Flipped Learning Model and Pre-Service Teachers' Computer Literacy Performance in Ghanaian Colleges of Education

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Abstract: **- This empirical work was basically designed to investigate possible impacts of flipped learning technique on academic performance of colleges of education student in Computer Literacy course. Two research questions and two hypotheses were designed to guide the research which was conducted on population of 1800 student in the two colleges of education in Ghana.Multiple sample technique was used to sample one school and two intact classes used that comprised of (experimental class comprised of 45 students while the control class comprised of 51students) for the research.Mean and Standard Deviation were used to answer research questions while hypotheses were tested using Analysis of Covariant. (ANCOVA) Reliability of instrument used for data collection was tested using Pearson Moment Correlation Co-efficient and reliability index value was 0.78The result of the analysis revealed that there is significant difference between performance of students taught Computer Literacy using flipped learning model and students taught same course using conventional learning method. It was therefore concluded that students taught Computer Literacy using flipped model performed better than students taught using conventional or Lecture method and that gender effect does not moderate performance of students taught Computer Literacy using flipped learning model. It was therefore recommended that colleges of education in Ghana should introduce flipped learning model into the teaching of Computer Literacy because flipped learning model has proven to be better than conventional or Lecture method and is not gender dependent.**

Key words: **Flipped Learning model, Conventional Learning Method, Academic Performance**

I. INTRODUCTION

In most colleges of education in Ghana, Computer Literacy is among the courses offered by student which was design to bring the student up to speed on both the software and hardware part of computer and some relevant packages which they would need in the course of their carrier as future teachers, some of the key content of the curriculum in Computer Literacy are Part of computer and their functions, some major software packages like Microsoft Word, Microsoft excel, Microsoft PowerPoint and others. Currently, there is notable decline in performance of studentsas far asComputer Literacy in colleges of education in Ghana is concerned and this decline in performance has been attributed to several factors, including the strategies used by tutors in teaching this course. One such factor is the conventional lecture method. Therefore, this research is designed to foster solution to this problem by investigating another strategy of teaching (flipped model) in comparison with this conventional Lecture Method.

In the conventional or Lecture method of teaching, which is commonly seen in most high institution, the teacher is usually the centre of attraction and focus of every learning process and the chief distributor or disseminator of needed information during learning periods in class. The teacher is responsible for asking and directing questions while students depend completely on teacher for feedback and guidance (Ryback, & Sanders, 2011). In classroom operating on conventional model of instruction, every lesson is focused on teachers who explain content of every lesson using normal lecture style. Students that participate in teaching based on conventional technique mostly operate independently when tasks are given to them by teachers. Class activities are mostly directed and concentrated on teacher opinion who coordinates and controls flow and direction of entire conversation. Naturally, Conventional form of teaching equally involves giving task to students and practicing certain concept and solving some problem outside school in form of homework (Bergmann, & Sams, 2012).

In flipped learning model, the teacher, intentionally, shifts instruction to students making the learning process a student-centred process in which class room time is utilized in exploring topics to greater depth and to create more appreciable meaningful learning because students are already and initially introduced to these topics outside the classroom Abeysekera, Phillip and Dawson (2015). In flipped learning technique, 'content delivery' can be carried out using several forms. In most cases, video lessons which are prepared by teacher or another educator are used in delivering lesson content, and in some cases online collaborative technique and digital research are used (Greg, 2011)By watching instructional material on video before class meeting, learners would come to class prepared and would actively participate in class activities which would increase their conceptual understanding of the needed information. By redirecting

learning process out from conventional pattern, time usage is more effective and engaging (Littles, 2015; Hung, 2015; Bergmann & Sam, 2012; Tucker, 2012; Strayer, 2007). The flipped technique makes more time available for more active and meaningful class activities and avail opportunity for direct instruction between teacher and learners which focuses directly on students' intellectual processes (Westermann, 2014; Little, 2015). The conventional technique has always been the normal method of teaching in most higher education institutions. But, e-based learning techniques currently improved notably and massively. Di-Rienzo and Lilly (2014) stated that more students need more flexible schooling schedules in order to meet up with work and family responsibilities. With introduction of several technology based advancement into education, educators are trying to design novel learning techniques to enhance and increase their effectiveness and to increase students' performance. However, using only technology is not as efficient as incorporating it with other effective teaching techniques. A novel blended learning model called Flipped learning was introduced. Flipped learning model is still new and its definition is still open to several interpretation. It is commonly defined as new teaching technique, that flips the conventional role of learners and teachers, delivers lesson material outside classroom and activities that were conventionally done at home based on conventional technique, is carried out in class.

According to Strayer (2012) flipped technique "moves the lectures outside the classrooms and uses learning activities to move practice with concepts inside the classroom". Using wider definition for flipped technique, Bishop and Verlegar (2013) sees flipped technique as learning technique which is composed of two main sections: interactive group section inside classroom, and computer-based individualized section outside classroom. They argue that meeting criteria for flipped learning technique section which involve outside-class activities must include video lectures while class activities involve interaction. Butt (2014) stated that flipped learning technique is delivering content material outside class time via video, recorded lectures and extensive note and then using normal class time for collaborative activities pertaining to material delivered. He also maintained that flipped technique inspires active student involvement with interaction inside classroom when pushing traditional-based activities outside classroom.

It is crucial to state that flipped learning does not entirely eliminate teachers from entire learning process; it only rearranges contact time between teachers and student in classroom. Little (2015) stated that teachers have prominent part to play as concerns helping students in applying taught content and in ensuring that applications are done properly. Also, teachers are essential in maintaining and controlling learning pace and teacher's knowledge content is crucial for student's success. Hamdam et al. (2013) stated that flipped technique gives teacher room to "break lecture-centred instruction model by redirecting focus from curriculum guide to students learning requirement" The flipped technique generates student-centred learning alongside collaborative method. By delivering instruction material usually videos outside normal classroom and cooperative interaction activities in class, students focus on engaging and interacting with peers and teacher, work to resolve set challenges with teachers directions.

Several research are already reported on how flipped technique learning technique impact on student performance as compare to other teaching technique. Some of these reports are reviewed below

Little (2015) conducted research to investigate whether flipped learning technique provoked positive change in academic performance of student compared to conventional learning technique. He used class of 9th level Psychology students in six month period. His research comprised of changed and active class meetings which are student-led and involved collaborative technique which enhanced creative reasoning. When comparing flipped technique and conventional technique. He stated that flipped technique provided positive outcomes with higher scores. Also, feedback from involved students was appreciably positive and participated students responded that they preferred lessons taught based on flipped technique than conventional technique.

Thompson and Mombourquatte (2014) examined two learning methods which are flipped method and conventional or Lecture method in Business Admin classes. The procedure involved three groups in which two groups were taught using conventional technique while and the third group were taught using flipped technique. They compared scores of these student and equally interviewed the students to give then room to express their personal opinion concerning flipped technique and conventional technique. Results showed that no disparity was observed between the two groups taught using normal or traditional method and flipped group. However, interview results showed that student preferred flipped technique because they are allowed more opportunity to interact with peers and teacher

Strayer (2012) conducted research designed to compare impacts of flipped learning technique to conventional lecture methods in two statistics classes in college. When comparing responses of these two groups, it was observed that students are not entirely contented with flipped learning technique but showed that they preferred collaborative techniques and innovative learning techniques.

Butt (2014) equally uncovered positive answers in science course taught in Australia. This research was concerned with reading techniques both outside class and active activities in class time which represent flipped technique. And involved learners stated that they preferred flipped technique because it benefits them more compared to conventional or Lecture method in learning science. However, the students preferred pre-recorded instruction materials and course material.

II. STATEMENTS OF PROBLEM

Based on the backgrounds above, it is observed that conventional learning technique which is currently used in teaching Computer Literacy in colleges of education in Ghana may not be the best when compared to the flipped learning model. Therefore this research is designed to determine the performance of students taught computer literacy using both conventional or Lecture method and flipped learning model to ascertain which would be the best and equally investigate whether gender would moderate performance of students taught using flipped learning model.

2.1 Research Objective,

The main objectives of this study are

1. To determine possible effect of flipped learning model and conventional learning method on performance of student in computer literacy
2. To determine possible effect of gender on performance of students taught computer literacy using flipped learning model.

2.2 Research Question

The research questions that guided this study are

1. What is the effect of flipped learning model and conventional learning method on performance of students in computer literacy?
2. How does gender moderate the performance of student taught in Computer Literacy using flipped learning model?

2.3 Research Hypothesis

The hypothesis formulated to guide this study are

1. No significant difference was noticed between the mean score of student taught Computer Literacy using flipped learning model and those taught Computer Literacy using conventional or Lecture method.
2. No significant difference was observed between the mean score of male and female students taught Computer Literacy using flipped learning model.

III. MATERIALS AND METHODS

3.1 Research Design

The design employed in this work is quasi experimental design. This design is usually used to access cause effect in target population withregular task.This design was employed because it would give the research room to examine possible effects of flipped and conventional learning methods on colleges of education students' Computer Literacy performance.

3.2 Research Participant

The participants in this research were one thousand eight hundred (1800) students of the two colleges of education in the Volta Region of Ghana. It was impossible to effectively involve all these students, so sampling was conducted. The sample technique used in this research was multiple sampling method which involve; first selecting one out of the two colleges of education in the Volta Region in Ghana using Simple random method, then selecting two intact classes (Experimental class and control class) that contain 45 student (18 male and 27 female) and 51 student (21 male and 30 female) respectively from the college of education selected.

3.3 Research Instrument

Pre-test and Post-test questionnaire which are questions set by researcher on computer literacy specifically on use of "Microsoft Excel" and Power Point" was instrument used to obtain score of the student before and after teaching with flipped learning model and conventional learning technique.

3.4 Reliability of Research Instrument

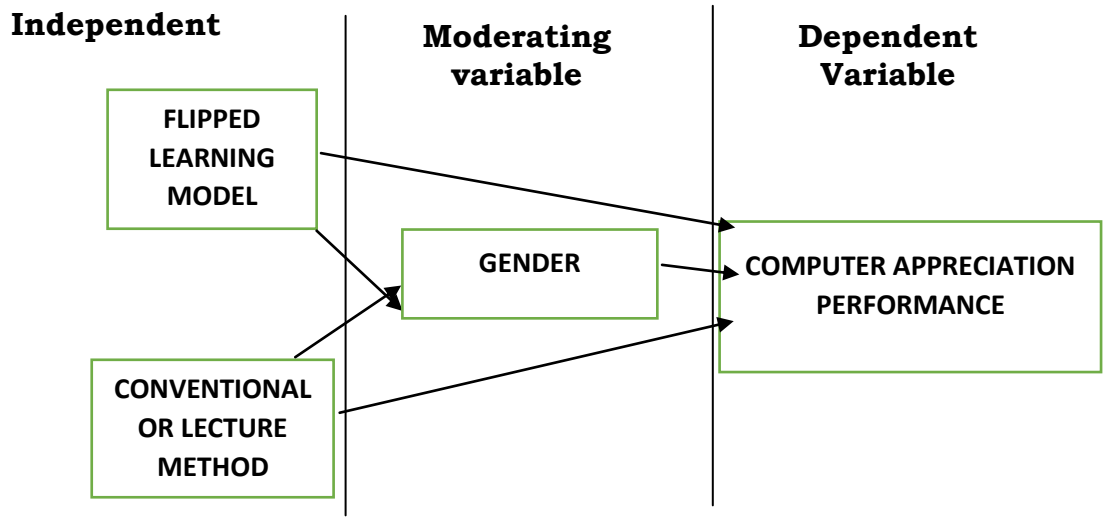
To meet with reliability of the used instrument, a test-re-test method was used. In this method, before proper administration of instrument, ten students who were not part of the class selected for experiment were administered with this instrument. Two weeks later, the same instrument was administered again and results of the two administrations was calculated for reliability using Pearson Moment Correlation Co-efficient and the reliability index value was 0.78

3.5 Data Collection Method

Data was collected by scoring the student based on questionnaires given to then before and after the lessons. The question paper contained 25 objective questions. 15 questions on Microsoft Excel and 10 questions on Power Point, and each question carried one mark.

Table 3.1: Sample Design

Class	Male	Female	Total
Experimental class	18	27	45
Control class	21	30	51
Total	**39**	**57**	**96**



3.1 Conceptual framework

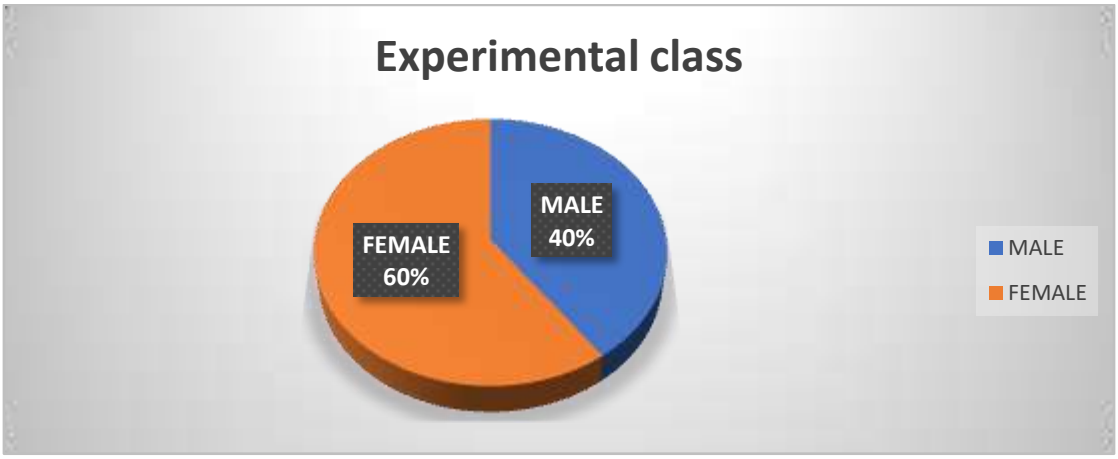


Figure 3.1 Pie chart of the male and female student in experimental class

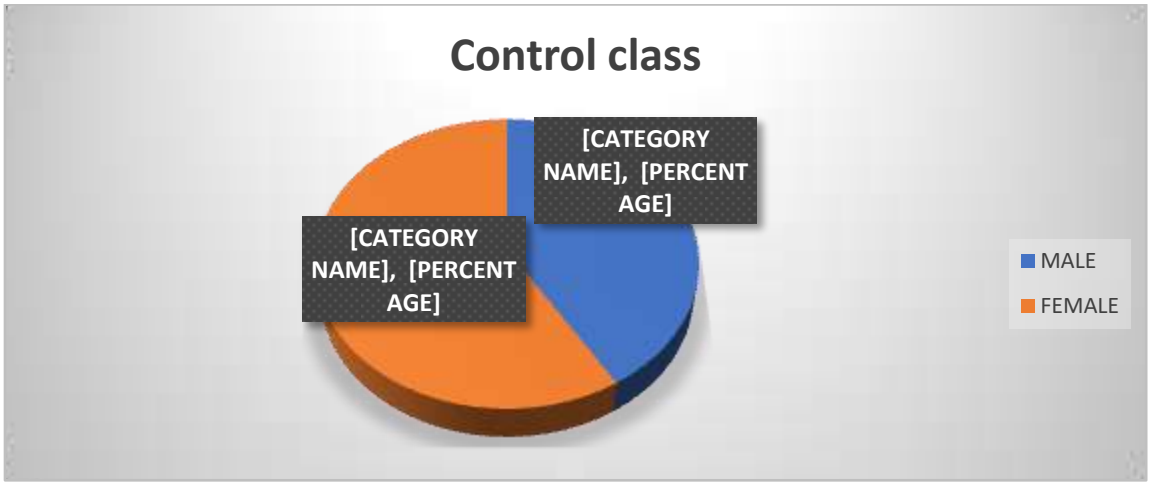


Figure 3.1 Pie chart of the male and female student in control class

3.6 Data Collection Procedure

This study used qualitative forms of analysis to gain insights into student academic performance when taught with both flipped learning model and conventional learning method respectively. Both Experimental class and control Class were

exposed to pre-test and a post-test based on ability to use Microsoft Excel to determine their academic performance

Both experimental and control contained same course outline which includes eight major lessons (four lessons on computer hardware and four on computer software) with assignments after every lesson. Control class received conventional lecturing method with lessons taught inside classroom while their homework are completed at home. Experimental class was taught using flipped lecturing model. During this procedure, students are allowed to watch well-compiled lesson videos at home while their homework are completed inside class. The lessons presented to students were developed by researcher with same course content for experimental and control class; however, the lessons were arranges and save in form of video for flipped learning model group. This research was separated into three sections namely Preparing, Tutoring, and Evaluating. During preparation section, students in both class were pretested to examine their knowledge before course content was delivered and was conducted using Computer Literacy question to source information on student's ability to use Microsoft Excel. During tutoring section, students in control class were taught using conventional lecture inside classroom while homework are completed at home. At the beginning of every class, homework were collected, reviewed and scored to ensure accuracy. After every lesson, students were given some quiz which was meant to examine their performance as concerns their understanding of lesson material.

Also, experimental class students were taught with flipped learning model via video which was given to student at home. After watching these lessons, students were presented with some questions and expected to submit their answers to teachers online before coming to class to ensure that they would come to class well informed. At commencement of each class, questions given to student are reviewed and every students is allowed some time to interact and collaborate with peers and tutor to share ideas and thoughtful on video set to then After showing their capacity to analyse and assess some elements of set video, homework are conducted in classroom. After every lesson, students are given test to ensure proper understanding of lesson material. In evaluation section. Students in both class were post-tested to measure changes that may have occurred due to the lessons treatment

3.7 Data Analysis method

Data collected from these two classes were arranged into two pre-test and post-test scores. These pre-test and post-test scores were used to analyse student academic performance. Mean and SD (Standard Deviation) of the pre-test and post-test scores were calculated to help answer designed research questions while One-way Analysis of Co-variant (ANCOVA) was used to test hypothesis as to ascertain whether there was significant difference between student performance in these classes.

IV. RESULTS AND DISCUSSIONS

4.1 Data Analysis on Research Questions

One; what is possible effect of flipped learning technique and conventional learning technique on performance of student in computer literacy.

Table 4.1: Mean score and SD of Pre-Test and Post-Test Scores of flipped Learning Model and Conventional or Lecture methods in Computer Literacy Performance Test

		Pre- test		Post – test		
Method	N	Mean	S.D	Mean	SD	Mean Difference
Flipped Learning Model	45	7.03	1.21	18.01	1.46	11.07
Conventional or Lecture method	51	7.54	1.53	9.80	1.32	2.26

This table in figure 4.1 showed that students that were taught Computer Literacy using Flipped learning model had mean score of 7.03 and SD of 1.21 before test (pre-test) and mean score of 18.01 and SD of 1.46 After flipped learning model was used in teaching them (post-test) then the mean difference for flipped learning model is 11.07. Students that were taught with traditional or conventional or Lecture method had mean score 7.54 and SD value 1.53 before test (pre-test) and mean score of 9.80 and SD value of 1.32 then their mean difference score of 2.26. This means that, there is appreciable increase in student performance from pre to post-test in flipped learning model and conventional or Lecture method which is proved by increase in their mean score from 7.03 in before test to 18.01 in after test was given for flipped method and 7.54 before test to 9.8 after test for conventional or Lecture method. it is equally noticed from this results that students that were taught Computer Literacy using flipped method performed notably better compared to students taught using conventional or Lecture method, this is made clear by mean difference between score before test and score after test performance which is 11.07 for flipped method and 2.26 for conventional or Lecture method. This suggested that using flipped method enhances student performance more compared to conventional or Lecture method.

Two, how does gender moderate the performance of student taught in Computer Literacy using flipped technique?

Table 4.2: Mean and SD of Pre-test and Post-test on Computer Literacy Performance of Male and Female Student Taught using Flipped Method

		Pre- test		Post – test		
Gender	N	Mean	S.D	Mean	SD	Mean Difference
Male	21	7.03	1.28	17.07	1.34	10.04
Female	30	7.38	1.65	17.98	1.57	10.60

Table 4.2 showed revealed that male student that were taught Computer Literacy using Flipped method score average of 7.03 with SD value 1.47 before test was given and average score of 17.07 with SD value of 1.34 after test was given to them with mean difference of 10.04 whereas female student that were taught same Computer Literacy using same flipped method scored average of 7.38 and SD value 1.65 before test was given to them and average score of 17.98 and SD value 1.57 after test score was given to them with mean difference 10.60. This suggest that female students performed slightly better than male students when flipped method is used in teaching Computer Literacy in colleges of education in Ghana, but this difference was never appreciable.

4.3 Data Analysis to Hypothesis Testing

Hypothesis 1: No appreciable disparity was noticed between the averages or mean score of student taught Computer Literacy using flipped technique and those taught same Computer Literacy using conventional technique.

Table 4.3: ANCOVA analysis of students' Computer Literacy performance between student taught using flipped method and those taught using conventional or Lecture method

Dependent Variable: post-test					
Source	Type III Sum of Squares	DF	Mean Square	F	Sig.
Corrected Model	779.970[a]	2	389.990	159.539	.000
Intercept	641.839	1	641.829	269.540	.000
Pre-test	28.910	1	28.900	11.998	.001
Methods	**769.847**	**1**	**769.847**	**329.996**	**.001**
Error	218.946	90	2.290		
Total	21675.000	96			
Corrected Total	1100.811	86			

Table 4.3 shown above is ANCOVA analysis which evaluated and revealed difference in flipped method and conventional technique on student performance in Computer Literacy. The result revealed significance level of 0.001 which is lower compare to 0.05 stipulated significance level. Hence, null hypothesis was discarded meaning that appreciable difference existed in student performance as concerns those taught Computer Literacy using flipped method and those taught using conventional or Lecture method.

Hypothesis 2: No appreciable difference was notice between mean score of male and female student taught Computer Literacy using flipped technique.

Table 4.4: ANCOVA results of students taught Computer Literacy using flipped method based on gender

Dependent Variable: post test					
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	332.861[a]	2	171.426	6.912	.003
Intercept	652.231	1	652.231	176.647	.033
Pre-test	9.501	1	3.701	1.082	.401
Gender	**15.907**	**1**	**15.907**	**4.565**	**0.059**
Error	785.985	41	2.310		
Total	1404.000	45			
Corrected Total	141.900	45			

Table 4.4 above showed ANCOVA result of difference in performance based on gender for student that were taught Computer Literacy using flipped method. This revealed significant level of 0.059 which is high compare to 0.05 stipulated significance level. Therefore, null hypothesis was incorporated or accepted meaning that no appreciable difference was observed in student performance based on gender when student are taught Computer Literacy using flipped method

4.3 Discussion

This research investigated effects of flipped learning technique on academic performance of student in collages of education in Ghana. Based on two research questions which were developed to direct the researcher on achieving research objective, it was uncovered from first research question that flipped technique and conventional technique appreciably enhanced learners performance in Computer Literacy courses which was confirmed by increase in score of student in before and after test evaluations. However, flipped technique showed better scores compared to conventional technique. This was revealed by differences in average scores of students using these techniques. Also, the first hypothesis testing confirmed that there is, indeed, an appreciable difference in performance of students that were taught Computer Literacy using flipped technique and those taught using conventional technique. This findings agree with findings from Little (2015), Thompson and Mombourquette (2014) and Butt (2014) who independently confirmed that flipped method improves academic performance of students compared to conventional or Lecture method in different fields of endeavour.

Second research question that was developed to find out whether gender moderate performance of student that were taught Computer Literacy using flipped technique indicated that female student performed slightly than male student but hypothesis testing failed to confirm this position by revealing that although there was disparity in performance based on gender but this disparity was not significant. Gender moderating research has not been conducted before with respect to flipped method of learning therefore this is the first time this kind of finding is reported.

V. CONCLUSIONS

From these finding obtained after analysis in this work we conclude that flipped learning model appreciably improve performance of student in Computer Literacy course more than the conventional or Lecture method currently been used in teaching this course in college of education in Ghana. And it was also reported that gender did not moderate performance of the student as concern learning computer application using flipped learning model. These imply that colleges of education in Ghana should seriously consider their position as concerns using conventional or Lecture method in teaching computer literacy because it has proven to be less effective compared to using the flipped model which has proven to be more effective based on students' performance.

VI. RECOMMENDATIONS

From these conclusions above, it was therefore recommended that

1) The conventional or Lecture method currently being used in teaching Computer Literacy in colleges of education in Ghana should be used together with the flipped learning model because the flipped learning model has proven to be a more effective method that would improve the performance of the students significantly.
2) Flipped method has also shown that it is not gender specific meaning that it improves performance of both male and female student alike.
3) However, more research should be carried out to ascertain the student perception as concern flipped method compare to conventional or Lecture method.

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