the Pomodoro technique more than the chunking method. The Pomodoro technique benefits the students to focus on a task and comprehend the information thoroughly, comprising 67 percent of students, and few of the students claimed that it helps them partially understand the topic. In contrast, less than half the proportion of students assumed that chunking methods slightly impacted their understanding of math lessons either fully or partially.

3.2 Students' academic performance

In the first data collection, the pretest was conducted using a written instrument. The result of the pretest is evaluated using a rubric which is categorized into high performance, proficient and not yet (those who did not meet the minimum criteria).

Criteria	**Grade**	**Pretest**		**Posttest**	
		F	**Percentage**	**F**	**Percentage**
High Performance	A	0	0%	2	7.4%
	B	0	0%	16	59.3%
Proficient	C	19	70.4%	9	33.3%
Not Yet	NY	8	29.6%	0	0%
TOTAL		27	100%	27	100%

Table 3. Students' performance Pre-Test and Post-Test

According to the pre-test result, about 70 percent of the students are proficient, and around one-third of the students underperformed. The lower achievers are selected as a group who have implemented the learning technique.

The post-test result shows significant enhancement in students' academic performance. About one-third of the students achieved the minimum criteria in Mathematics which is proficiency, and a tiny proportion got an A. The majority of the students performed better, previously those who were at a proficient level, substantially improved to a higher grade, which is grade B or A. Approximately 3 percent of lower achievers did not make any significant improvement in their academic performance. This result proved that the "how to learn " skill is beneficial for enhancing students' achievement. The students who were not fulfilling the minimum criteria in the pre-test show better performance at the minimum criteria

3.3 Frequency of trials and students motivation

Number of trials Pomodoro and student	N	27
	r value	-0.46
	p value	-
Number of trials Chunking	N	27
	r value	0.19
	p value	0.32

Table 4. Pearson correlation between number of trials in the learning skills towards students motivations

The Pearson's Product Moment Correlation coefficient is a measure of the strength and direction of association that exists between two variables. A Pearson's correlation attempts to draw a line of best fit through the data of two variables, and the Pearson's correlation coefficient, r, indicates how far away all these data points are from this line of best fit. The frequency of implementing the learning skills is recorded by the students. This data is used to find its correlation with the students' motivation scores. It is predicted that the more frequently the students used the learning technique, the higher their motivation. Pearson correlation is measured to analyse whether one variable affects another variable. The correlation between the number of trials in using the Pomodoro technique to motivation percentage is negative. The r-value is -0.46, indicates that the correlation between the number of trials using the Pomodoro technique is weak and negatively correlated. It is worth noting the number of trials in chunking methods positively correlated with students' motivation with the r-value of 0.19, indicates that there is a weak positive correlation between the variables.

4. Discussion

The result indicates that the Pomodoro and Chunking techniques had a significant effect on students' achievement. It can be seen from the pre-test result that 30 percent of the students underperformed in the prior stage before the intervention was implemented, and those students showed better performance at minimum on proficient criteria and no students failed referring to the post test result. In addition, a group of students who were achieving proficient criteria showed noticeable progress on their academic performance where the majority of them fulfilled high performance criteria (grade B) and a tiny proportion got an A grade. The improvement on students' performance showed that both learning skills effectively help students to maximize their asynchronous session to learn and it is impacted to their quality of the learning. This result is aligned with students' self-reflection where the students' claim that they obtain the benefit of applying the "how to learn skill" (Pomodoro and chunking techniques) which results in improving their understanding of math subjects when they learn about statistics and probability topics and apply it during asynchronous session. These findings are supported by a previous study correlate to the benefits of executive function level in regard to the use of Pomodoro technique. An overall effect of students' learning experience using time management, self-regulation, creating goals, and recording the data, have shown prove to the improvement of executive function, hence, it greatly impacts to students' academic performance (Singer & Bashir, 1999 in Akers, 2015).

According to the learning skills monitoring record, the Pomodoro technique is more likely to be used by the students to help them overcome distraction during asynchronous sessions. During the weekly discussion, students convey that this learning skill is easy to implement and foster them to focus on a task rather than multitasking and improve productivity. Also, the break that they have after focusing for 25 minutes allows them to relax and be less tense. This statement proved that Pomodoro technique could make tasks feel more manageable (Tabackman, 2021). How the brain works during the implementation of Pomodoro technique, Oakley (2016) mentioned that for 25 minutes student' brain is in a focus mode. During the focus mode, the brain concentrates intently on something that the students are trying to learn or to understand. Then, during the break, student' brain is more diffused. Diffuse mode allows the students to generate new ideas or approaches that they need. Also, the diffuse mode makes new neural connections traveling along new pathways. It can be said that pomodoro technique enhances students' time management that contributes to productivity during independent learning.

To improve the effectiveness of the Pomodoro technique, there are some activities that students can do such as set upcoming activities or goal (planning), tracking and record by listing the daily performance, identify distractors and find a way to cope with it, and visualize the improvement of the Pomodoro technique (Shinoda, 2020). In this study, the tracking, recording, and visualizing the progress when using the Pomodoro technique has been done completely. Likewise, having a goal setting, identifying distractors as well as finding a way to cope with them, for example, unexamined.

Meanwhile, the students less preferably implemented the chunking technique. It was due to the implementation of the chunking technique required an analysis to break down the information into bite-sized pieces. Some students who implement it claim that they understand the information easily. This analysis supports the theory that the chunking technique can help students direct attention to the important features of the material, and in turn help the acquisition of perceptual chunks that are appropriate, given the task at hand (Gobet, 2005). The students who implement this learning skill consistently show significant improvement in understanding the math topic. As shown by the result of the post test, about 7.4% of the students got an A grade. The results of this study are similar to the previous research of Hardiana (2019) that the chunking method is undoubtedly beneficial for students to improve students' reading comprehension in 8th grade. This learning technique helps students for ideas management.

This study also demonstrates a correlation between the number of trials the students took in implementing the "how to learn" skills and students' motivation. As for the Pomodoro technique, the scatterplot shows a weak negative correlation between the number of Pomodoro techniques and students' motivation. Pomodoro technique corresponds with students' time management and improves focus which also affects the quality of their learning; however, it does not positively correlate with their intrinsic motivation. In contrast, the number of trials in the chunking method shows positive correlation with students' motivation. According to Ryan and Deci (2000), there are 4 elements as factors of improving students' intrinsic motivation: self-autonomy, competence, relatedness, and relevance. The Pomodoro technique and chunking apparently improves their competence but still needs further intervention that also enhances students' self-autonomy, relatedness, and relevance towards the learning to enhance their intrinsic motivation. According to Gottfried (1990) In longitudinal study of children, motivation and achievement in learning math was found to be affected by prior math achievement or math motivation. It means that the students' prior motivation and achievement contributes to the current motivations.

Conclusion and Recommendation

By testing the effect of "how to learn" skills: Pomodoro and Chunking methods on students, this study established that the implementation of these learning skills does indeed have a significant effect on students' academic performance. Accordingly, chunking methods have a positive correlation between the frequency in implementing the methods towards students' motivation. Yet, the Pomodoro technique was less likely to improve students' motivation, and more to help students promote their time management.

Further research is needed to establish teachers' planning in nurturing students' intrinsic motivation by considering relatedness, relevance and self-determination in the learning. If the intrinsic motivation is well cultivated, it will have a lasting effect and drive the students to be self-directed learners. Also, in the future research, a longer period of teaching the chunking

method to students is recommended and graphic organizers might be helpful to help them break down ideas that are easier to digest. Moreover, teaching students to list down the distractors and cope with it is also an important step in the implementation of the Pomodoro technique as well as setting a specific goal prior to the Pomodoro technique.

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