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How to Improve Students' Computer Skills? A Flipped-Blended Instructional Model for Economics' Students in Higher Education

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Abstract

Basic computer skills are essentials for students in higher education to achieve. This study was a research and development (R&D) of a flipped-blended instructional model for Computer Application Courses. The study followed Steps of System Approach Model of Educational Research and Development by Gall, Gall, and Borg. In a flipped-blended instructional model, students watched online instructional video before class and then practice to it through taks and problems in the classroom with the guidance of a lecturer. The model was developed and evaluated by experts and students. Six experts were involved to evaluate this model. According to the experts the model was valid and ready to use. Pre test and post test were conducted to see the effectiveness of the model and the result was an increase in learning outcomes which meant the model was effective to improve students' performance.

Keywords: Basic computer skills; Research and development; Flipped-blended; Instructional model.

1. Introduction

Today, computer skills are taught in elementary school all the way up to university. Previously, it was included in the school curriculum under Information and Communication Technology (ICT). Today, in curriculum 2013 it is integrated into other courses (Fitriana, 2014). Even though it is no longer an independent subject, computer skill remains an important thing to be possessed by each individual person.

Computer skill constitutes one of essential skills to be mastered by Indonesian workers, other than the basic skills (arithmetic, reading, and writing), and English skill (di Gropello et al., 2011). Nevertheless, the biggest gap is found in English and computer skills. What it means by skill gap is the differences between the employer's expectation of the skill of a worker and the actual skill the worker has. The gap in computer skill shows that many Indonesian workers are still not able to perform as expected. This could occur due to the worker's lack of knowledge or lack of training to improve their computer skill. Not only for workers, computer skill is also essential for university students. They need computer skills to help them finish their homeworks or to enter employment once they graduate. However, students often encounter difficulties in learning computer skills taught in Computer Application Course. They can easily follow the basic steps to run various applications. But, when the instructions are getting more complicated and they were asked to analyze and start a project from scratch, they start to have difficulties.

Intervention is needed to help these students taking the Computer Application Course. Not only they must be able to follow basic instructions of particular applications, they must also be able to analyze and start a project from scratch. One of the interventions an instructor could do is to design of the Computer Application Course instructions as such that it will enhance students' understanding about the course material. The instructions for Computer Application course should be designed to encourage active learning. The nature of the Computer Application Course that needs accuracy in following particular instructions may cause confusion. However, even though students feel the need to ask questions, they are afraid to raise their hands, even for simple questions, for fear of being thought stupid. This could be overcome by motivating students that they will have courage to actively ask questions. We found that students actually find more difficulties outside the classroom. The homeworks given to enhance students' understanding often make the students confused even more. It is not uncommon that students will come to the class with unfinished work or wrong solution. One of the reasons is that students don't know where to find help when they have difficulties in doing their homework. They don't know who to ask or they have conditions that restrain them to find answers, such as time and place constraints.

Bergmann introduced a flipped classroom method that flips the activities inside and outside the classroom. In flipped classroom, the instructions are delivered outside the class, and the assignments are done in the class. Flipped classroom can be a solution to enhance students understanding in learning computer application. Instructional material could be presented outside the class, and in the class students can actively work on their assignments and ask questions directly to the instructor in the class. The instructions can be delivered online through a website, that it will not be just a flipped classroom, but it has become flipped-blended based learning. The online instructions can

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also be integrated with an online discussion forum to help students when they have difficulties in understanding the online instructions.

Numerous studies on flipped classroom and blended learning have been conducted around the world. Hajhashemi, Caltabiano, and Anderson from James Cook University, Australia studied various forms of flipped classroom and how the Australian Teaching Institute integrates this approach with their instructional activities (Hajhashemi *et al.*, 2016). They found that the flipped classroom approach has both attract and challenge instructors in universities. Another study is conducted in Indonesia by Linawati. This study applied the blended learning approach by using Flipped model for shortcourse or Partograph workshop in the Udayana University. Linawati found out that the participants in her study have better learning result (Linawati, 2016). Flipped classroom is also applied to blended instructions for atletic training program at West Chester University. Heinerichs, Pazzaglia, and Golboy who conducted the study found out that flipped classroom could create a student-oriented learning that encourages active learning (Heinerichs *et al.*, 2016). El Haji, et. al. also applied the flipped-blended instuctions in the vocational work-linked training in Morrocco that actually can improve the work efficiency and performance of the participants (El Hajji *et al.,* 2016). Many experiments on flipped classroom and blended learning have been conducted by researchers around the world. Turan dan Guktas conducted an experiment on flipped classroom instructions on a course in ICT (Information and Communication Technology), Turkey. The study found out that the participants in the flipped classroom class have more motivation to learn compared to those in the traditional class (Turan and Guktas, 2018).

1.1. Research Objective
1. To evaluate the flipped-blended instructional model for Computer Application Courses.
2. To study the validity of the model based on the evaluation results.
3. To study the effectivenes of the flipped-blended instructional model for Computer Application Course.

2. Literature Review
2.1. Flipped Classroom and Blended Learning

Flipped classroom is a pedagogical approach where learning is directly transferred from group learning spaces (in classrooms) to individual learning spaces (outside the classroom), thus the group space is transformed into a dynamic and interactive learning environment where lecturer guide the students to apply concepts and involved in learning process (Carbaugh *et al.*, 2016). Basically the flipped classroom concept is what is done in the classroom now done outside the classroom and what is commonly called "homework" is done in classroom (Bergmann and Sams, 2012). Flipped or inverted classrom includes assigned students to learn the basic concepts of a course before entering the classroom. Students can learn in their own time, sometimes by watching a video, listening to a recording or by completing a reading assigned by the lecturer (Arnold-Garza, 2014; Saitta, 2016).

This approach frees up in-class time for problem solving based assignments, demos, experiments, question and answer, and other activities that involve students. There are many ways to flip the classroom. The basic basic is that students learn lecture material outside the classroom (before entering the classroom). Students then enter the classroom in a condition that they are ready to be involved in learning activities guided by lecturers (Fulton, 2014; Hughes, 2014). Flipped classroom is a teaching method that delivers lecture material to students outside the classroom by technology and uses time in the classroom to carry out practical activities of the subject matter.

Blended learning is a formal education program where students study in online environment and face-to-face in the classroom. In online learning, students have control over their own time, place and/or pace (Garrison and Vaughan, 2008; Horn and Staker, 2015). Blended learning integrates the innovative advancements and technologies offered by online learning with the interaction and participation offered in traditional learning (Thorne, 2003).

According to Hew and Cheung, blended learning should be seen as a pedagogical approach that combines face-to-face and online learning that can enhance interaction, not just mere learning delivery tools (Hew and Cheung, 2014). The intended interaction is the interaction between students and the interaction between students and lecturers (Hew and Cheung, 2014). Blended learning is about integrating Information and Communication Technology (ICT) into the design of courses or subjects to enhance teaching and learning experience for students and lecturers. In many cases, blended learning provides a good experience and impact for students, and makes learning and management of subjects more effective (Bath and Bourke, 2010).

Blended learning is not only in accordance with a connected modern life, but also has other advantages that are beneficial for students, lecturers, and administrative managers in an educational institution. These advantages include: (1) increasing access and comfort, and (2) improving learning.

It can be concluded that flipped-blended based learning is learning that reverses activities inside and outside the classroom by using the internet for the out-class activities. Out-class activities are in the form of preparations made by students by watching or reading learning materials that have been given by the lecturer. The learning materials can be in the form of video, audio, or other digital files. It can be presented online so that students can access it anywhere and anytime. Even out-class discussions can be done online through the internet. While the activities in the classroom are in the form of giving exercises, tasks, or projects that students do with mentoring lecturers so that if students find it difficult, they can directly ask the lecturers in the class.

Some results of researches related to learning based on blended and flipped classroom indicate an increase in student learning outcomes and attitudes. An analysis by the US Department of Education shows that based on 45 e-

learning researches is as effective as face-to-face learning and blended learning approach is better than both (Jacot *et al.,* 2014).

Research conducted by Jalal Nouri showed that most students who carry out flipped classroom based learning have a positive attitude towards the flipped classroom based learning. Nouri conducted his research at Stockholm University Sweden. The participants of this study were students from the Department of Computer and Systems Sciences who took the Research Methods and Communication Course. This positive attitude is caused by students appreciating the opportunity to learn according to their own speed, flexibility and mobility of easily accessible lecture videos. Students also felt that learning becomes easier and more effective in flipped-based learning (Nouri, 2016).

The study of Shang-Der Hsu, et. al., showed that flipped classroom can change student learning behavior from passive learning and active learning (Hsu *et al*., 2016). The study was conducted on medical students in the Postgraduate Year (PGY) Program. In PGY, students will learn about diagnosis, treatment, and nursing from various diseases that are common to people. Flipped classroom implementation in this study improves student performance and evokes positive student attitudes towards their learning experience.

Flores, del-Arco, and Silva conducted a study to investigate the implementation of the flipped classroom model in the Master Psychopedagogy Program at the University of Lleida. The results of the study included an increase in participation and communication in the teaching and learning process, an increase in the use of Information and Communication Technology (ICT), an increase in learning outcomes, and an increase in student interest in the course (Flores *et al.*, 2016). Their results show that flipped classroom improves integration of various concepts, participation and communication, student interest in the course, integration of ICT use, and student learning outcomes.

Davies, Dean, and Ball conducted research to explore the use of technology for learning technology skills and to determine student achievement and satisfaction of flipped learning in the Numbers Processing Application Course. Davies, Dean, and Ball compared flipped learning with simulation-based learning. The results showed that the use of technology in flipped learning proved effective in facilitating students to learn. Students are more motivated in flipped learning compared to simulation-based learning (Davies *et al*., 2013).

In flipped-blended learning there are in-class activities and out-class activities. The following are the learning steps:

Out-class activities:
1. Students are assigned to watch learning materials and to do online discussion;
2. Students are assigned to make summaries or to do structured tasks to ensure they watch or study the material.
In-class Activities:
3. Lecturer reviews the learning materials that were assigned to the students;
4. Lecturer start a question and answer session regarding the learning material;
5. Lecturers provide more complex exercises (start it with some demonstrations);
6. Lecturers go around to see students doing the exercises and helping students who are having difficulties;
7. Lecturers examine the work of students and provide corrections if there is an error made.

This flipped-blended model used various methods and actively involved the participants that the participants became more independent in making decisions and finding solutions for their assignments. The methods used were, i.e.: (1) Demonstration by using audio visual media to help the understanding process; (2) Self-reflection on students' experiences after studying the material outside the class; (3) Case study that will build the ability to analyze problems and find the right solution; (4) Question & answer session that will give opportunities to students to interact with one another, ask and answer questions in order to have deeper understanding on the subject.

Students shall watch the instructional video and study the material outside the class or in other words, the low-level thinking process (remember and understand) happens outside the classroom. On the other hand, in the classroom, students will work on more complicated assignments with the assistance of the instructor.

3. Methodology/Materials

This study uses the R&D study method from Gall, Gall, and Borg found in the book titled Educational Research: An Introduction, Eight Edition Year 2007 (Gall *et al.,* 2007). Research and Development (R&D) is a process that studies the need of consumer followed by development of a product that will meet the need. The purpose of the research and development in education is not to test the validity of a theory, but to develop products (teaching materials, instructional media, management system, etc.) that would be effective in the field of education (Wibawa *et al.*, 2014).

Data was collected from: (1) document analysis, (2) interviews, (3) field obsevation, (4) questionnaires, and (5) exams.

In this study, the validity test on the material content is done by getting experts' evaluation, and reability test is done twice by using study instrument (reliability test-retest). For the validity test, the experts are the people believed to have expertise in the field of research methode, measurement and education technology, namely Dr. Ir.Rusmono and Dr. Moch Sukardjo from Universitas Negeri Jakarta, Indonesia. Furthermore, a validity test was also conducted on exam instrument by asking for assessment from two experts in the field of computer science, namely Dr. Arief Ramadhan (Institut Pertanian Bogor) and Dr. Imas Sitanggang (Computer Science Department, Institut Pertanian Bogor).

Questionnaires were distributed to students and have reability value (r) of 0.93 and 0.88, which means that the questionnaire is reliable. The test on instrument reliability was obtained by doing reliability test-retest (Gay e*t al.,*

2012). In this study, the test was done twice with two-week intervals. The reliability value r is 0.82 which means that the objective test was reliable. Exams used to test the performance were also tested and the r value is 0.85 which means the exams are reliable.

The data that has been collected will be processed qualitatively and quantitatively. Primary data that was derived from interviews, observations, and secondary data derived from document study were processed qualitatively. Students were doing pre-test and post test which will be scored by instructors. The score of the pre-test and post-test were analyze using T-test to compare the average score of pre-test and post-test.

This study conducted at Muhammadiyah Schools of Economics. Six experts and a group of 24 students were involved in the study. Six experts reviewed the flipped-blended model which suggest some feedback and revision. A group of 24 students then used the model for eight weeks. The pre-test and post-test administered and analyze to found the effectiveness of the model.

4. Results and Findings
4.1. One-to-one Evaluation with Experts
4.1.1. Content Experts' Reviews

We have interviews with two content experts. These experts have several recommendations to improve the developed instructional material, i.e.: (1) There should be a prerequisite for some subjects, for example a student must pass the internet introduction class before taking the web-making class since students must be familiar with internet before they are able to build a website; (2) Summary can contain brief explanation of the topics covered in a a chapter; (3) To form a study or activity group so that students would be able to work together and have discussions about the lessons; and (4) To provide students with information about for programming applications, such as Visual C or NET.

4.1.2. Instructional Design Experts' Reviews

We conducted interviews with two instructional design experts. These experts have several recommendations to improve the developed instructional material, i.e.: (1) The first expert suggested to split the instructional material into several books so that it will be handy and easy to carry. The book can be broken down based on subjects and accompanied with more thorough explanation and elaboration on the subject, grading system and reading material in each chapter; (2) To use column or checklist for easier grading process; (3) In instructional strategy section, there should be a note about the flipped activity to differentiate the activities done inside or outside the classroom; (4) The second expert suggested that Performance Objectives should be elaborated in more detail. We then draw a competency map of each Performance Objectives and presented it to the experts who gave their approvals; and (5) Instructional material should show more "steps" or procedures such as the steps needed to create page number in word processing application. The second expert suggested that the instructional material should not be too textual and provide more pictures or diagrams.

4.1.3. Language Expert's Revies

We conducted interview with language expert. The expert have some recommendation to improve the developed instruction material, i.e.: In general, there are grammar errors that must be corrected, such as the use of verb "to learn", it should not be followed by "about" preposition since "to learn" is a transitive verb. Transitive verb means the verb have to be followed by object, so it should not be followed by a preposition.

4.1.4. Media and Graphic Design Expert's Review

We conducted an interview with a media and graphic design expert. The experts have some recommendation to improve the developed instruction material, i.e.: (1) Use darker font color to increase readability; (2) The images should be sharpened more because there are unreadable texts in the images; (3) Image is better to be placed in center position. The size of some images is too large and some are too small, they need to be adjusted; (4) The sound of the video is not clear enough, it need to be made more clear and louder; (5) Improve the layout and sound of the video so that it will be more interesting to watch and listen to.

The one-on-one evaluation with the experts gave a lot of inputs for the developed instructional material. There are revisions in the syllabus, strategy, up to the instructional video. All these revision were done to ensure that the material is valid to be used.

4.2. Field Trial

A group of 24 students participated in the Field Trial. Instructions were began by pre-test to measure the prior knowledge of students. Then a learning event will take place by using the instructional materials. After that, students will work on post test to measure their capabilities after studying the instructional materials. Students were also asked to fill in questionnaires. The Questionnaires were probe on the difficulties experienced by students and also to get inputs from students to improve the instructional materials.

The effectiveness of the model were measured by comparing pre-test and post-test. The comparison done by using paired t-test. From there, we got the value of Sig. =0.000 which is smaller than 0.05 which means that there are differences between the average scores of the pre-tests and the average scores of the post-tests. Then we got the value of t = 12.907 which is bigger than the value of t table $(\alpha, n-1) = 2.069$ which means that the average scoresof the post-tests is higher than the average scores of the pre-test.

From the student questionnaire, we have found that students felt the need to take the Computer Application Course (mean 4.39) but they have difficulties in learning the material of this course (mean 2.96). The interaction between instructors and students occured quiet oftem (mean 4.13). Students frequently asked questions when they have problems (mean 4.22) and instructors frequently answered the students' questions (mean 4.64). Students also actively interacted with one another inside the class (mean 4.52) and outside the class or via online (mean 4.13).

An additional questionnaire was distributed to students to find out how students interact with each other via online and the difficulties they have while studying the Flipped-Blended based instructional material. Most of the students found difficulties when they work on the assignments given in the class (81.8%). A number of students also run into difficulties when they try to create a simple information system (68.18%). But those difficulties could be overcome. Based on the interviews with students, students can overcome difficulties with the help from instructor or class-peer. Most students asked questions when they encounter difficulties (77.27%). Besides the instructor, students also ask their peers (54.54%). A small number of students tried to find the solution on their own (7,5%). One of the means used for this purpose is the internet. Furthermore, when asked during interviews, whether they prefer easy or difficult assignment, all students chose difficult assignment. Students reasoned that difficult assignment will make them study more that they will gain more knowledge. The questionnaire also shows that students were using Whatsapp (100%) and e-mail (45.5%) to communicate. Based on the results of interviews, students preferred to communicate using Whatsapp because this application is considered faster in delivering messages. Messages can be received almost instantly and responses can also be sent at the same time. On the other hand, e-mail is more effective to send big files.

Interviews were conducted with several students who gave comments as follows: (1) According to students, the number of practice problems given is enough; (2) The quality of the images in the video is quite clear, so does the sound; and (3) Students encountered difficulties when they worked on the class assigments but they can overcome the difficulties with the assisstance from the instructor.

5. Discussion

In Flipped-Blended based instructions, students prepared themselves by studying the material and doing practice problems outside the class (online) and work on various assignments given in the class with the assistance of the instructor. Because the assignment is given in the class, every time students run into difficulties, student can ask for instructor's help and the instructor will respond immediately. As the result, the learning result of students was improved because the students became used to prepare themselves before coming to class and work on difficult assignments in class. Students even chose to be given difficult assignment over the easy one. Thus, it can be concluded that the Flipped-Blended based instructions could improve the learning result of the students enrolling in Computer Application Course. The better learning result also means the students will have better computer skills which will be very useful for entering employment. In the working world, computer skill constitutes one of the essential skills an Indonesian worker must have (di Gropello *et al.*, 2011).

According to Wolf and Chen, the flipped instructional video should be done in one take and not repeatedly to diminish errors (Wolff and Chan, 2016). However, an instructional video must go through a design phase first. Sentences or texts that are going to be displayed must be prepared first before shooting starts. It also applies to the images and sound needed to complete the instructional video. The instructional video of Computer Application Course contains steps needed to use the computer applications, such as word processor, spreadsheet and other applications. These steps must be determined first before shooting takes place.

The interaction in the flipped-blended model has gone well, both via online and inside the class. Most online interactions occurred in Whatsapp. When they were asked why they were using Whatsapp, students answered that they felt that Whatsapp is easier to use and faster in sending and receiving messages. The instructor also gave feedback for the assignments by e-mail. Feedback was given in the class before the lesson was started. Instructor shall make notes on mistakes on students' work, for example if the data is not formatted as requested in spreadsheet. The instructor also gave feedbacks via Whatsapp. Students having difficulties in working on group project, usually will ask questions via Whatsapp and the instructor will help if, for example the student enters wrong formula in spreadsheet.

Interactions in the classroom happened frequently because the instructor will go around helping troubled students. Talbert stated that flipped classroom gives opportunity to students and instructor to have more interactions due to the amount of time spent to work on the assignments in the class. This is possible since the instructional material is presented outside the class that in the classroom, the instructor and students will have more time to work on the assignments. Moreover, students could have deeper understanding on various concepts by working on the assignments (Talbert, 2016).

Also, there is evidence of improvement on students' learning result before and after studying with flipped-Blended based instructional model. The average score of the post-test was 83 and the average score of the pre-test was 54. The T test showed that there was a difference between the average score of post-test and the evarage score of pre-test. The scores in post-test were higher than the scores in pre-test. This improvement can happen because students have prepared themselves before coming to the class. Students are obliged to first study the material before coming to class and send their practice file by e-mail. Then, in class, students were given more difficult assignments. With these assignments, students were expected to gain more knowledge. From the result of interviews, we found that students prefer more complicated assignments over easy assignments. Students have been used to work on easy assignments outside the class.

Another interesting thing is the psychomotoric domain of this instructional model. There are five levels of psychomotoric domain by R. H. Dave, namely: imitation, manipulation, precision, articulation, dan naturalization. The first level, imitation, could done before the class is started. This was done by Mishra and Barrans who gave computer-based instructional program to students to be learned independently before they came into the lab (Mishra and Barrans, 2009). According to Fadde, at this level, some skills could be fully learned just by observation, without formal instruction (Fadde, 2010). Computer skill constitutes one of the skills that could be learned by observation. Students can learn by following steps provided in the video and this is what is called the imitation level of this instructional model. Later on, students will continue learning in the classroom by working on their assignments. In the classroom, various levels of psychomotoric domains could happen. For example, the manipulation level applies when students are allowed to have trial and error while trying to find solutions for their assignments. And at precision level, students are allowed to correct the mistakes they have made and solve the assignment in their own way. It is possible for a given assignment to have more than one way to solve the problem and even though the Instructor know the most efficient way to solve the problem, the Instructor will allow students to solve the problem according to their way. At articulation level, students would be able to describe the steps in accordance with the given assignment and understand the outcome expected from the assignment. Then on the highest level, naturalization, students would be able to execute basic steps accurately and fast. Students also would be able to solve assignments with various scenarios or the exam problems.

6. Conclusion

Computer Application Course is an important course to improve students' basic computer skills. Flipped-blended based instructional model were developed and formative evaluation of the model were administered to find out the model's effectiveness. The model turns out to be effective to improve students' performance. The model consist of paper based worksheets and online video. Students prepared themselves before get in to the class by watching and doing the online video. In class, students were doing more complex tasks to help them got more comprehensive knowledge and skills they need to achieve. These methods help to get better understanding of the instructional goals. It is also challenge them with more complex problems.

Acknowledgement

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