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“CLIMBING COGNITIVE SKILLS THROUGH COLLABORATION WITH TECHNOLOGY INTEGRATION”



<https://youtu.be/uUIEYqsAjqotdCLBv>

Project Description

The purpose of this study is to investigate the impact of blended learning to student's motivation and cognitive skills. It focused on social interaction that highlight collaboration among students and interaction between teacher and students. Data for motivation were collected through questionnaires to secondary students from grade 9, 10 and 11 grades at Heritage School Jakarta before and after implementation flipped classroom, using modified ARCS motivation questionnaire. Cognitive skills were measured using written test before and after implementation of flipped classroom. Student assignments had been arranged based on level difficulty according to revised Bloom Taxonomy through online platform (https://padlet.com/manihar_pasaribu/g6fjxe4q2db8) beforehand where they could start their learning according to their situation, time and preference. In normal class time they can clarify anything that they do not understand with the teacher and with their friends. Class assignments were arranged from lowest level and then moving to higher level. Data analysis was carried out using Excel Windows 2010 statistical tools. The results showed that student learning motivation and learning outcome were significantly increased after implementation of flipped classroom ($p: 0.05$). This is very useful for teachers and school leaders to plan and to develop differentiated learning programs that support student's needs using technology.

Keywords: flipped classroom, differentiated learning, students' motivation, cognitive skills, collaboration.

School Context:

Location: Heritage School Jakarta, Indonesia

Levels: Secondary School Students

Student Population: 160

Staff Population: 50

Year School founded: 2008

Type: Private School

I. Transformational Action Plan

Transformation action plan was designed based on situation in the context of Heritage School Jakarta, Academic Year 2017-2018. Heritage School Jakarta was established in 2008, providing education ranging from kindergarten to 12th grade. The curriculum used at Heritage School Jakarta is the Cambridge curriculum which includes Cambridge Primary Check Points for elementary school level, International General Certificate of Secondary Education (IGCSE) for grades 7-10 and Cambridge AS/A Level for 11th and 12th grade. Students attending the Heritage School are not only Indonesian citizens but also expatriate students. Heritage School is located in Beleza Arcade Lt. 3, at Jalan Arteri Permata Hijau no. 34 South Jakarta.

Students at Heritage School have different needs that come from many aspects, it could be a language barrier, learning disabilities or emotional problems and of course some of them also are gifted students. Lacking of engagement comes from various reasons, it could be different of speed of learning, readiness of learning, interest in learning, and preference of learning. Traditional classroom are not met those needs. The existence of different needs in students the in traditional face-to-face classroom model related to the readiness of learning, interest in learning, and preference of learning. If this is continue to happen students do not show significant improvement in cognitive learning outcomes and lack of learning motivation. What adaptation needs to be implemented to overcome this situation? What material could be used? Which technology could be applied? Or what kind of sequence of learning needs to adapt?

One option was to apply different style of teaching and learning process that met student needs. For this option Teacher needed to prepare teaching material that suits for students. This option needed too much time for preparation and also for implementation and in long run could make teacher overloaded. Second option was to adopt technology that combines online and offline teaching and learning process (flipped classroom). Teacher uploaded teaching material to internet for students to study in their home and discuss or clarify the topic with teacher in class time. This option also needed time investment in the beginning from teacher side but in the long run teacher can focus on evaluating and improving and making differentiated learning according to the students needs. The third option was integrate differentiated learning approaches in the flipped classroom model by using *zone of proximal development* (ZPD) strategy that meet different students' needs in terms of readiness in learning, interest in learning, and learning how to learn. This Transformational Action Plan used the third option to overcome the situation at Heritage School Jakarta.

According to Revised Bloom model, cognitive learning outcomes are measured through dimensions of the cognitive process from the lowest thinking order, it starts from remembering (C1) and understanding (C2), after that application process (C3), analyzing (C4), evaluating (C5), and creating (C6) (Anderson & Krathwohl 2009, 31).

Questionnaire to measure student motivation was modified from ARCS model (Keller 2010, 46). ARCS learning motivation model questionnaire consist of four domain where each domain consists of three indicators.

- Attention : perceptual inquiry arousal, variability
- Relevance: goal orientation, motive matching, familiarity
- Confidence: learning requirement, success opportunities, personal control
- Satisfaction: natural consequences, positive consequences, equity.

Examples question of ARCS model for measuring motivation are: Domain: attention with indicator perceptual inquiry, ‘The instructor does unusual or surprising things that is interesting. Domain: satisfaction with indicator, equity ‘I feel that the grades or other recognition I received are fair compared to other students’. Learning motivation is measured through questionnaire that adopts a Likert scale.

Aspects of flipped classroom strategy	Dimensions of Cognitive Learning Outcomes (Bloom Revised)	ARCS Motivation Model
Self-study using Padlet.com at home	C1, C2	Attention
Discussion/Clarify-using Padlet.com in class	C1, C2	Relevance
Scaffolding I: Terminology/Definition- recite	C1	Relevance, Confidence
Scaffolding II: Worksheet 1 (math skills/entry skill (imit	C2, C3, C4	Relevance, Confidence
Scaffolding III: Worksheet 2 (imitation--→independent)	C4, C5, C6	Relevance, Confidence
Exam/Test – Written test/ socrative.com	C1, C2, C3, C4, C5, C6	Satisfaction

Table 1.1 Mapping of differentiated learning approaches in the flipped classroom approached

Table 1.1 is the integration approach of flipped classroom strategy with cognitive skills, learning motivation through social interaction.

II. Gantt chart

Key question that need to be addressed are how to improve students cognitive skills and motivation. The project started on the first week of March related to find literature review about cognitive skill, motivation and social interaction that improve cognitive skills. Preparation

included teaching materials that have to be ready beforehand (see Tabel 2.1). After getting approval from School Principal, transformation action plan took place for about six weeks. It started with questionnaire of learning motivation. Uploading the teaching material to padlet.com, creating question for evaluation either paper based or online format to socrative.com. For cognitive outcome, *pre test* data was taken at the term three exam.

Transformational Action Plan (TAP):	Technology integration to cater diverse student abilities to improve students motivation and cognitive skills															
Vision:	Engaging student in long life learner															
Key Performance Indicators (KPIs)	Motivation (Attentiveness, Relevance, Confidence, Satisfaction) of students increase Increase Cognitive skills															
Goals/Objectives	March				April				May				June-July			
	Wk1	Wk2	Wk3	Wk4	Wk1	Wk2	Wk3	Wk4	Wk1	Wk2	Wk3	Wk4	Jn1	Jn4	Jul1	Jul4
Finalisation of TAP																
Literature review (What theories guide your project?) - ARCS -Model, - Bloom Model - ZPD		√	√	√	√											
Obtaining approvals from relevant stakeholders		√	√													
Implementation of intervention (How will TAP address the situation?)			√	√	√	√	√	√								
Measuring the impact of TAP using KPIs		√		√		√		√	√							
Preparing Final Report										√	√	√				
Finalising Critical Reflective Portfolios											√	√		√	√	√

Figure 2.1. Gantt Chart. Actual Implementation of Transformation Action Plan (TAP)

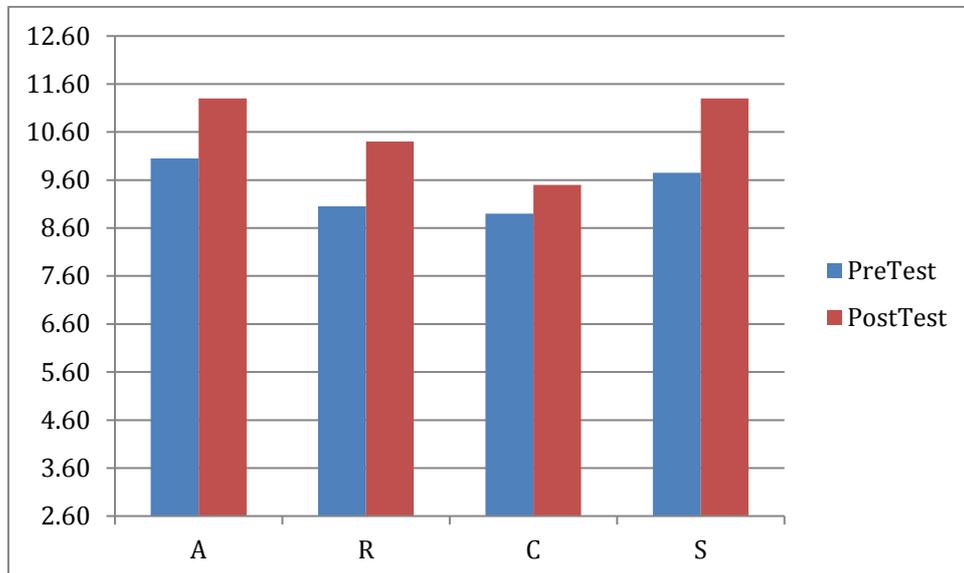
Post Test data was taken after the implementation of flipped classroom at the fourth week of April 2018. The results were then compared between *pre test* and *post test* both for students learning motivation and students cognitive skills.

III. Evidence of Transformation

3.1 Student's Learning Motivation

Student motivation was analyzed based on the total score of each domain of ARCS learning motivation models that were measured, namely attention, relevance, confidence and satisfaction. Each domain consist of three indicators, indicators of domain attention consists of perceptual inquiry arousal, variability, indicators of domain relevance consists of goal orientation, motive matching, familiarity. Indicator of domain confidence consists of: learning requirement, success opportunities, and personal control. Indicator of domain satisfaction consists of: natural consequences, positive consequences, equity. Total of

each domain of learning motivation were measured before and after implementing flipped classroom. Graph 3.1 showed the dynamics of students learning motivation. It is clear that in every domain of learning motivation measured, they were increased after implementing flipped classroom.



Graph 3.1 Student motivation based on ARCS Model before and after implementing flipped classroom

Further analysis indicated that there is significant differences between *pre test* and *post test* result which showed increasing in the component of motivation.

Anova: Two-Factor With Replication

SUMMARY	A	R	C	S	Total
<i>Pre Test</i>					
Count	20	20	20	20	80
Sum	201	181	178	195	755
Average	10.05	9.05	8.9	9.75	9.4375
Variance	1.944736842	2.892105263	2.831578947	2.197368421	2.60363924
<i>Post Test</i>					
Count	20	20	20	20	80
Sum	226	208	190	226	850
Average	11.3	10.4	9.5	11.3	10.625
Variance	2.010526316	2.778947368	1.526315789	1.378947368	2.41455696
<i>Total</i>					
Count	40	40	40	40	
Sum	427	389	368	421	
Average	10.675	9.725	9.2	10.525	
Variance	2.327564103	3.230128205	2.215384615	2.358333333	

ANOVA						
<i>Source of Variation</i>	<i>SS</i>	<i>Df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Sample	56.40625	1	56.40625	25.696838	1.14637E-06	3.903366
Columns	57.71875	3	19.2395833	8.76492332	2.13017E-05	2.664107
Interaction	5.06875	3	1.68958333	0.76971876	0.512654921	2.664107
Within	333.65	152	2.19506578	7		
Total	452.84375	159	9			

Table 3.1 Analysis of variance of students learning motivation

3.2 Flipped Classroom

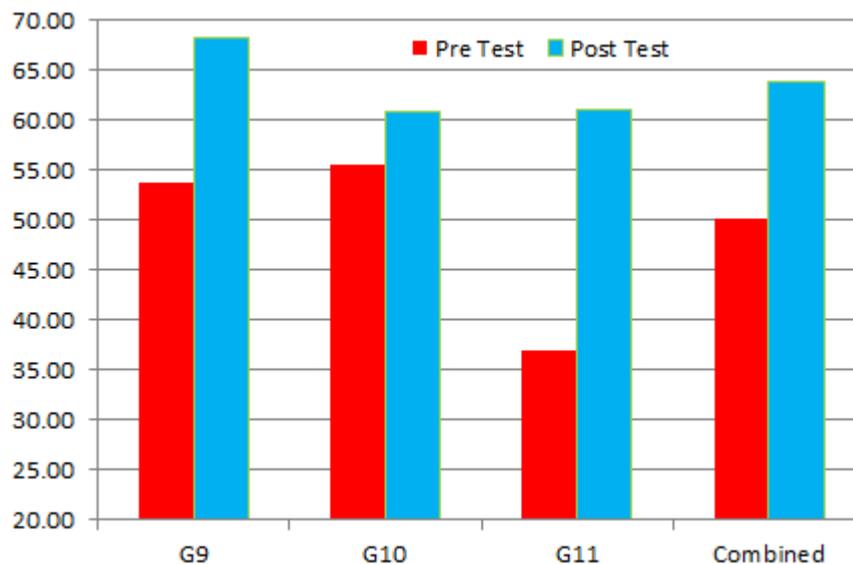
Students gained access to online platform (padlet.com) before class so they can read and take notes. Assignments were uploaded according to Bloom Taxonomy hierarchy. Students tried to complete assignments from the lowest level to the higher level one at a time. Once they completed one stage then they moved to next level. They can discuss with their friends online, shared answer and asked feedback. If they have questions about the assignment they can discuss online. At normal class, students discussed and clarified what they had learnt, shared ideas with friends and also with teacher. Some students can immediately learn in an orderly manner, both online and off line independently.

After students completed all assignments they took chapter test, this process of implementation took six weeks. Through online interaction, students participated, shared ideas and gave feedback among them. It gave them different way of approaching difficult concepts. Lecture learning method turns out to something that students still needed. In lecture method, they can interact with teacher and other students that bring them to explore more concepts. It can produce sharpening of the concept through discussion with teachers and fellow students. This is in accordance with the theory of learning of cognitive development Lev Vygotsky said that collaborative problem solving will maximize learning (Gredler 1997, 162). It seems that students need to be helped to make achievement targets at the beginning of completing assignments that were arranged from the lowest cognitive skills to the highest level so that they are efficient and effective in using time. Some students said that they have more control in fulfilling task, flipped classroom model gives them a chance to get more teacher

assistance. Flipped classroom transforms the way of teaching that integrate technology and collaborative learning.

3.3 Cognitive Skills

Cognitive learning outcomes are measured from the written test, before and after implementation of flipped classroom. It is a product that is expressed by changes obtained in the form of knowledge at the end of the learning process (Anderson and Krathwohl 2009, 31). Graph 3.2 showed the results of students learning outcome. There are 20 students participated form three classes. There are eight students are grade 9, seven students are grade 10 and five students are grade 11.



Graph 3.2 Student learning outcome before and after implementing flipped classroom

Grade 9 and Grade 10 students use IGCSE syllabus and Grade 11 students use AS level syllabus. During the project grade 9 students were in the preparation of national exam, grade 10 students were in the preparation for IGCSE exam and Grade 11 students did not take external exam. From graph 3.2 grade 11 showed the most improved class. However all three classes showed a better results after implementation of flipped classroom. Combined learning outcome was tested its significant level using t- Test with p value = 0.05, the results was shown at Table 3.2.

	<i>Pre Test</i>	<i>Post Test</i>
Mean	50.25512821	63.92099359
Variance	316.2880705	193.4738345
Observations	20	20
Pearson Correlation	0.688303055	
Hypothesized Mean Difference	0	
Df	19	
t Stat	4.698052833	
P(T<=t) one-tail	7.83044E-05	
t Critical one-tail	1.729132812	
P(T<=t) two-tail	0.000156609	
t Critical two-tail	2.093024054	

Table 3.2 t-Test results of student's learning outcome

The t-Test confirmed that students learning outcome were significantly improved after the implementation flipped class room.

IV. Critical Reflections

This project started with the concern about lack of student learning motivation due to preference of learning style, readiness of learning and language barrier that existed at Heritage School Jakarta. If the situation continues to happen, student learning outcome would be at risk. It is important to address these issues properly with resources that we have. In order for transformation to happen, it took strategy and support from students, fellow teachers and also school principal.

Transformational leadership is a type of leadership that lead through examples. Leader supports his/her follower. As a teacher, it is part of our task to support our students and our fellow teacher, working as a team and serve and inspires our students. This project is part of my response to the challenge that comes to the context where I worked, tried to find possible options and finally chose one of them. This project aimed to help students having better understanding of their study, by facilitating them with proper scaffolding, provide environment to shares ideas. The role of a teacher is to facilitate students to get to their full potential. It did not take long time to see the changes happen. Students responded well to flipped classroom that I implemented.

Initially I planned to run flipped classroom with grade 10 science streams, but later on grade 11 asked the same thing and finally I run flipped classroom for grade 9 also. With flipped classroom strategy, they had access to learning materials before class and set their own schedule, this was the first tipping point of this project.

The success of this flipped classroom model is largely determined not only by teacher's commitments to prepare learning materials before class time but also by student's commitment in completing assignments and making preparation before class time. From observations, discussion among students through online platform helped students to engage in learning process. However, it was also observed that several students who appeared to lack discipline in doing assignments. In this case, role of students who get benefit from this learning strategy is important to support and encourage them to be more discipline. The impact of this project hopefully would also affect other teachers at Heritage School Jakarta in the academic year 2018-2019, as school principal asked me to conduct seminar for returning and new teacher at Heritage School Jakarta on July 12th 2018. Seminar entitle: "*Navigating challenge in education, our response in our context*"(https://padlet.com/manihar_pasaribu/uprjswika8eb). In this seminar, I shared about my concern of student learning motivation and learning outcome and I gave response by implementing blended learning using flipped class room strategy, and now is their response is needed to face challenges in their context. Flipped classroom is one way to response that met my student's needs. This is the testimony of School Principal of Heritage School Jakarta, [Mr. Julius Go](#)

For academic year 2018-2019, I got job offer from International School of Dongguan, China, I teach Theory of Knowledge and Physics for IB Diploma Program. After having through all this process, it is part of my responsibility to give responses to the challenge in the context; the setting is totally different so do the responses but one remain the same spirit to help students to get their full potential. That is the calling.

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