Effectiveness of Flipped Classroom in General Mathematics

Emma R. Durong¹, Alyanna Joyce D. Rana², Mary Rose Basiliote³, Jerald C. Moneva⁴

^{1, 2, 3}Students, Jagobiao National High School - Senior High Department

⁴Adviser, Jagobiao National High School

Abstract: Flipped Classroom is an instructional strategy that acquired students to gain necessary knowledge before class. This study determined the use of flipped classroom in teaching General Mathematics to Grade 11 students of Senior High School. The pre-test and post-test questionnaires were administered to the respondents under the supervision of the assigned researcher for easy access and ready to answer concerns of the given questions. This quantitative research study used the pre-experimental design. The data were collected, tallied, analyze and summarize using the t-test statistics. The following conclusions were hereby presented: pre-test and post-test scores has significant difference which means the improvement is observable in using flipped classroom style in General Mathematics academic performance of students. Students are very satisfied with the use of flipped classroom, however, traditional way like lecture was more favorable by them in learning General Mathematics subject.

Keywords: Flipped Classroom, Academic Performance, General Mathematics, Pre-test, Post-test

1. Introduction

The flipped classroom instruction model was introduced by Jonathan Bergman and Aaron Sams in 2007 to provide instruction to secondary students who were missing class and missing instruction. Oxford Dictionary define flipped classroom model as the current trend in the education community. This trend is known as the "flipped classroom" or "inverted classroom". (Oxford Dictionary, 2008).

Flipped classroom provides a new methodology for teaching and learning that changes the roles of instructors from frontof-the-class to a more cooperative and collaborative contribution to the teaching process; which means that flipped classroom is effective in increasing students' foreign language higher-order thinking skills, engagement and satisfaction. Student interests and well-organized course could affect students' mathematics achievement in flipped course (So, Yang & Hsiao, 2015). In addition, flipped classroom has been proposed to answer question through technology; flipped classroom demonstrate as a teaching method that may promote student engagement and a more active approach to learning in higher education. In a flipped classroom, students are required to put in effort to learn the materials on their own before coming to class; flipped classroom requires that students have access to technology, whether this is provided by the university or by the student. (Jensen, Kummer & Godoy, 2015)

In addition, flipped classroom designed to promote interaction, teacher-led reviews, sometimes including theory; it is also possible for a broad range of activities which suitable in interactive sessions in mathematics, not only multiple-choice questions, for the students develop the desired mathematical skills. They also stated that the implementation of flippes classroom was beneficial for the students. (Chonjort, Filipson & Wearlander, 2017)

Flipped classroom has grown in popularity across teaching venues and age levels. Future flipped learning is not only

practiced in higher education or college level, but also for K-12 environments (Garza, 2014). Flipped instruction leads to better learning results, this concept also helps students to effectively learn to acquire skill, knowledge, and also to show a good attitude towards learning. (Nwosisi, Ferreira, Rosenberg and Walsh, 2016).

The purpose of this study is to know the effectiveness of inverted classroom or known as flipped classroom in the learning skills of Grade-11 students in accordance to their General Mathematics Grades.

2. The Problem

Statement of the Problem

This study aims to determine the effectiveness of Flipped Classroom in teaching in General Mathematics of Grade-11 Students of Jagobiao National High School-Senior High School.Specifically, this intends to answer the following questions: the pre-test and post-test scores of the students in General Mathematics exposed to Flipped Classroom, significant difference between the pre-test and post-test scores of students and recommendations can be propose with Flipped Classroom.

Hypothesis

 $\begin{array}{ll} H_0: \mbox{ There is no significant difference between flipped} \\ \mbox{ classroom and General} & Mathematics subject. \\ H_1: \mbox{ There is a significant difference between flipped} \\ \mbox{ classroom and General} & Mathematics subject. \end{array}$

3. Review of Related Literature

Flipped classroom has become increasingly popular among many educators around the world (Lo and Hew, 2017). Flipped learning is being similar to the early indications from K-12 seems to be resulting in improve student academic performance and instructor morale, and which also being used in higher education; flipped learning requires flexible environments, a shift learning culture, intentional

Volume 7 Issue 12, December 2018 <u>www.ijsr.net</u> Licensed Under Creative Commons Attribution CC BY content and professional educators (Hamdan, Mcknight, Mcknight and Arfstrom, 5-8).

Flipped classrooms were being pursued by some instructors as a way to transfer some for responsibility learning back to students. Flipped classroom is a kind of active learning that allows student to engage with the material through discussion, application of prior knowledge and connections (Adkins, 2014,4). In addition, active learning is necessary for students to effectively cope with the high level of demands placed on the learner in a constructivist learning operationalized environment. which bv cognitive. metacognitive, affective and resource management learning strategies. The main goal of flipped classroom's is to improve students' learning and achievement by exchanging the traditional model of a classroom, emphasizing class time on student understanding rather than on lecture (Yousefzadeh and Salimi, 2015, 209-210)

Emerging the flipped classroom was been use to improve learner retention and transfer, and making efficient use of class time. The emerging of flipped classroom has a both disruption and an opportunity for the higher education community. The concept reverses traditional thinking about the instructional process and calls for the use of innovative strategies to deliver material and resources. Flipped classroom assessment may take place online, in the classroom and/or in authentic setting-technological advancements such as the increasingly accessible and reliable nature of the internet afford the delivery of content in ways previously possible. (Estes, Ingram and Liu, 2014)

The flipped classroom yielded both positive and negative outcomes, when this approach have received much attention as they may increase the learning outcomes and effectiveness not only in elementary, junior high but also in university classes, this learning maybe difficult to adopt in one at the time (Kuhihara, 2016, 69-70).

In a research study, there were no significant impacts on the achievement of all middle school mathematics students using the flipped learning classroom (Martin, Arrambide and Holt, 2016, p. 106). But in other studies, the most suitable teaching for mathematics is the flipped classroom learning as parents are not in a position to teach their own words on some mathematical problems, working in the classroom with teacher that would help them a lot (Ramakrishnan and Priya, 58).

In some studies, flipped learning model was really effective in language learning. The out of class activities gave students the advance to review the lesson and had a clear idea about the content and also stated that using the flipped classroom strategy does not result in gaining higher learning or improved students' performance and better attitudes compared with the non-flipped classroom when both teaching strategies utilize both active learning(Jensen, Kummer and Goday, 2015, 1).The continuing popularity oflipped learning, as flipped learning gain its popularity, the teacher reports and research have also gained benefits of student achievement and in teacher pedagogy. The flipped classroom learning instruction included enthusiasm, confidence and intrinsic motivation in student daily behaviors and comments/words. (Draddato, Fresno and Miller, 2016, 34-36)

The learning strategy of flipped classroom improved students learning such asenhanced class preparation, increased classroom interactivity which students developed their ability in interacting with their peers and gained or improved student's academic performance. (Flaherty and Philips, 2015, 89-93). As a teaching method may promote student engagement and a more active approach to learning in higher education, as proven and demonstrated in several studies. Students appreciated flipped learning through using video material the opportunity to study in their own pace, flexibility and mobility brought by accessible video lectures, and that learning is easier and more effective within the frame or flipped classroom-these are the most common valued reasons of students who were appreciate flipped learning classroom (Nouri, 2016,8). Technology integrates the learning process and ensures that students are equipped to participate in 21st century life, which have been created with a sense of urgency in educational community. The improving strategies in utilizing computers as teaching tools includes the idea of a "flipped classroom" because of the increasing availability of technology. (Rivera, 2016, 9-10)

In recent years, due to the rapid development in technology, the flipped classroom approach has recently gained prominence in the education system demonstrating a better learning achievement of students than using other approaches. Students can stop, rewind, and watch the lecture again, makeone of the best features of the flipped classroom than of a student-oriented approach. Meanwhile, flipped classroom gives a great potential to enhance learning performance and academic gains among learners (Bhagat & Chang, 2016, 135).

The flipped classroom model was been familiar from many tertiary educators, with videos as an exchange to traditional learning. Flipped classroom has been recently used by professional teachers in high school settings-teachers using flipped classroom approach typically used their own created online video lectures and ready to access online videos in the internet (Muir and Chick, 2015).

In addition, flipped classroom instruction addresses the development of media and technology skill. It enables teachers to shift from teacher-driven to student-centered learning. It unveils characteristic where students are responsible for their own learning. The teacher's acts as guides, especially nowadays that each student need to compete and enhance their skills as the K-to-12 curriculum promises (Casem, 2016, 38).

Flipped classroom model provides alternative ways such as helping teaches to overcome their time based problem and having more time of acquiring theoretical knowledge out of school. In this problem, flipped classroom can be a necessary solution to consider in the field of educationflipped classroom model has remarkable yield in education and training for teachers and student (Cevikbas and Argun, 2017).

Volume 7 Issue 12, December 2018 <u>www.ijsr.net</u> Licensed Under Creative Commons Attribution CC BY In the flipped classroom model, the considered key ingredient is the video lecture, such as videos lectures posted online and videos lectures created by the teacher. These videos today are easy to access and to view anytime. Problem-based learning, collaborative learning and project base learning are some of the approaches of flipped classroom learning. There are advantages of using flipped classroom model personality styles of students matching their performance in traditional environment and learn in their own pace. Teachers can build relationship with their students and the teachers can group students together (Du, Fu & Wang, 2014). However, flipped classroom models oblige students to have united time to access the internet while it would be difficult for teachers to keep students.

Recent study confirmed that using flipped classroom teaching style would enhance student engagement thaut would lead to active learning environment, and enhance students behavioral, emotional, and cognitive aspects. (Jamaludin & Osman, 2014)

Flipped classroom teaching style has been misunderstood, like other people think that student consume their thorough time in facing the computer screen, taking the part of teacher in online videos, learning solitude, students learn with no outline or framework, or that a flipped classroom is a kind of online learning course (Szparagowski, 2014, 2). This teaching strategy has the potential to be an effective and beneficial method of learning. Especially nowadays, young students as part of new generations are really engaging media or internet that would help them to access easily the video lectures in YouTube that discusses competencies for students learning.

On the other hand, student prefers listening and looking flipped classroom online lecture recordings rather than reading book or printed materials helping student's develop their analysis and critical thinking(Albalawi, 2018, 201). Flipped Classroom has its advantages in students and teachers especially in improving student interactivity and resiliency in learning environment (Taylor, n.d.). However, if students do not watch videos or complete quizzes as instructed they fail to know or to determine the lesson in a deeper understanding.

Flipped classroom strategy acknowledges students in terms of interval and duration and because of these, students are more suitable for pliancy or ductility of an environment (Hernandez, 2014). In a study, flipped classroom indicated more sufficient to students having good performance rather than average to low students (Calamlam, 2016). The main purpose of flipped classroom model is to progress students' inspiration considering it adequate students ability or capability, distinctness, and self-esteem (Aljaser ,2017, 68).

A study confirmed that using flipped classroom model strategy is efficient in language acquisition (Alsowat, 2016,16). In support, several studies showed that there were advantages on discussing or lecturing and also in acquisition practice. It also showed that flipped classroom integrates a good practice in enhancing students knowledge in specific areas (Zainuddin & Halili, 2016, 325-329).

The structure of flipped classroom is easy to access for students for learning in just watching videos compared to written notes and screenshots. But flipped classroom has also its disadvantage in arising student absences because they think that no need for them to attend the class everyday by assessing the lectures through online videos (McArthy, 2016, 344). Even if flipped classroom can improve students' performance, learning and engagement, students need to maintain and handle their self in order to motivate themselves in implementing a good performance in academic areas. (Sifakaya & Ozdemir, 2018). In several studies shown above, flipped classroom learning strategy proven that can improve the capability, ability, performance, learning, and motivation of students. But it also has disadvantages that students should be aware of it. Behavior is very important to think in using flipped classroom strategy especially when accessing online videos in YouTube. In addition, studies have demonstrated that flipped classroom as a teaching method may promote student engagement and a more active approach to learning higher education. In accordance that flipped classroom is a good practiced in improving students performance in specific areas (Zainuddin & Halili, 2016, 325-329).

Therefore, students with motivation and positive attitude toward learning, besides working in a good design learning environment will succeed in achieving student's good performance.

4. Research Methodology

This research study used the quasi-experimental design. This design will use a pre-test and post-test questionnaire to gather data. The researchers believe that this design is the appropriate design to conduct this survey and also to get some data from the selected respondents. This study focuses on all Grade 11 Senior High School students in Jagobiao National High School. It consists of Grade 11 ABM (Accountancy, Business and Management), Grade 11 HUMSS A (Humanities and Social Sciences), Grade 11 HUMSS B (Humanities and Social Sciences) and Grade 11 GAS (General Academic Strand). This study uses the purposive sampling to choosing the correct respondents. This study conducted to know and evaluate the Flipped Classroom and how this will affect in Academic Grades in General Mathematics. The data were then collected after the respondents answered the questionnaire. All the results were tabulated and analyzed. To arrive at significant findings for this study, the data collected were examined and analyzed using the t-test statistics. T-test is an analysis of two population's means through the use of statistical examination.

5. Presentation, Analysis, and Interpretation of Data

Table 1: T-test result	of Pre-test and	Post-test of Functions

	Mean	Variance	Ho	df	t- stat	t critical one-tail	T critical two tail	Interpretation
Pre- test	8.31	10.15	0	56	5.46	1.67	2.00	Significant
Post- test	13.69	18.01						

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The table shows that the pre-test has the mean of 8.31 and variance of 10.15 and has a post-test mean of 13.69 and variance of 18.01 among 30 randomly selected respondents in Grade 11-Senior High Students. The post-test mean and variance have increased, which entails that the students have been stirred positively. The t-test value of 5.46 is greater than the critical value 1.67 hence the null hypothesis is rejected. It means that the flipped classroom teaching style is suitable for student learning with the topic Functions in General Mathematics of Grade 11- students. Hamdan, Mcknight & Arfstrom (n.d.), flipped learning can increase student academic performance.

Table 2: T-test result of Pre-test and Post-test of Rational

	Functions									
	Mean	Variance	Ho	df	t-stat	t critical one-tail	T critical two tail	Interpretation		
Pre- test	8.03	11.75	0	56	11.92	1.67	2.00	Significant		
Post- test	21.31	24.22								

With the topic rational functions the students perform and has the pre-test mean of 8.03 and has a post-test mean of 21.31 showing can increase of student performance. Then, has a pre-test variance of 11.75 and a post-test variance of 24.22, which can be shown that there is a variability between the pre-test and post-test variance, where post-test variance is greater than pre-test variance. This mean that the students have been stirred positively. The t-test value of 11.92 s greater than the critical value of 1.67 hence the null hypothesis is rejected. Therefore, there is a significant difference in students scores in taking pre-test and post-test exams. Zainuddin and Halili (2016) said that flipped learning strategy indicates a good strategy in developing students learning in specific areas.

 Table 3: T-test result of Pre-test and Post-test of

 Exponential Functions

	Mean	Variance	Ho	df	t-stat	t critical one-tail	T critical two tail	Interpretation
Pre- test	8.03	11.75	0	56	11.92	1.67	2.00	Significant
Post- test	21.31	24.22						

The table shown the data that pre-test mean of 8.03 and has a variance of 11.75 while has post-test mean of 21.31 showing an increase of student performance and has a variance of 24.22 among 30 randomly selected students in. The t-test value of 11.92 is higher than the critical value 1.67 hencethe null hypothesis is rejected. Therefore there is significant difference between the pre-test and post-test scores of Grade-11 students.Flaherty & Philips (2015), that flipped classroom learning was truly effective for improving students learning's especially in improving their academic grades. As also Grade-11 students showed that using flipped classroom strategy has an good impact in their scores taking the General Mathematics.

 Table 4: T-test result of Pre-test and Post-test of

 Logarithmic Functions

	Logartinine Tulletions										
	Mean	Variance	Ho	df	t-stat	t critical one-tail	T critical two tail	Interpretation			
Pre- Test	14.10	17.52	0	56	1.37	1.68	2.00	Not Significant			
Post- test	15.79	26.60									

The table shows that the logarithmic functions scores of students has a pre-test mean of 14.10 and has a variance of 17.52, while the post-test has a mean of 15.79 and has a variance of 26.60 among 30 respondents of Grade11-studens of Jagobiao-Senior High Students. The computed value is 1.37 where lesser than the critical value 1.68 hence the null hypothesis is fail to reject. Therefore there is no significant relationship or difference between the pre-test and post-test scores of students scores of learning Logarithmic Functions using Flipped Classroom strategy.Jensen, Kummer and Goday (2015), used flipped classroom strategy but did not observe in significant improvement of students performance. The level of difficulty of this lesson might be higher. Likewise flipped classroom might not be appropriate.

 Table 5: Recommendation in using Flipped Classroom

Strategy	
Recurring Themes	Frequency
The speaker voice should be loud and clear.	15
The speaker should elaborate and explain the	15
topic more.	
Watch the video repeatedly.	13
Study hard and listen to teacher.	13
The topic should be discussed not only watching	8
it through videos.	
Easily understood explanations	8
Don't like the perception using the flipped in	7
strategy.	
No recommendation everything's okay.	6
To have discussion or group study.	6
Learn the strategies of the flipped classroom.	6
Follow the traditional way of teaching.	5
The examples given should be more difficult.	5
The discussion on the video should be clearly	3
and softly explain by the speaker.	
Watch the video properly.	3
Suits students' preference	3
Enhance skills in thinking critically.	3
More examples in the video about the topic.	2
Study hard the video given.	2
The video should be appropriate to audience.	1
The speaker must use the mother tongue	1
language in discussing the topic.	
The speakers on the video should discuss the	1
topic professionally.	

Technical

The speakers need to make their voice louder and clear in order for the learners understand the topic they discussed. The lecturer also need to elaborate and explain the topic more for the students can generate ideas from the topic given.

Repetitions

The students recommend to watch the video not just once or twice, but again and again. Unfortunately, watching these

videos it requires thorough time and waste of money which may burn-out students energy.

Interaction and Elaboration

The flipped classroom strategy has a limited discussion of a certain topic. Besides there's no student to teacher interaction that students can clarify for incomprehensible concepts from the teacher discussion.

Student

Student need to focus their mind on watching the videos and they also need to listen in their teacher discussion.

Lecture Method VS. Flipped Classroom Strategy

A contradicting attitude of students towards Flipped Classroom learning strategy has revealed that traditional method like lecture are more favorable among students than Flipped Classroom strategy. Students argue that its hard for them to access those videos in Flipped Learning style because watching those videos really involves a high value of money. Therefore, teachers should also consider in using used the traditional way of teaching.

Table 6: Perception of Students in	using Flipped Classroom	
Strategy		

	StateBj		
	Indicators	Weighted Mean	Interpretation
1)	I am satisfied with the format and presentation of the learning materials.	3.51	Very Satisfactory
2)	I am satisfied with the integration of technology and multimedia resources.	3.74	Very Satisfactory
3)	The flipped classroom has suitable tools for supporting my learning.	3.52	Very Satisfactory
4)	I am satisfied with the content and topics of the learning materials.	3.62	Very Satisfactory
5)	I feel that flipped classroom has improved my understanding.	3.46	Very Satisfactory
6)	I can able to work at my own pace.	3.39	Satisfactory
7)	The flipped learning encourages me to have creative thinking and evaluation.	3.45	Very Satisfactory
8)	I am satisfied with the control and freedom of choosing what and how to learn.	3.73	Very Satisfactory
9)	The use of flipped classroom is easy and applicable.	3.4	Satisfactory
10)	I am satisfied with the flipped learning experience.	3.45	Very Satisfactory
	AVERAGE	3.53	Very Satisfactory

Legend: 1.00 - 1.80(Good) 1.81 - 2.60(Very Good) 2.61 - 3.41(Satisfactory) 3.41 - 4.20(Very Satisfactory) 4.21 - 5.00(Outstanding)

Students perceive that they are very satisfied with the integration of technology and multimedia resources, with the control and freedom of choosing what and how to learn this strategy The table also shows that students are tagged as with the flipped classroom for they can work it at their own pace and easy and applicable to access. And students are very satisfied with the content and topics of the learning materials of Flipped Classroom Strategy.

Overall, students are very satisfied with format and structure of using flipped classroom model in teaching General Mathematics.

6. Summary of Findings

The study is about "the effectiveness of flipped classroom teaching in general mathematics of Grade-11 students of Jagobiao National High School-Senior High School," where the researchers conducted a survey that made use of Quasi-experimental design in knowing the pre-test scores, post-test scores, recommendation and perception of students using Flipped Classroom Strategy.

The researchers found out that flipped classroom learning strategy can improve student's academic performance. Student's post-test scores increased when it comes to General Mathematics lessons specifically functions, rational functions and exponential functions except in the topic logarithmic functions. The logarithmic function is more difficult than the other lessons.

The researchers also found out that students suggest that the lecturer on flipped the classroom teaching strategy should have a loud and clear voice for the students can hear the lesson discussion clearly, likewise, the audio must be audible enough and functional. Student also suggest that the teacher must discuss again the lecture without the video.

The students are very satisfied with the integration of technology and multimedia resources of flipped classroom strategy. Students who already engaged with flipped classroom teaching style were very satisfied with the structure and video watching in the class.

7. Conclusion

Flipped Classroom teaching is a learning strategy introduced that would help students to have better academic performance, especially, when it comes to Mathematics subject that need more time to perceive and generate such ideas specifically in learning the formulas and methods in calculating numbers. Flipped classroom approach demonstrates a better learning achievement of students than using other strategies stated in the study of Bhagat and Chang (2016). But, traditional way of teaching need also to be considered as reinforcement where students also need a interactive with their teacher.

8. Recommendations

Based on the findings and conclusion on this study, the researchers suggest the following recommendation as follows:

- 1) Lecturer on the Flipped Classroom learning strategy needs to consider her/his voice to be audible and clear.
- 2) To be actively and watching the video, students also need to listen properly and focus their attention to the lecturer.
- 3) Teachers need to be more sensitive on what their students needs especially the style or strategy they have introduced if this strategy will help their students to achieve good academic performance in school. Teachers

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need to pick appropriate videos for the students can watch it properly.

4) School should provide the materials or tools that can be use by students in watching videos.

9. Limitations of the Study

In this study there are various of limitations. First, this is exclusive for all Grade-11 students taking General Mathematics subject. This research study is not conclusive for all students, however, this qualified to students who are using flipped classroom strategy. Second, the pre-test and post-test questionnaires are not validated but competency base.

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Source:

Appendix A Research Instrument General Mathematics Summative Assessment 11.1.1

Encircle the letter of the correct answer.

- 1. Which of the following represents a one to one function?
- A. Students to their height C. Students to their LRN
- B. Students to their weight D. Students to their age

2. A computer shop charges 25 pesos per hour for the first two hours and an addition of 15 pesos per hour for each succeeding hour. This situation is an example of;

A. Linear Function	C. Relation
B. Piecewise Function	D. None of these

3. Grade 11 students have 10 subjects in the first semester. Students with respect to their subjects are an example of;

17

C. Maybe

A. relation

B. Function

C. Piecewise Function D. All of these

For items 4-5, refer to the given below. Given: $f(x) = x^2 - 10x + 4$

4. What $isf(x + 3)$ A. $x^2 - 4x - 17$ B. $x^2 - 10x - 20$)?	C. $x^2 - x + 3$ D. $x^2 - x + 3$	3 1
5. What is f(3)? A. 20	B. 10	C17	D.
6. Is $f(x + 3)$ the	same as $f(x)$	+ f(3)?	

A. Yes

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^[36] https://www.iiste.org/Journals/index.php/JEP/article/vie w/29629

B. No

D. Undecided 7. What is the process of evaluating a function?

A. The variable in the function is not replaced

B. There is no process that takes place

C. Replacing the variable in the function with its given value

D. None of these

8. For what values of x will result to undefined when evaluating the function, $f(x) = \frac{2x+5}{x^2-1}$

C. x = -2, 2A. x = -5, 5B. x = -3, 3D. x = -1, 1

9. From the given of item number 8, what is the domain of the function? A. $\{x: x \in R, x \neq \pm 3\}$ C. { $x: x \in R, x = \pm 5$ } B. $\{x: x \in R, x \neq \pm 1\}$ D. { $x: x \in R, x = \pm 2$ }

10. The composition of the two functions f(x) and g(x) is defined as:

A. $f(f(x))g(x)$	C. $g[g(x)]g(x)$
B. f[g(x)]	D. $f(x)$. $g(x)$

For items 11-13, Refer to the given below: Let f and g be defined as $f(x) = 10x^2 - 5$ and g(x) = 2x - 1 respectively. Find;

11. (f.g)(x) C. $20x^2 - 10x - 10$ A. 20*x* − 10 B. $20x^4 - 10x + 5$ D. $20x^3 - 10x^2 - 10x + 5$ 12.(f + g)(x)A. $10x^2 + 2x - 6$ C. $3x^2 + 6x + 1$ B. $5x^2 + 2x - 6$ D. None of these 13. (f - g)(x)A. $10x^2 - 2x - 4$ C. $5x^2 + 6x + 1$ B. $3x^2 - 6x + 1$ D. $10x^2 - 2x + 4$ 14. If f(x) is 13x - 20 and g(x) = 2x - 7, what if $(f_0 g)(x)$? A. $3x^2 - 4$ C. 26x - 111B. 9*x* − 2 D. None of these

15. Consider the given in number 14, is $(f_0 g)$ equal to $(g_0 f)$? A. Yes B. No C. Mavbe D. Undecided

16. A student is earning \mathbb{P} 250.00 per day in his part time job. What is the total salary *s* as a function of the number *n* of days that the person works?

B. $\frac{250}{c} = n$ C. **s** = **n** A. 250s - n D. s(n) = 250 n

17. A computer shop at the mall charges ₱30.00 per hour (or a fraction of an hour) for the first two hours and an additional of ₱15.00 per hour (or a fraction of an hour) for each succeeding hour. How much will you pay if you will play for 45 minutes on the said shop? A. ₱22.50 B.₱60.50 C. ₱25.00 D.₱30.00

18. From the given problem in number 17, what will be the amount to be paid in 200 minutes? A. ₱90.00 B. ₱150.00 C. ₱180.00 D. ₱200.00

19. A jeepney ride costs \$7.00 for the first 3 kilometers and an additional of 1 peso for every succeeding kilometer travelled. Give the model

 $\begin{array}{l} \text{19. A Just for the costs F 7.00 for the first 5 knowledges and an additional of 1 peso for every success of the piecewise function with respect to the relationship of the fare to the distance (d).\\ \text{A. } f(d) = \begin{cases} \texttt{P} 7.00 & if \ 0 < d \leq 3 \\ \texttt{P} 7.00 + \texttt{P}1(d-3) & d > 3 \end{cases} \\ \text{C. } f(d) = \begin{cases} \texttt{P} 7.00 & if \ 0 > d \leq 3 \\ \texttt{P} 7.00 + \texttt{P}1(d-3) & d > 3 \end{cases} \\ \text{B. } f(d) = \begin{cases} \texttt{P} 7.00 & if \ 0 < d \geq 3 \\ \texttt{P} 7.00 + \texttt{P}1(d-3) & d > 3 \end{cases} \\ \text{D. } f(d) = \begin{cases} \texttt{P} 7.00 & if \ 0 > d \leq 3 \\ \texttt{P} 7.00 + \texttt{P}1(d-3) & d > 3 \end{cases} \\ \text{D. } f(d) = \begin{cases} \texttt{P} 7.00 & if \ 0 > d \leq 3 \\ \texttt{P} 7.00 + \texttt{P}1(d-3) & d > 3 \end{cases} \\ \text{D. } f(d) = \begin{cases} \texttt{P} 7.00 & if \ 0 > d \leq 3 \\ \texttt{P} 7.00 + \texttt{P}1(d-3) & d > 3 \end{cases} \end{array}$

20. A hotel chain has a promo that charges Php 3,400 for the first two nights and Php 2, 250 for each additional night's stay. The total cost <u>*T*</u> is a function of the number of nights x that a guests stays. Which if the following functions best represents the situation?

A.
$$T(x) = \begin{cases} 3,400 & \text{if } 0 < x \le 2\\ 3,400 + Php \ 2,250(x-2) & \text{if } x > 2 \end{cases}$$

B.
$$T(x) = \begin{cases} 3,400 & \text{if } 0 \le x \le 2\\ 3,400 + Php \ 2,250(x-2) & \text{if } x \ge 2 \end{cases}$$

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C. $T(x) = \begin{cases} 3,400 & \text{if } 0 > x \le 2\\ 3,400 + Php 2,250(x-2) & \text{if } x > 2 \end{cases}$ D. $T(x) = \begin{cases} 3,400 & \text{if } 0 < x \ge 2\\ 3,400 + Php 2,250(x-2) & \text{if } x > 2 \end{cases}$

General Mathematics Summative Assessment 11.1.2

1) The distance from Mandaue City to Bogo City is 90 kilometers. What function describes the time t it takes to travel from Mandaue City to Bogo City as a function of your speed s? C +(-)

A.
$$t(s) = \frac{1}{s}$$

B. $t(s) = 90s$
C. $t(s) = 90 - s$
D. $t(s) = s + 90$

2) If the rational function is $f(x) = \frac{-x+3}{-2}$, what is f (7)?

A. 2

- В. -2
- 3) A drug is injected into a patient and the concentration of the drug in the bloodstream is monitored. The drug's concentration, C(t), in milligrams per liter, after hours is modeled by $C(t) = \frac{5t}{t^2+1}$. What is the drug concentration after 3 hours?

C. 10/2

D. -10/2

A.
$$\frac{15}{4}$$
 C. $\frac{15}{2}$
B. $\frac{3}{2}$ D. $\frac{1}{2}$

4) An object is to travel a distance of 12 meters. The following table of values shows velocity (v) for various values of time (t):

	The object is to traver a distance of 12 meters. The	und wing table	or values sho	ws velocity (v)	ior vario
	t(seconds)	1	2	3	4
	v (meters per second)	12	6	4	3
Ех	press velocity v as a function of time traveled, in sec	conds.		•	
Α.	$v(t) = \frac{12}{t}$	C. v(t) :	= 12t		
В.	v(t) = t + 12 D. v	(t) = 12 - t			
5)	What value of x will make the rational function $f($	$x) = \frac{x(x+2)}{x-1} \text{und}$	lefined?		
Α.	0	C. 1			
В.	-1	D2			
6)	Which of the following represent a rational functio	n?			
Α.	$f(x) = \frac{50}{x} \qquad C.g$	(x) = x - 3			
В.	d(x) = 40x	(x) = 5x + 2			
7)	Which of the following represent a rational equation	on?			
A.	$\frac{x^2-2}{2}$ C. $\frac{43}{22}$	$\frac{(+6)}{1} < \frac{1}{4}$			
р	$\frac{3x}{1} - \frac{1}{2} - \frac{1}{2}$	<u> </u>			
D.	6 2 3 D 2	r' 5x 2 3			
8)	Which of the following does NOT represent a ratio	onal inequality	2		
A.	$\frac{2}{r-1} + \frac{3}{r-1} \le 2$ C.7	$-\frac{x}{4} > \frac{1}{2}$			
в	$\frac{2x^2}{x^2} - \frac{x}{x} \neq \frac{3}{2}$ D $\frac{x}{x} + \frac{12}{x^2} = 1$	-2			
Б.	4 6 2 D.3 x	-			

9) Which of the following does NOT describe a rational function? C. $h(x) = x^3(x-3)$ D. $h(x) = \frac{2}{x^2} - 4$ A. $h(x) = \frac{x-5}{x}$ B. $h(x) = 4x^2 + \frac{27}{x}$

10) Which rational equation has a solution of 3?

A.
$$\frac{x+5}{2x} = \frac{3}{4}$$

B. $\frac{1}{x+1} + \frac{2}{x+2} = (x1)$
C. $\frac{6}{x} + \frac{x-3}{4} = 2$
D. $\frac{3}{x-1} = \frac{4}{x+2}$

11) Which of the following is the solution of the rational equation $\frac{5x}{6} - \frac{1}{2} = \frac{1}{3}$? A. x = 1C. x = 2B. x = -1D. x = -2

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12)	What is the least common denominator (LCD	D) to be used to solve the rational equation? $\frac{2x^2}{4} - \frac{x}{6} = \frac{3}{2}$?
A. (6	C. 12
B. 2	24	D. 36
13)	Which is the solution of the rational equation	$h \frac{3}{x-1} = \frac{4}{x+2}?$
A.	1	C. 6
B. (0	D. 10
14)	Which of the following equation is the simp	plified form of the rational equation $\frac{x^2}{6} + \frac{2x}{3} = 1$?
A.	$x^2 - 4x - 6 = 0$	C. $x^2 + 4x - 6 = 0$
B.	$x^2 - 2x + 6 = 0$	D. $x^2 + 2x + 6 = 0$
15) A. B.	Which is the solution of the rational equation 12	$ \begin{array}{l} \text{on } \frac{x+5}{2x} = \frac{2}{4}? \\ \text{C. 8} \\ \text{D. 6} \end{array} $
16)	Which value of the variable will make the ra	ational inequality $\frac{x}{5} - \frac{x}{4} \le \frac{1}{10}$ true?
A.	-7	C3
B.	-1	D5
17)	Which value of x that will make the rational	l inequality $\frac{2x-1}{x+2} \ge 1$ false?
A.	-2	C. 3
B.	4	D5
18)	Which is the solution of the rational inequal	$\operatorname{lity}_{\frac{x+3}{x-2}} \ge 0?$
А.	[-3, 2)	C. $(-\infty, -3] \cup [-3, 2)$
В.	[-3, 2) ∪ (2,+∞)	D. $(-\infty, -3] \cup (2, +\infty)$
19)	Which value of x will make the inequality $\frac{1}{x}$	$\frac{x-3}{e(x+2)} < -1$ undefined?
А.	3	C. 0
В.	2	D. 1
20)	Which is NOT a solution of the rational inec	equality $\frac{2x}{5} + \frac{3x-1}{2} > 9$?
А.	10	C. 6
В.	8	D. 4

General Mathematics Summative Assessment 11.1.3

Instructions: Choose the letter of the best answer. Write your answers on a separate sheet.

1. Which of the following graphs represent a rational function?





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For items 13-17, refer to the choices below for your answers. A. $y = \frac{(x+5)(x-3)}{(x-3)(x-2)}$ B. $y = \frac{1}{x+3}$ C. $y = \frac{x+2}{x-3}$ D. $y = \frac{3x(x+2)}{x+2}$							
Find the equation that is best described by the following statements: 13. Has a vertical asymptote at $x = -3$ and horizontal asymptote at $y = 0$.							
14. Has both a vertical and horizontal asymptote but no hole.							
15. Has a hole but no asymptotes.							
16. Has it all, both asymptotes and a hole.							
17. The weekly sale S (in thousands of units) for the t^{th} week after the introduction of the product in the market is given by $S = \frac{120t}{t^2 + 100}$. In which week would the sale (S) have been 6?							
A. Fourth B. Fifth C. Ninth D. Tenth							
18. After taking a certain antibiotic, the concentration (C) of the drug in the patient's bloodstream is given by $C(x) = \frac{0.04t}{t^2 - 2}$, where <i>t</i> is the time (in hours) after taking the antibiotic. How many hours after taking the antibiotic will its concentration be 0.04 units? A. 2 hours B. 3 hours C. 4 hours D. 5 hours							
 19. Two race car drivers Ryan and Philip were taking laps around the race track. It was noted that Ryan drove 52.5 miles in the same time that Philip drove 37.5 miles. If Ryan's average speed was 30 mph more than that of Philip, what was Ryan's average speed? A. 75 mph B. 85 mph C. 105 mph D. 115 mph 							
20. The average cost to produce x ball pens is given by $C(x) = \frac{1800}{x-30}$. How many t-shirts need to be produced in order for the average cost							
of each ball pen to be at least P5?C. $30 \ge x \ge 390$ A. $30 \le x \le 390$ C. $30 \ge x \ge 390$ B. $30 < x \le 390$ D. $30 > x \ge 390$							
General Mathematics Summative Assessment 11.1.4							
Choose the letter of the correct answer.							
 Which of the following real-life situations does not illustrate one-to-one function? A. Sanctity of marriage vow in Catholic Church B. Learner's Refence Number (LRN) as used in DepEd C. Deoxyribonucleic acid (DNA) molecule in humans D. A person with dual citizenship 							

2. Which of the following sets of ordered pairs shows one-to-one function?
A. {(1,2),(1,3),(1,4)} B. {(1,1),(2,2),(3,3)} C. {(1,2),(2,2),(3,2)} D. {(1,2),(2,3),(1,3)}

3. Which of the following graphs does not show a one-to-one function?



4. Which test determines that a graph is a one-to-one function?A. Vertical Line Test B. Horizontal Line Test C. Z-Test D. none of these

5. Which of the following real-life scenarios shows an inverse that is one-to-one function?

A. Cellphone to SIM Card B. Nation to its flag C. Human to the thumb mark D. B and C

6. A.	What is the inverse of $f(x) = x - 3$	x = x + 3? B. $f^{-1}(x) = x + 3$	C. $f^{1}(x) = 3x$	D. $f^{-1}(x) = 3 - x$
7. A.	Which is the inverse of { {(b,a),(d,c),(f,e) }	(a,b),(c,d),(e,f)}? B. {(a,b),(c,d),(e,f)}	C. $\{(e,f),((c,d),(a,b))\}$	D. {(b,a),(c,d),(f,e)}

8. Which is the inverse function g of function f(x)=4x?

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A.
$$g(x)=x+4$$
 B. $g(x) = 4-x$ C. $g(x) = \frac{x}{4}$ D. $g(x) = \frac{4}{x}$

- 9. Which of the following given pairs are not inverses of each other?
- A. f(x) = 2x 1 and $f^{-1}(x) = \frac{x+1}{2}$ B. f(x) = 2x - 1 and $f^{-1}(x) = 2x$ C. f(x) = 7x and $f^{-1}(x) = \frac{x}{7}$ D. $f(x) = x^2$ and $f^{-1}(x) = \sqrt{x}$

10. Which of the following inverses is not an inverse function?

A.
$$y=x+3$$
 B. $y = x^2$ C. $y = \pm \sqrt{x}$ if not restricted D. $y = \frac{x}{2}$

11. Which is the Domain of the inverse of this function as represented in the given table?

			х	-1	0	1	2	
			f(x)	-5	-4	-3	-2	
A.	D={-1,0,1,2}	B. D={-5,-4,-3,-2} C. D	={ x/x i	s a R	}		D.	none of these

12. Which is the Range of the inverse of this function as represented in the given set of ordered pairs $\{(-1,1),(0,0),(1,1),(2,4)\}$?A. R= $\{-1,0,1,2\}$ B. R= $\{1,0,1,4\}$ C. R = $\{1,0,4\}$ D. R= D

- 13. Given that $\{(A,a), (B,b), (C, c), (D,d)\}$ is an inverse function, what are the elements that will contain the Domain? A. $\{a, b, c, d\}$ B. $\{A, B, C, D\}$ C. $\{(a,A), (b,B), (c,C), (d,D)\}$ D. $\{(A,a), (B,b), (C,c), (D,d)\}$
- 14. Is the inverse of $G(x) = \{(3,15), (4,9), (5,3), (6,-3), (7,-9)\}$ a function?
- A. Yes, because no two ordered pairs have the same x.
- B. Yes, because it is many-to-one.
- C. No, because each of element of the Domain has been paired to two elements in the Range.
- D. No, because it is one-to-one.

15. If a function has (3,5) as point in its graph, which point will definitely become a point on the graph of its inverse?A. (3,5)B. (5,3)C.(-3,-5)D. (-5,-3)

16. Does the inverse of this real-life situation show a one-to-one function?

Table shows a function that relates members of the family to their birth month.

Х	Mother	Father	Baby 1	Baby 2
f(x)	June	December	January	December

- A. Yes, for each has a month of birth.
- B. Yes, for no 2 family members have the same birth month.
- C. No, for it is one-to-one.
- D. No, for in December, there are two family members celebrating their birthdays.
- 17. Which represents the graph of the inverse of the function f(x) = x?



18. Which of the conditions must be satisfied in determining whether or not pairs are inverses of each other?

A. $(f \circ f^{-1})(x) = 1$ and $(f^{-1} \circ f)(x) = 1$ C. $(f \circ f^{-1})(x) = x$ and $(f^{-1} \circ f)(x) = x$

- B. $(f \circ f)(x) = 1$ and $(f^{-1} \circ f^{-1})(x) = 1$ D. $(f \circ f^{-1})(x) = 1$ and $(f^{-1} \circ f)(x) = x$
- 19. Given the table below, which should be the most possible population of Canduman NHS for school year 2015-2016 so that its inverse will be one-to-one function?

Student Population (X)	2014-2015	2015-2016	2016-2017	2017-2018
School Year (Y)	2889		2898	2988
C. 2889		D. 2999		

- 20. Which conclusion will best describe the relationship of $A = \{(3,6), (9,12), (15,18)\}$ and $B = \{(6,3), (12,9), (18,15)\}$?
- A. B is an inverse function because B is the inverse of A.

B. 2988

B. B is an inverse function because B is a function and is the inverse of A.

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2898

A.

C. B is not an inverse of A.

D. B is not an inverse of A because B is not an inverse function.

General Mathematics Summative Assessment 11.1.5

1. Suppose that the half-life of a certain radioactive substance is 5 days and there are 20g initially, which of the following is the exponential model for the remaining substance?

A.
$$Y = 20 \left(\frac{1}{2}\right)^{t/5}$$
 B. $Y = 5 \left(\frac{1}{2}\right)^{t/20}$ C. $Y = 20(2)^{t/5}$ D. $Y = 20(2)^{t/20}$

2. A barangay has 2,000 individuals and its population doubles every 30 years. Which represents the exponential model for the barangay?

A. $Y = 2000(2)^{30/t}$ C. $Y = 2000(2)^{t/30}$

B. $Y = 2(2000)^{30/t}$ D. $Y = 2(2000)^{t/30}$

3. Which of the following statement is FALSE?

A. In the exponential function defined by $f(x) = 3^{2x}$, x can be any real number.

B. An exponential function is a function that can be expressed as $f(x) = b^x$, where b is any positive real number not equal to 1.

C. In an exponential function, the values of the function have a common ratio.

D. Exponential function is one-to-one function.

4. Which of the following describes an exponential function? B. $f(x) = 5^x$ C. $f(x) = x^2$ D. $f(x) = 4x^3$ A. f(x) = 3xWhich of the following describes an exponential equation? $n^2 + n = 5$ B. $\frac{a}{n^2} = 4$ C. $4^{2n} = 8$ 5. D. $n^3 - 27 = 0$ A. 6. Which is an example of exponential inequality? $4^{r+3} < 8^{r+1}$ B. $\left(\frac{r+2}{2}\right)^2 \ge 0$ C. $27^{r+2} = 9$ D. $7x^3 \le 6$ A. Which value of x will satisfy the function $2^{x-1} = 16$? 7. B. 4 5 D. 6 C A. 3 8. Which of the following values of x will satisfy the exponential inequality $5^{x} > 25^{x+1}$? A. 0 B. -1 C. -2 D. -3 Which is the solution of the exponential inequality $2^{x} > 4^{x-2}$? 9. A. x > 4B. x > 2C. x < 4 $D. \quad x < 2$ 10. Which exponential function describes the table of values below? 1 2 3 4 5 0 Х 1 1 1 1 1 f(x) 1 2 4 8 16 32 A. $f(x) = 2^x$ B. $f(x) = 4^x$ C. $f(x) = \left(\frac{1}{2}\right)^x$ D. $f(x) = \left(\frac{1}{4}\right)^x$ For items 11-14, refer to the function: $f(x) = -2^{x+3} + 4$. 11. What is the domain of the function? C. (−∞, 4) A. (4,+∞) Β. (−∞, +∞) (−∞, 4] 12. What is the range of the function? C. (−∞, 4) A. (4,+∞) B. (−∞, +∞) $(-\infty, 4]$

13. What is the horizontal asymptote of the function?A. x = -4B. x = 4C. y = -4D. y = 4

14. What is the graph of the function?

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B. $\log_2 2 + \log_2 4 + \log_2 2 + \log_2 2$ D. $\log_2 6 + \log_2 6$

- 4. When $\log_2 80 \log_2 5$ is expressed as quotient its result will be?
- A. 2 B. 4 C. 6

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D. 8

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5. Which of the following is equal to log 4 64? D. 8 3 B. 4 C. 6 A. $\log_4 9 > 2\log_4 x$ is an example of 6. Logarithmic equation C. Logarithmic inequality Α. Logarithmic function D. Exponential inequality Β. The intensity of a sound in decibels or commonly known as loudness is $d = 10 \log \frac{I}{I_0}$. Find the rating of a voice which is 15,000 7. times as intense as the standard one. $(\log 15000 = 4.176)$ B. 4.17 C. 40 D. 42 A. 4 Given $f(x) = y = \log_2 x$, what will be the corresponding elements in the Range when x values are 1, 2, 4 respectively? 8. B. {2,4,6} C. {0,1,4} D. {1,2,4} A. $\{0,1,2\}$ The graph of $y = 4 \log_2 x$ has a domain that is 9. C. $\{x/x \in \Re\}$ B. $\{x/x > 1\}$ $\{x/x > 0\}$ D. none of these A. 10. $F(x) = \log b x$ where $b \neq 1$ exhibits a graph whose properties are the following except A. Domain is $\{x/x>0\}$ C. The graph passes through (1,0). B. Range is $\{y/y \in \Re\}$ D. The function will touch the y-axis 11. October 15, 2013 was the most remarkable earthquake which hit the province of Bohol. The earthquake was registered 7.2 in the Richter scale. What would be the magnitude of an earthquake 50 times as intense as Bohol earthquake? A. 10.9 B. 8.9 C. 3.7 D. 6.0 12. You and your classmates watch your favorite rock band. You happen to measure the intensity of their voice as 70 watts per square meter. What is the intensity in decibels? A. 138.45 B. 140.5 C. 141.8 D. 143 For numbers 13-14 refer to the choices below: A. $log_2(x+10) = 16$ C. $log_9(1-3x) < 7$ B. $f(x) = \log_6 x$ D. f(x) = 3x + 213. Which of the above choices is a logarithmic function? 14. Among the choices above, which is a logarithmic inequality? 15. Which of the following is equal to $log_2(b+5) - log_2(3b) + log_2(1-b)$? C. $log\left[\frac{(b+5)(1-b)}{3b}\right]$ D. $log\left[\frac{(b+5)(b-1)}{3b}\right]$ A. $log_2 \left[\frac{(b+5)(1-b)}{3b} \right]$ B. $log_2 \left[\frac{(b+5)(1-b)}{3b} \right]$ 16. If $log_2 8 = c$ and $log_2 3 = d$ then $log_2 \frac{24}{6}$ is equal to, A. c + 1 B. d + 1 C. d - 1D. c - 1 17. Solve the inequality $log_4(5x-1) > log_4(x+3)$ C. $-\frac{1}{3} < x < \frac{1}{5}$ D. $(\frac{1}{3} < x < \frac{1}{5})$ A. (1,−∞) B. (1, +∞) 18. The vertical asymptote $g(x) = log_2(9 - 3x)$ is, A. x = -3B. **x** = **0** C. x = 1D. x = 3 19. What is the x intercept of the logarithmic function, $f(x) = log_3 x - 1$? B. 3 A. 1 C. 4 D. 5

20. What is the graph of the function in number 19?

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Evaluation Checklist (Instrument)

Direction: Rank the following statements on a scale of 1-5, put a check (/) on the number below. Considering 5- being the highest and 1- being the lowest.

To what	t extent does l	Flipped	Classroom	impact	your	perception/	experience	using	flipped	classr	oor	n sti	ateg	gy.	
											-		-		Ē

	5	4	3	2	1
1. I am satisfied with the format and presentation of the learning materials.					
2. I am satisfied with the integration of technology and multimedia resources.					
3. The flipped classroom has suitable tools for supporting my learning.					
4. I am satisfied with the content and topics of the learning materials.					
5. I feel that flipped classroom has improved my understanding.					
6. I can able to work at my own pace.					
7. The flipped learning encourages me to have creative thinking and evaluation.					
8. I am satisfied with the control and freedom of choosing what and how to learn.					
9. The use of flipped classroom is easy and applicable.					
10. I am satisfied with the flipped learning experience.					

Sources: https://www.iiste.org/Journals/index.php/JEP/article/view/29629

Adapted from: An EFL Classroom Teaching Model: Effects on English Language High- order Thinking Skills, Student Engagement and Satisfaction

Grade: Strand:

Research Instrument

(Survey Questionnaire)

Name:			
Age:			

1. In your own perception, what recommendation may be propose in learning using flipped classroom strategy?

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