HỘI THẢO QUỐC GIA VỀ KHOA HỌC GIÁO DỤC NĂM 2024

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SÁCH KHÔNG BÁN

BỘ GIÁO DỤC VÀ ĐÀO TẠO

TRƯỜNG ĐẠI HỌC VINH

KỶ YẾU

HỘI THẢO QUỐC GIA VỀ KHOA HỌC GIÁO DỤC

NĂM 2024

NHÀ XUẤT BẢN ĐẠI HỌC VINH

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Trường Đại học Vinh, ngày 4 tháng 10 năm 2024

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ÁP DỤNG MÔ HÌNH CFB (CDIO - LỚP HỌC ĐẢO NGƯỢC - HỌC TẬP KẾT HỢP) TRONG MÔN HỌC THỐNG KÊ KINH TẾ

Lương Thị Quỳnh Mai

Trường Kinh tế, Trường Đại học Vinh, Nghệ An

TÓM TẮT

Bài viết mô tả việc áp dụng mô hình CFB (CDIO - Lớp học đảo ngược - Học tập kết hợp) trong giảng dạy môn Thống kê Kinh tế tại Trường Kinh tế, Trường Đại học Vinh. Việc tích hợp khung CDIO nhấn mạnh cách tiếp cận định hướng ứng dụng, trong khi phương pháp lớp học đảo ngược định nghĩa lại cách học truyền thống bằng cách chuyển giao nội dung ra ngoài giờ học. Học tập kết hợp làm phong phú thêm trải nghiệm giáo dục thông qua sự kết hợp liền mạch giữa các tương tác trực tuyến và trực tiếp. Bài báo nghiên cứu đề xuất một quy trình cụ thể để thiết kế kế hoạch bài học áp dụng mô hình CFB trong môn Thống kê Kinh tế tại Trường Kinh tế, Trường Đại học Vinh.

Từ khóa: *mô hình CFB; CDIO; lớp học đảo ngược; dạy học kết hợp; thống kê kinh tế*

APPLYING THE CFB (CDIO - FLIPPED CLASSROOM - BLENDED LEARNING) MODEL IN ECONOMIC STATISTICS COURSE

Luong Thi Quynh Mai

College of Economics, Vinh University, Nghe An, Vietnam

ABSTRACT

This article investigates the application of the CFB (CDIO – Flipped classroom - Blended learning) model in teaching Economic Statistics at the College of Economics, Vinh University. Integrating the CDIO framework emphasizes the application-driven approach, while the flipped classroom method redefines traditional learning dynamics by shifting content delivery outside of class time. Blended learning further enriches the educational experience through a seamless combination of online and face-to-face interactions. The research article describes a specific process for designing a lesson plan that applies the CFB model in economic statistics at the College of Economics, Vinh University.

Keywords: *CFB model; CDIO; flipped classroom; blended learning; statistic economics*

1. Introduction

The rapid development of science, technology, and engineering has transformed education in general and higher education in particular. Traditional teaching methods and models need to evolve to meet the learning needs and requirements of modern students to foster active learning, and to meet the learning outcomes of university programs. The Flipped Classroom, Blended Learning and CDIO teaching models are effective competency-based teaching approaches that combine direct and online instruction, centering on the learner, increasing personalization, and enhancing self-learning and interaction abilities. At Vinh University, the combination of these three models - CDIO, Flipped Classroom, and Blended Learning - is called the CFB teaching model.

Vinh University has implemented the Project for the Development and Advancement of Training Programs Approaching CDIO since April, 2016. The university has developed learning outcomes and training program frameworks for various disciplines, and numerous related projects have been initiated. Since 2017, Vinh University has built and executed CDIO-approach training programs for both technical and non-technical fields (including Economics).

At the end of April 2021, Vietnam experienced a total of four waves of Covid-19 since the beginning of 2020. This has caused significant damage across all sectors, particularly in education. Specifically, schools from primary to tertiary levels in Vietnam have been forced to switch to online learning and continually adapt to the current situation. With the impact of the pandemic, online learning has become a necessary solution when students cannot attend school. This learning method is still relatively new and poses significant challenges for both teachers and students.

Teaching according to the flipped classroom model is one of the modern methods that meets the requirements of innovative teaching methods. The principle of this teaching method is that students independently explore lesson content at home, using various sources such as textbooks or the internet. Then, students interact with teachers and classmates in the classroom to reinforce the knowledge gained through self-discovery, exploration, and experiential learning at home. This learning model helps students become more interested in learning and provides opportunities for them to develop their abilities.

2. Tools and methods

The article mainly employs the theoretical development research method. Through analyzing and synthesizing research on the CFB model, the article

focuses on clarifying the characteristics of this model. Additionally, based on observation methods and the analysis and synthesis of teaching experiences of the author and colleagues when applying the CFB model, the article proposes a specific process for applying the CFB model to the Economic Statistics course with a specific lesson plan.

3. Results and discussion

3.1. CDIO model

The CDIO model, a framework for engineering education, was developed to ensure that students are prepared to meet the real-world demands of their profession. CDIO outlines 12 standards for developing and operating educational programs, particularly in engineering. Here is an overview of the 12 CDIO standards (Malmqvist *et al.*, 2019):

- CDIO as Context: Adopt the CDIO framework as the context for engineering education; Integrate learning outcomes that emphasize conceiving, designing, implementing, and operating systems in real-world settings.

- CDIO Syllabus Outcomes: Define clear learning outcomes based on the CDIO syllabus, which includes technical knowledge, personal and professional skills, and product and system building skills.

- Integrated Curriculum: Create an integrated curriculum that aligns with the CDIO syllabus, linking various subjects and courses to the CDIO context and learning outcomes.

- Introduction to Engineering: Provide introductory courses that expose students to engineering and the CDIO framework, giving them a foundation in the engineering process early in their education.

- Design-Implement Experiences: Include hands-on design-implement experiences at various levels of the curriculum, allowing students to apply theoretical knowledge to practical projects.

- CDIO Workspaces: Develop and maintain workspaces and labs that support the CDIO approach, facilitating collaborative and practical learning experiences.

- Integrated Learning Experiences: Ensure that students engage in integrated learning experiences, blending technical knowledge with personal and interpersonal skills.

- Active Learning: Promote active learning strategies that engage students in their education through activities like problem-solving, group work, and interactive discussions.

- Enhancement of Faculty Competence: Continuously develop faculty competence in both technical and professional skills, ensuring they can effectively deliver the CDIO curriculum.

- Enhancement of Faculty Teaching Competence: Encourage faculty development in teaching methods, particularly those that support active and experiential learning aligned with the CDIO approach.

- Learning Assessment: Implement assessment methods that evaluate students' achievement of learning outcomes, particularly in the context of CDIO skills and competencies.

- Program Evaluation: Regularly evaluate the program to ensure it meets CDIO standards and continually improves based on feedback from students, faculty, and industry stakeholders.

These standards provide a comprehensive framework for developing and operating educational programs that prepare students for the complexities of modern practice.

3.2. Flipped classroom model

The flipped classroom, “flip” meaning “reversal” and “classroom” referring to the learning environment, gained traction notably from Eric MaZur - who developed the peer instruction method in the 20s of the 20th century. He realized that using computers in teaching allowed him to guide students rather than lecture them. Starting in the fall of 2000, the University of Wisconsin - Madison used software to replace traditional lectures in the Information Technology field with instructional videos accompanied by slides. In 2011, two centers, the Wisconsin Collaboratory for Enhanced Learning, were established to focus on flipped classroom models.

There are many definitions regarding flipped classroom in literature. According to Bishop and Verleger (2013) flipped classroom is a student - centred learning method consisting of two parts with interactive learning activities during lesson and individual teaching bases directly on computer out of lesson. Hamdan *et al.* (2013) explained flipped classroom is not a defined model instead it is a model that teachers use as compensating the demands of students by using different equipments. The flipped classroom model is where the steps of teaching and learning in traditional classrooms are reversed - meaning lecture content is delivered at home through online videos, practice, applications, assignments, question answering, and in - depth discussions are conducted in class.

In traditional classrooms, students attend lectures by teachers, which specialists call low - level thinking. Then, students go home to do assignments, and the assignment process becomes challenging if students do not understand the material. In practice, for traditional teaching methods, teachers do not have enough time to both deliver new knowledge and help students solve all assignments related to that knowledge unit, let alone have time to closely supervise all students. The flipped classroom model addresses these challenges by "flipping" the process of traditional teaching and learning. Thus, the task of delivering new knowledge belongs to the teacher, and according to Bloom's taxonomy, this task only exists at the low level (remembering and understanding). Conversely, the task of students is to apply the knowledge acquired, which belongs to the high level of Bloom's taxonomy (including applying, analyzing, evaluating and creating). The obstacle is that tasks at the high level are solved by students themselves.

With the flipped classroom model, understanding knowledge is guided by the teacher (through E-learning textbooks prepared by teachers beforehand and information searched by students themselves), and the task of students is to self-study this new knowledge and do low - level assignments at home. Then, in class, students engage in activities organized by the teacher to interact and share with each other. High - level assignments are also performed in class with the support of the teacher and classmates. This learning method requires students to engage in more brain activities, hence it is called high - level thinking. Thus, high - level tasks in Bloom's taxonomy are carried out by both teachers and students. This is the difference between the traditional classroom model and the flipped classroom model.

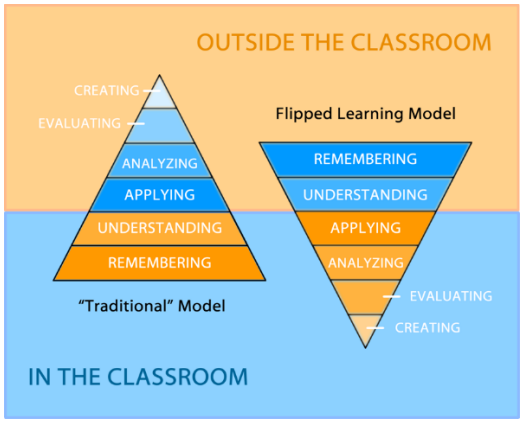

Figure 1. *Flipped learning in Bloom's taxonomy*

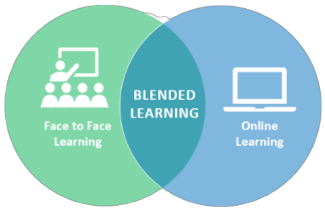

Figure 2. Blended learning

3.3. Blended learning

Blended learning is "a formal education program in which a student learns at least in part through online learning, with some element of student control over time, place, path, and/or pace, and at least in part at a supervised brick-and-mortar location away from home" (Staker & Horn, 2012). This model combines in-class/face to face learning activities (including lesson plans, discussions, exercises, instructional materials, related subject materials, laboratories) and online learning activities (including online surveys, e-learning, online discussions, online forums, multimedia, online documents, self-assessment, learning software).

3.4. CFB model

3.4.1. Concept of CFB model

According to CDIO model, students will learn personal skills, communication skills, product creation skills, developing processes and systems, along with specialized knowledge within the professional training program, and this is called integrated learning. It allows students to use double their time to simultaneously learn both knowledge and specialized application skills. However, to take advantage of that good thing, it is important to apply new teaching and learning methods. How can one optimize time usage without adding to the already dense theoretical content of the curriculum? This is a challenging issue and can be considered a "bottleneck" of the CDIO model.

With the advent of Flipped Classroom and Blended Learning and their outstanding features, it can be seen as an effective way to solve the disadvantages of the CDIO model. Therefore, at Vinh University, the current teaching model combines these three models and is called the CFB model, which is expected to optimize the teaching process to ensure the effective development of learners' competencies and the achievement of the desired learning outcomes. The CFB model can be understood as a combination of the CDIO approach with the design of a clear and effective training program and plan, integrating the Flipped Classroom model to delineate what content will be taught online and what

content will be learned in-person. This increases personalization, enhances interaction, fosters self-learning abilities, and provides learners with ample opportunities to apply and experience the knowledge learned before class. Additionally, the Blended Learning model is incorporated to effectively combine direct and online instruction. These three models support each other which is expected to be an effective teaching model that enhances learners' capabilities and can meet the program's learning outcomes efficiently.

3.4.2. Teaching process in the CFB model

The CFB model is designed around the following three stages:

Stage	Instructor	Learner
(1) Pre-class	- Gather information for the lesson; Design the teaching plan, content, and assessment methods - Provide learning materials (videos, SCORM lectures…) - Share learning resources and assign specific learning tasks to students - Create chat rooms for discussions, answering, and resolving questions - Monitor students' theoretical learning progress before class	- Review the instructor's guidelines and requirements on the LMS before class. - Watch videos, SCORM lectures, read books and study materials as required by the instructor; further explore using technology platforms to meet the requirements. - Take notes, store the acquired knowledge, complete quizzes, and do assignments. - Participate in forum discussions, note down questions that need to be addressed, prepare group projects, and interact with the instructor or other students on the system.
(2) During class	- Organize teaching and support students to help them deeply understand knowledge, enhance interaction and career skills - Answer questions and queries. Provide feedback, evaluate, and systematize the core and specialized knowledge	- Ask questions to clarify issues - Listen to the instructor's explanations and answers - Work in groups, discuss cases, debate, and practice professional skills - Give individual and group presentations.

	- Assign learning tasks in post-class phase (stage 3)	
(3) Post-class	- Continue to support, communicate, and address learners' questions about the learned content through the online classroom space created after the direct class session ends - Conduct assessments and evaluations to measure the learners' achievement of objectives	- Discuss and debate with the team and the instructor to deepen knowledge - Review feedback from the instructor and classmates - Maintain a continuous learning process after the class session - Measure learning effectiveness, self-evaluate, and draw lessons from the experience

3.5. Illustrating a teaching plan applying CFB model

Teaching plan for the "Time series" topic in the "Economic statistics" course has been designed and implemented as follows:

LESSON: TIME SERIES

I. Objectives

By the end of the lesson, students will be able to understand time series as well as the method of analyzing time series. In addition, students demonstrate the ability to report group discussion results and the ability to solve some related problems raised by others.

II. Learning outcomes

4. CLO1.4: Understand economic indicators

5. CLO2.2: Apply statistical economic models to economic measurement

6. CLO3.1: Critical thinking skills

7. CLO3.2: Effective teamwork organization skills

III. Teaching aids

Includes teaching aids such as PowerPoint; E-Learning system; Projector; Computer; Textbook (Economic Statistics); A0 paper.

IV. Teaching process

Based on course learning outcomes, teaching content was designed as follows:

Stage	Teaching content	CLO
(1) - Pre-class	Study Elearning lecture on Time series, Indicators	CLO1.4 CLO2.2
	Do exercise on LMS: Indicator of time series analysis	CLO2.2
	Do exercise on LMS: Bài Case study of time series	CLO3.2
(2) - During class	Calculate Indicators of time series through Multiple choice questions	CLO2.2 CLO3.1
	Group discussion about Case study of time series	CLO2.2 CLO3.2
	Presentation about group result	CLO3.1 CLO3.2
(3) - Post-class	Revise about Indicators	CLO2.2
	Do exercise about Indicators on LMS	CLO2.2

Specifically, the lesson is organized as follows:

Stage 1: Pre - class

Upload the E-lecture to the E-Learning Systems. For the discussion section:

- Assign students to calculate time series analysis indicators.
- Each group should find and draw one real-life time series on an A0 paper.

Statge 2: During class

Activity	Aims of activity	Description of activity
Lead - in	- Create good atmosphere for students to learn and get them ready for the new lesson. - Check the knowledge of the previous lesson.	**Some time series in reality** **(1)** Show datas (2) Show time series in reality (3) Using some indicators to analyse Give 5 indicators of time series analysis
Multiple-choice questions	Apply the fomula into the reality	Give 5 multiple choice questions for 5 indicators

Discussion & Presentation	- Discuss problems and solution - Develop teamwork skills - Develop presentation skills	**1.** Before the lesson, the following requirements were posted on the Class discussion part on the E – learning system: **Find and draw a case study of time series on A0 paper** 1. Ask students to work in groups of 5/6 members in 10 minutes to use indicators for time series analysis. 2. While discussing, ask students to take notes on A0 paper they had. 3. Obverse students' group discussion and evaluate each member's contribution and participation. 4. After group working, ask students to choose one representative per group, other members go to see other groups's result. The criteria for group task: Content; Format; Presentation A. After galary walk acitivites, each student chooses the 2 best groups. The group has the most votes will be a winner in strawpoll website by QR code.
Wrap-up	Identify what students have learnt trough the case study.	B. Ask students what they have learnt through group task. C. Summarize time series analysis.

Stage 3: Post - class

- Homework: Ask students to work individually and do time series analysis. Post the answers in the Class Discussion part on the E-learning system.

- Self - study: Do excercise in textbook 5.6 - 5.10 (pp. 192-193). Post the answers in the Class Discussion part on the E-learning system.

4. Conclusion

Based on theoretical research on CFB model, I have designed activities and organized teaching "Time series" topic in the "Economic statistics" course

to develop students' competencies. Through the learning process and experiences with CFB model, students have learned about time series in reality and how to analyze data, thereby autonomously acquiring knowledge through learning activities and helping students develop various competencies such as self-learning ability, numerical competence, and collaborative skills. This contributes to fostering a passion for scientific research, enhancing interest in learning, and promoting and harnessing autonomy, proactivity, and creativity in both learning and life.

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