Implementing the Flipped Learning Comprehensive Model (FLCM) through Basic Informatics Course, Van Lang University, 2021 – 2022

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Abstract

During the implementation phase of the Elearning teaching system for the 2021-2022 school year, with the requirements set forth for the subject of research and implementation of the teaching system, it is possible to apply flexible teaching for a group ranging from 0% to 100% of students and online learners. At the same time, it encourages students to actively participate in learning throughout the learning content deployed by the subject. We have focused on research and implementation of the comprehensive Flipped Learning Model, The Flipped Learning Comprehensive Model – FLCM, which uses H5P interactive teaching content to provide instant, attention-grabbing feedback for students. Furthermore, we also implement the development and rearrangement of learning materials and learning activities that require learners to complete their studies according to the set course schedule. Besides the development of content, we also have interactive lectures that return immediate results to help attract students to complete the course. We have implemented the FLCM model during the 1st and 2nd semesters of the academic year 2021 – 2022, with more than 12,000 students. At the end of the course, we collected statistics on positive and proactive changes in students through learning activities on the Elearning site implemented by the FLCM method. Due to the content with interactive videos, the number of active students increased by over 70%.

Keywords: *eLearning, LMS Moodle, LMS, H5P, FLCM*

Introduction

Recently, online learning is a new model of education in the age of information and technology. Nowadays, almost all universities in the world consider digital learning a strategic asset to reach people.

General Informatics course, which was implemented E-learning in 2018 - 2020 from phase 1 to phase 3 by Van Lang University, has been introduced at the international conference Asia CALL International Conference & VLETESOL 2021 and published in the AsiaCALL Online Journal (Tran Thi Yen Nhi, 2021). With the initial first steps, courses that apply the Flip classroom model can be applicable to both offline and online classes following new requests and increase the positive engagement rate in students. As new situations arise, the course develops teaching procedures and course materials that are flexible for both offline and online learning. To satisfy the learning outcome criteria of the course and education program and to change the mindset of lecturers and

students, there needs to be a procedure combining LMS and LCMS in teaching and learning through the E-learning model.

Literature review

In the process of implementing the E-learning system, we have read through the research of Koohang, Riley, and Smith (2009), which have come up with a learning model in the E-learning environment based on constructivist theory. This model includes the following three basic elements: Design of learning activities, Assessing the learning process, and The role of a teacher or guide. The design of learning activities includes coordination, cooperation, and problem-solving, the importance of 21st-century skills to learners (Hiroyuki, 2021). Together with the study of the author group Lo, C. K., & Hwang, G. J. (Chung & Hwang, 2018) elucidates three possible directions for future studies of teaching methods according to the flipped classroom model, including a model framework. The description proposed in the flipped learning model includes four aspects: research background, course design, course activities, and outcomes. In the course design section, the authors also suggest activities before learning, during and after learning (Koohang, Riley, & Smith, 2009) (Oproiu, 2015). And in our research and implementation in the stages of implementing the online teaching system Elearning, there are many similarities in the construction of the flipped classroom model and the organization of activities before, during and after class. However, these studies rely too much on videos and student initiative.

For this stage of implementation, we want to stimulate active learning in students through the comprehensive flipped classroom model (FLCM) built based on the combination of the perspective and scores of both teachers and students. This model is built based on the preparation of questions from the learner and the answers from the teacher in order to immediately provide learners with the fastest answers during the class-based learning process, reverse learning (Reyna, 2019). These materials will be provided to learners through the subject's LMS, one learner-centered training method. The target audience for this subject is first-year students from many different majors, so the entry-level is not uniform. For this model, the identification of training subjects helps to research and evaluate more accurately, from which there are training methods and selection of appropriate technologies to include in the development of learning materials (Rekhari, 2018). However, it should be emphasized that the communication between the teacher and the learner, the pedagogy, the approach, the planning, the development of the training route and the agreements of the two sides play a very important role in creating and motivating learners in the training process. Simultaneously promoting the development of lectures with interactive videos, H5P is also important (Sharp & Sharp, 2017).

The content management system (LCMS) includes learning materials, reference materials, and teaching slides in the form of electronic files through attachments on LMS, Rich Media and H5P. Electronic lectures are published as web pages with rich content ranging from text, images, animations, videos, games, etc. It provides students with a whole new learning experience. Lectures are published in the form of a website so that students can actively view the content anywhere, on any device (Han, Liyue, & Cheng, 2017). In addition, the application of Microsoft Sway to the design of Rich Media supports teaching, helping teachers easily view evaluation reports on the content that students are interested in. The report helps determine what content needs to be developed to suit students' abilities and direction. H5P is an open-source authoring tool used to design interactive learning content for students and provides immediate results. It allows the

creation of content such as interactive videos, presentations, quizzes, games, and even interactive eBooks with great flexibility.

Method

We continue to use the eLearning system that has been implemented since phase 3, basically including Learning Management System (LMS); Content Management System (LCMS); Real-time Virtual Classroom. For learning management system - Learning Management System. The school is currently implementing LMS Moodle along with the online classroom organization platform (Virtual Classroom) MS Teams, which is recommended by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as one of the solutions for distance learning. For the Virtual Classroom system, the course uses MS Teams which is built into the Microsoft Office 365 suite. Currently, students and teachers throughout the school have been provided with this account, and this account has been synchronized with all school support websites.

Table 1. Summary of models that are implemented through stages

Period	School years	Proportion of content delivered Online	Type of Course	Typical Description
0	2016 or earlier	0%	Tradional	Course where no online technilogy used – content is delivered in writing or orally
1	2017 -2018	1 to 20%	Web Facilitated	Course that use web based technology to facilitate that essentially a face to face course. May use LMS to download document.
2	2018 - 2019	1 to 80%	Blended	Course that blends online and face to face delivery. Substantial proportion of the content is delivered online , typical uses online discussions and typically has a reduced number of face to face meetings.
3	2019 - 2020	80 - 100%	Flipped	A Course where most or all of the content is delivered online. Typical have no face to face meetings.
4	2021 – 20220	0 – 100%	FLCM	The FLCM method is based on the cooperation of teachers and learners. Focusing on building interactive online lectures, responding to instant answers to attract learners, increasing interactivity and matching the requirements of the new situation can teach face-to-face and online.

- Stage 1: 2017 - 2018, implementing E-Learning level 2, learning materials are provided through https://hoctructuyen.vanlanguni.edu.vn/. At this stage, 100% of learning is still offline.

- Stage 2: 2018 -2019, implementing E-Learning level 3, with 80% of the learning is still offline while 20% is online. Learning resources along with practice tests and discussions have been made available online.

- Stage 3: 2019 – 2020, implementing E-Learning level 4 with online time constitutes 50% - 100%. Flipped classroom model is implemented, and learning resources are getting more diverse.

- Stage 4: 2021 – 2022, implementing E-Learning level 4 with online time reaches 100% or online classes applying FLCM. The comprehensive FLCM is used widely, and learning activities have cohesion with each other, forcing students to pay attention during class and results are returned quickly to encourage students to finish the course.

The Flipped Learning Comprehensive Model (FLCM)

The FLCM method is implemented to support learners better, create cohesion between different content, and increase the engagement rate in learners. The model is developed based on the preparation of questions from the learners and answers from the lecturers to provide immediate student results. These learning resources will be provided through LMS, and this system will be learner-centric.
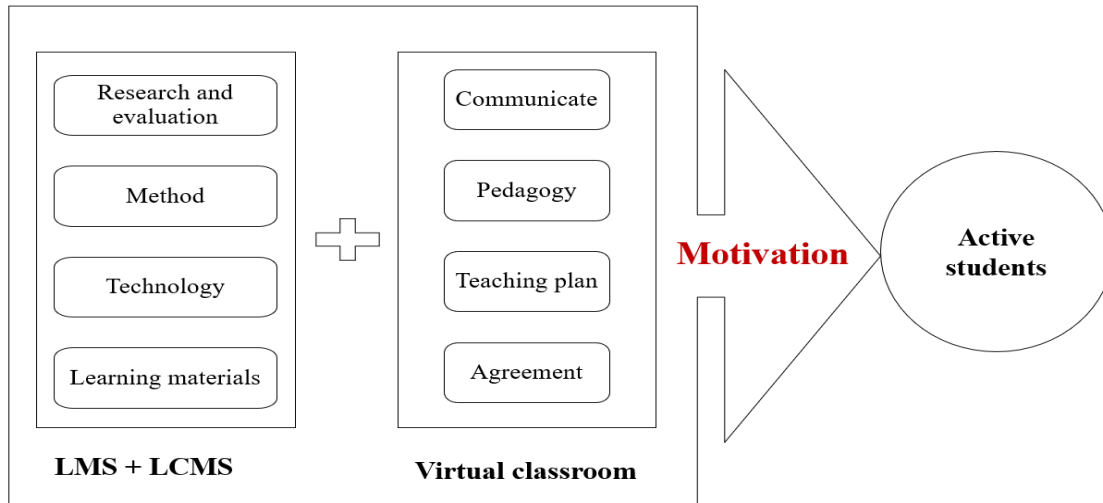
Figure 1. Implementation of E-Learning with Flipped classroom model (FLCM)

The research target for the course is first-year students. And adjustments to the implementation of LMS, real-time classroom on MS Teams and study methods before, during, and after class will be based on the survey at the beginning of the courses. With every result obtained, an appropriate adjustment will be made for each module chapter to suit the learning outcomes published in the course's detailed curriculum.
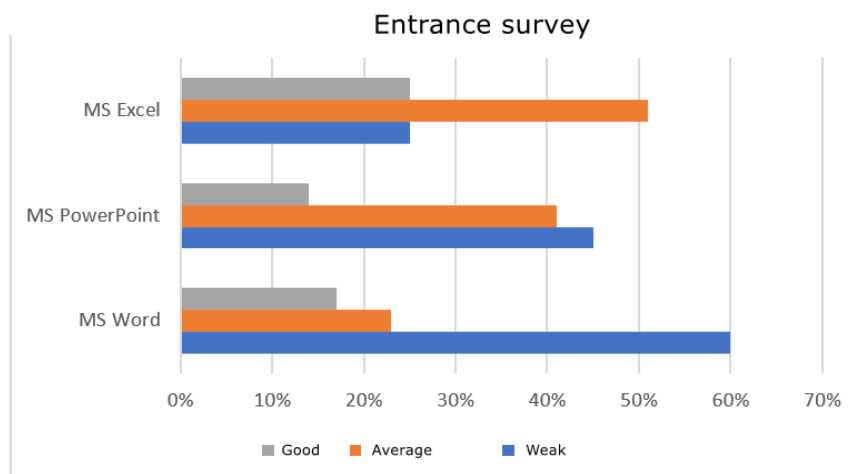
Figure 2. Entrance survey results: Students' competency with MS Office Word, PowerPoint, and Excel, Semester I 2021 - 2022
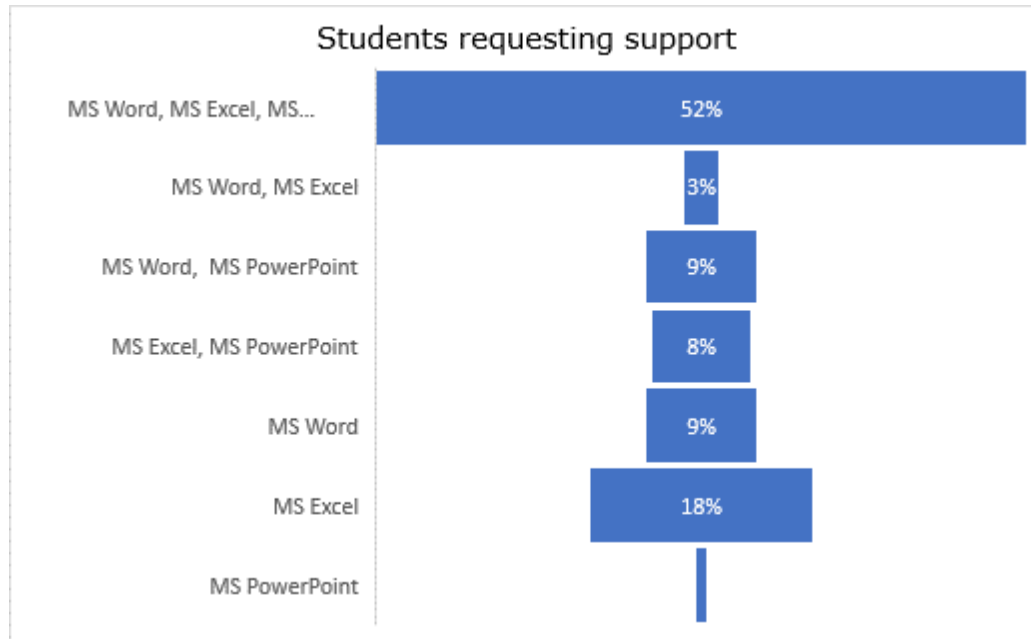
Figure 3. Survey results: MS Office software that students need help with, Semester I 2021 - 2022

Appropriately identifying targets helps with research and evaluation. From that, picking the right methodology and technology is easier. However, it is worth emphasizing that the communication process between learners and lecturers, educational methodology, and planning is important to encourage students in the learning process.

Educational Methodology

The core of the Flip classroom model is a positive learning experience and increasing the engagement rate of students. Educational methods that facilitate positive student learning experiences are Problem Based Learning - PBL, Learning by Doing, Project Based Learning - PBL, and Peer Learning - PL. The appropriate method is selected based on the content and nature of the course. For Module 2 on basic usage of computers, the learning method is problem-solving through common problems when using computers. For Module 5 presentation design, Project Based Learning will be implemented, and students are given a choice to pick and design their own presentation along with a video. To implement the Flip classroom model, lecturers have to equip learners with essential knowledge such as: What is the Flip classroom model? What are the benefits? What are the learning activities? When persuading students about the benefits of this method, lecturers need to emphasize the soft skills that the students will gain as a result: learning digitally, independent problem-solver, and lifelong learning.

Table 2. Comparison: Different methods of learning and their levels of challenge based on Bloom's taxonomy

Module	Subject Goal	Educational methods	Bloom's taxonomy					
			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Module 1	CELO1, CELO7	Peer Learning - PL		X				
Module 2	CELO2, CELO7	Problem Based Learning - PBL			X			
Module 3	CELO5, CELO7	Project Based Learning - PBL			X			
Module 4	CELO6, CELO7	Learning by doing			X			
Module 5	CELO4, CELO7	Project Based Learning - PBL				X		
Module 6	CELO3, CELO7	Peer Learning - PL Problem Based Learning - PBL			X			

Planning

If the activities before, during, and after the classroom are precise and cohesive, they will strictly follow the curriculum. Implementing a 100% Flip classroom model for offline and online classes reverses the order of the classroom and requires students to read notes and do their assignments before class. Students can access their lecture slides on all digital devices and study easily. During class, students and lecturers can focus on a case study, research and discuss further content; With this model, the learning experience is spread out before, during, and after class. Learning and education methods are diversified: LCMS, textbooks, video, rich media eBooks, advanced materials, online discussions, and interactions between students and between students and lecturers.

Special attention must be devoted to interactive videos in this process. There must be no more than five units of content to be delivered in a video and the maximum time for each video is 15 minutes. It is important to consider whether online or offline learning is to be implemented and pick the appropriate videos. Furthermore, videos need to have questions for learners to answer immediately after every lecture, as this helps improve students' learning experience. Detailed learning plans must be announced on the website with clear instructions and steps to be taken before, during, and after class. The study plan is divided into three main activities: Activity #1: At the beginning of the class, Activity #2: detailed content (during class), and Activity #3: Evaluation (after class).

Rules

The course focuses on the procedure and consistency of the learning process. It also takes advantage of the Restrict access function of LMS Moodle to restrict access to certain content and require students to finish a certain course before moving on to the next. Students are required to finish prerequisites. Activities will be evaluated based on criteria designed by lecturers, such as submit/view date, group, grade, and student.

Communication

In the E-Learning model, especially with the Flip classroom model, students' engagement rate and proactivity play a crucial role. Therefore, it is important to have agreements and instructions at the beginning on how to use support materials and rules and regulations. There need to be adjustments, and time allocations for activities before, during, and after class. Lecturers will monitor and adjust this study activity, and all resources will be published on E-Learning. Besides study guides, E-Learning will also have a detailed curriculum with specific learning outcome criteria, content and schedule for students. Study goals for the whole course or just individual modules will be published according to the Bloom chart (Bloom, 1956).

Table 3. Aims of the level of students' understanding per course based on Bloom's taxonomy

Subject Goal	Subject Content		Bloom's taxonomy					
			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CELO1, CELO7	Module 1	1.1	X					
		1.2		X				
CELO2, CELO7	Module 2	2.1		X				
		2.2			X			
CELO5, CELO7	Module 3	3.1	X					
		3.2			X			
		3.3				X		
CELO6, CELO7	Module 4	4.1	X					
		4.2		X				
		4.3		X				
		4.4			X			
CELO4, CELO7	Module 5	5.1		X				
		5.2			X			
		5.3				X		
CELO3, CELO7	Module 6	6.1		X				
		6.2			X			

E-Learning stage 4 2021 – 2022
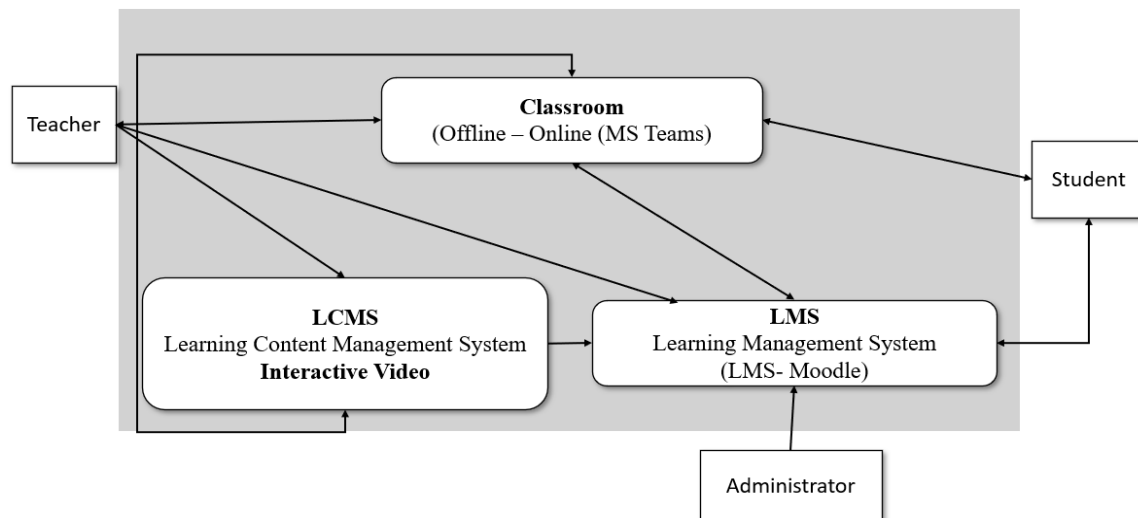
Figure 4. Model of implementation of E-Learning stage 4 2021 - 2022
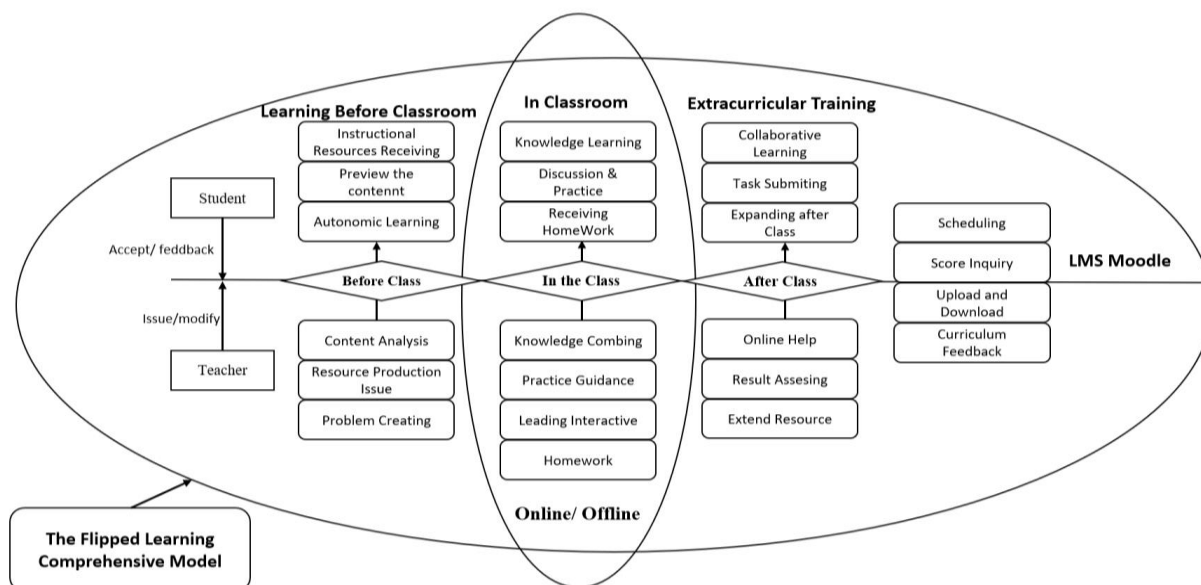
Model E-Learning:

- – Learning Management System (LMS)
- – Learning Content Management System (LCMS)
- – Virtual Classroom through Microsoft Teams (Virtual Classroom) in real-time
- – The announcement, forum to discuss (Forum)
- – Resources: study guide, books, lectures, interactive videos, videos, question banks, and exercises.
- – Study support
- – FLCM (The Flipped Learning Comprehensive Model)

Implementing LMS and LCMS phase 4

Phase 4 is being implemented from 2021 - 2022

FLCM (The Flipped Learning Comprehensive Model) is implemented in this phase. The online time will be 100%. At this stage, the old model is still kept intact along with Classroom Procedure and learning resources: study guide, books, lectures, interactive videos, videos, question banks, and exercises. However, during this phase, LMS and LCMS work together closely to create an interactive studying platform through restricted access content and interactive videos. The increasing responsive rate in students and convincing students to do online learning. The dashboard system also updates the function to display the amount and frequency of students subscribing to E-Learning and build a framework that predicts and detects absent students. To prepare for this stage, lecturers have undergone courses on managing the LMS Moodle, such as "Learn Moodle 3.11" by Moodle.org and "Transitioning from teaching offline to online" by AUF.

Learning organization procedure

Figure 5. The Flipped Learning Comprehensive Model

Learning Management System uses LMS Moodle 3.9 with an updated user interface and function to improve user experience. The LMS at this stage improves upon functions that have been implemented in phase 3: Assignment, Quiz, Grade Report, Grate calculator, and Attendance. The functions are also developed to help students manage and monitor their learning process easier.

Results

General Informatics course was implemented in E-learning in 2017 - 2018, 2018 - 2019, 2019 – 2020 (Tran, Nguyen, Do, & Nguyen, 2021). Implementing E-Learning from levels 1, 2, 3 and now at level 4 with online time reaches 100%.

Table 4. Summary of the process of implementing E-Learning 2017 – 2022

Stage	School Year	% Online	Model	Virtual Classroom	LMS					LCMS				
					Assigment	Quiz	Grade Caculator	DashBoard	Attedance	Rich Media	Video	H5P	Docs	Slide
Stage 1	2017 -2018	0%	General		X								X	X
Stage 2	2018 - 2019	20%	Blended classroom	X	X	X	X		X	X			X	X
Stage 3	2019 - 2020	50 – 100%	Flipped classroom	X	X	X	X	X	X	X	X		X	X
Stage 4	2021 - 2022	0 – 100%	Flipped Learning Comprehensive	x/0	X	X	X	X	X	X	X	X	X	X

Now, the course has finished developing its resources vault, study methodologies, and online learning evaluation process. Along with digital transformation, many types are implemented too: traditional, mixed, and flip. Besides that, we also actively research ways to improve the user experience and utilities of the website. The statistical survey at stage 4 interviewed 12144 students from stage 2021- 2022.

Table 5. Statistical data on students' engagement and academic achievements during the implementation phases of E-Learning

School year	Semester	Student	View	Submit
2017 - 2018	SEM. 1	2,152	43,970	-
	SEM. 2	2,233	40,986	-
2018 - 2019	SEM. 1	4,591	180,050	10,216
	SEM. 2	7,417	300,083	16,327
2019 - 2020	SEM. 1	5,369	1,305,197	88,285
	SEM. 2	8,882	1,953,839	136,424
2021 - 2022	SEM. 1	7,100	1,707,000	127,800
	SEM. 2	4,783	1,987,852	100,880

The table survey has data on the view, submission rate, and completion rate of students from stage 4, the year 2021 - 2022, combined with four implementing phases of 4 school years. The submission rate mostly does not change compared to stage 3. However, the view rate increases by 73% per student and the completion rate still average at around 89%. This is the first step of our digital transformation process to support offline and online teaching.
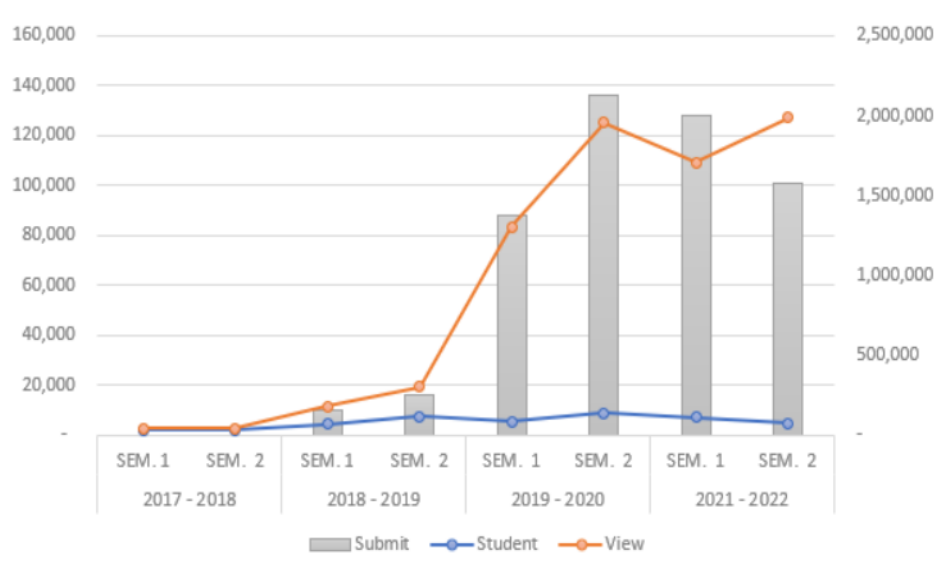

Figure 6. Visualisation of Statistics of our E-Learning Course through the academic years from 2017 to 2022

During the implementation process, we continuously take data on the amount of student interaction in semester two compared with the amount of interaction in semester 1. After that, we evaluate the growth in student learning activities on the LMS Moodle. Through the data table of views for each module on the Elearning site, we can measure the growth in attracting students interested in each digital content provided
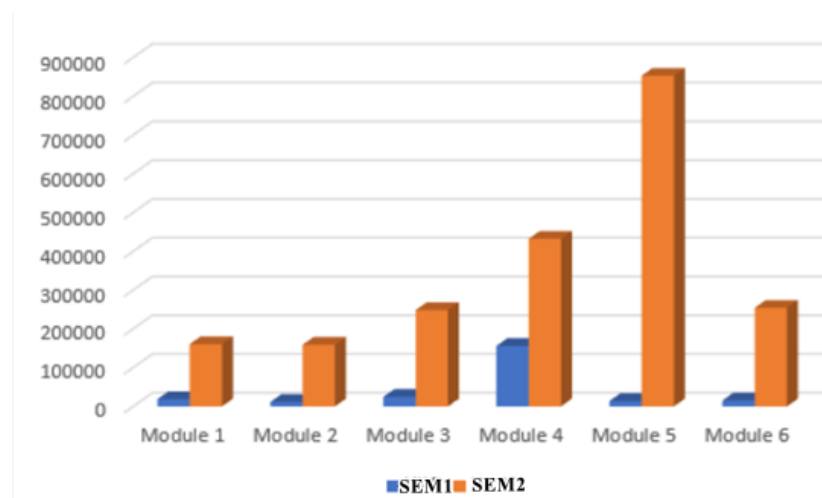

Figure 7. Interactive comparison chart between the 1st and 2nd semesters of the academic year 2021 -2022

In addition, the department is also very interested in the number of students participating in each module. We survey the percentage of students participating in the course who are interested in digital content. The collection of data on the number of students participating and completing the required content helps the teachers have a strategy to improve teaching activities in the following semesters.
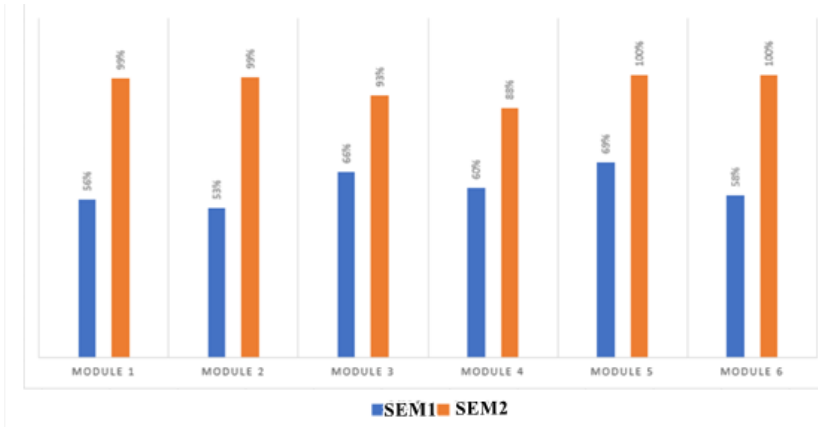

Figure 8 Graph comparing the number of students participating between the 1st and 2nd semesters of the academic year 2021 -2022

According to statistics, the number of students participating in learning modules in semester 2 reached an average of 97%, an increase of 60% compared to semester 1 in the same academic year, 2021-2022. We also continued to collect statistics on how long students spent doing academic activities over the two semesters. The unit is used to measure time in minutes. It is found that the student's learning time with training methods, content and organization of digital content in semester 2, the duration of student learning increased by 124% compared to that of learning. Term 1 in the same academic year 2021-2022.
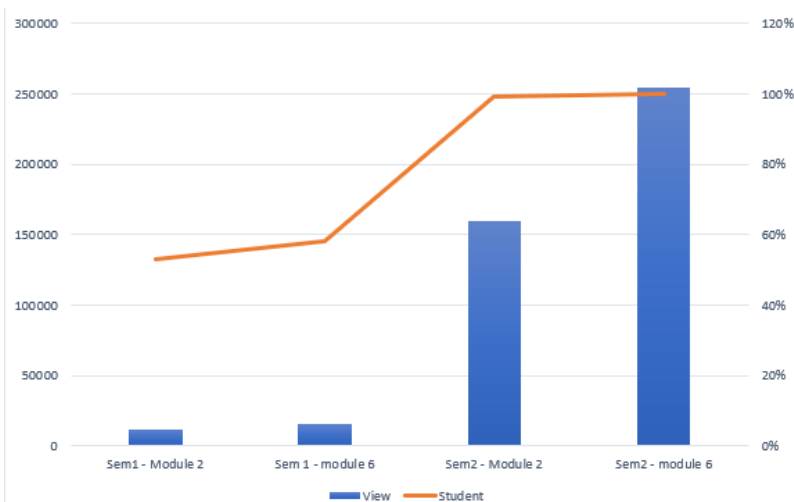

Figure 9. Comparison chart of view growth and rate of students participating in interactive videos at HK2

In the 2nd semester, the review unit implemented interactive videos to get live scores. These videos allow students to do it as many times as they want. They will get points at the learner's last burst,

which has attracted the number of students participating in completing the learning content with interactive videos at 2: Module 2 and Module 6.
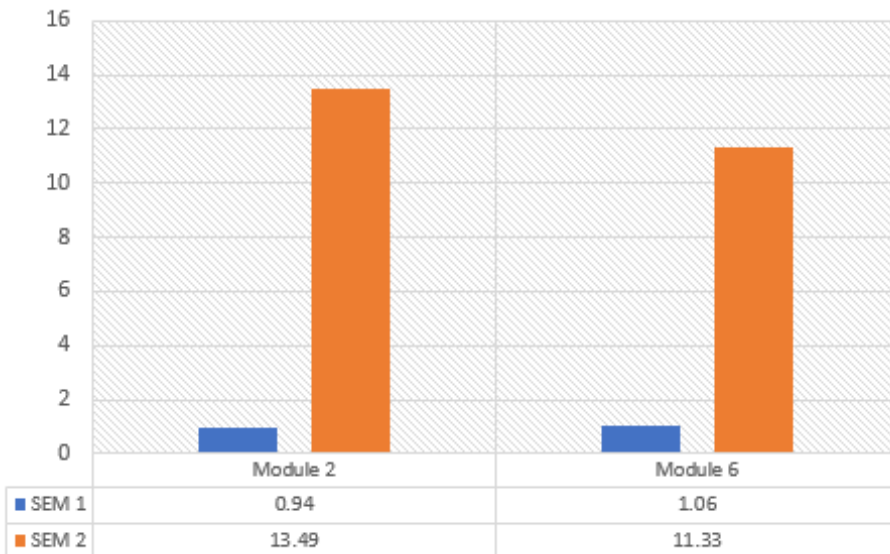

Figure 10. Number of students studying for Modules 2 and Module 6

In addition, we also measure the number of student interactions at each module using interactive videos and conventions for students to do an unlimited number of times and record the results at the student's final effort. Realizing that it is effective in attracting students to study and practice more, specifically, in Module 2, the number of interactions increases 12.55 times and Module 6 increases 10.27 times per student participating in learning.
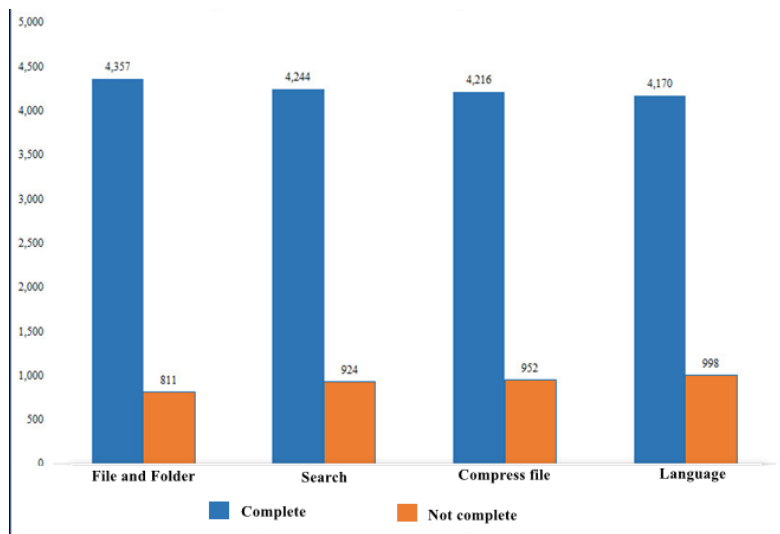

Figure 11. Statistical chart of the number of actively completing Module 2

In the process of implementing the two modules using interactive videos, there is a difference between the teaching methods in both modules. Specifically for Module 2, this is a model of classroom organization with direct interaction with students during direct class. Statistics are performed on all four interactive videos of the module.
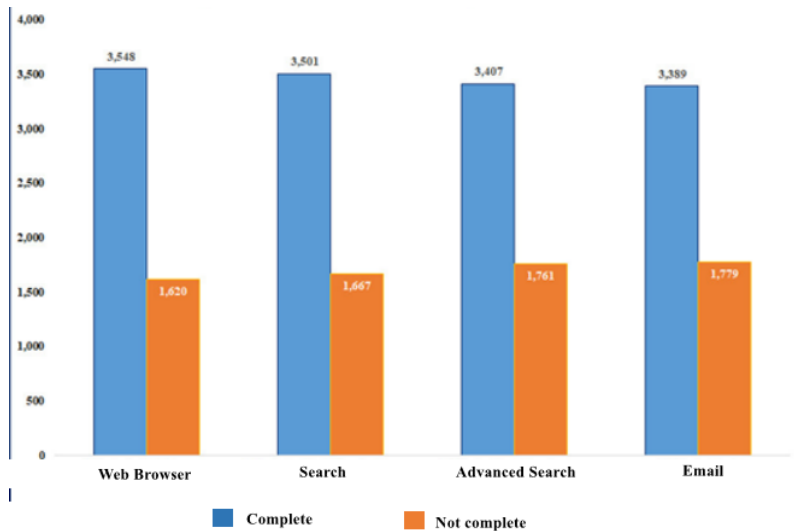
Figure 12 Statistical chart of the number of actively completing module content 6

Module 6 is implemented through Elearning sessions at the request of the school. Initially, we recognize the active initiative of students in completing Module 2 content better than students completing the content themselves. Module 6.

Conclusion and recommendation

During the research and implementation of the E-Learning for General Informatics process, we notice that different courses and industries will require different amounts of online time. Based on the different needs for online time, lecturers can pick the appropriate teaching methods ranging from traditional classrooms with E-Learning support in exercises, testing, communication, and advanced study activities to complete online or offline classes. Regardless of methods, the most important factor remains in the cooperation between learners and teachers and requires both perspectives in planning, organizing, support, and evaluating. Researching and implementing Benjamin S. Bloom's (Bloom, 1956) levels of cognition in building curriculums, videos, interactive videos, lecture slides, rules, and question banks to aid students with learning. Furthermore, adequate attention also must be paid to designing a user-friendly interface and creating study content: videos, interactive videos (H5P), rich media, question banks, and exercises.

Despite advantages and successes when implementing E-Learning with the support of departments and policies of the headmaster of VanLang University, courses also face difficulty when students lack proactivity and engagement. This creates a lot of difficulties in planning, organizing, and teaching. There need to be extracurricular classes to equip students with online learning skills, research skills, and studying in college. There needs to be precision in identifying targets for education so that study methods and technologies can be selected accurately and appropriately. Also, it is crucial to emphasize the communication between learners and teachers, study methods, approach, planning, building study roadmap and mutual agreements between students and lecturers. I sincerely thank Van Lang University for enabling us to implement the online teaching system.

Acknowledgments

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