

APPLICATION OF CDIO: AFTER 2 YEARS AND WHAT IS NEXT

Dinh Ba Tien

University of Science, Vietnam National University – Ho Chi Minh

Le Hoi Bac

University of Science, Vietnam National University – Ho Chi Minh

Tran Dan Thu

University of Science, Vietnam National University – Ho Chi Minh

ABSTRACT

Our school, the school of Information Technology, University of Science, Vietnam National University – Ho Chi Minh, has been selected as one of the three schools in Vietnam to implement CDIO framework to improve our teaching and learning quality. The project will last for 7 years, which is fully supported by the government in an effort to make a model for other schools in Vietnam later on. Until now, it has gone through 2 years with a lot of positive changes in the teaching and learning. Although the project is still at the early stage and a lot of work need to be done in the coming years, lecturers and students are pleased with what they have experienced. The paper shares the experience and results that we have in the last 2 years when applying CDIO framework to the School of Information Technology with 6 departments and a total of more than 2000 students. The paper also shows the self-evaluation rubrics on 12 CDIO standards of the school before applying CDIO, after 6 months, 1 year, and 2 years. The key contribution of the paper is to show the step by step approach to update and improve the school learning outcomes, the curriculum, and changes in course syllabi to reflect personal, inter-personal and CDIO skills.

KEYWORDS

CDIO adaptation, CDIO in IT, CDIO self-evaluation, 2-year CDIO application

INTRODUCTION

Based on a successful external assessment from the ASEAN University Network-Quality Assurance (AUN-QA) [1], the school of Information Technology, University of Science, Vietnam National University – Ho Chi Minh (VNU-HCM), has been selected as one of the two pilot programs to adopt the CDIO Framework [2, 3, 6, and 7]. The proposed project is sponsored by the government and will last for 7 years from 2010 in an effort to improve the teaching and learning quality at the school and build up a model for other schools in Vietnam.

The school has run through the CDIO adoption process to revise the school learning outcomes, the curriculum, the syllabi and the teaching methodology. The project is

considered as the key project with the participation of all the lecturers, nearly 2000 students in 6 different departments of the school, the alumni, and the industrial partners. With the advice and review by invited CDIO experts every year, our school staff members have done their best to achieve the most out of the project.

The project is implemented using both top-down and bottom-up approaches. At first, the learning outcomes and the curriculum of the school have been revised and verified by all the stakeholders, such as the school scientific committee, the lecturers, the alumni, and the industrial partners. A revised learning outcomes and an updated and integrated curriculum have been introduced to all participants. New syllabi for courses have been prepared to include personal, inter-personal and CDIO skills. A few courses have been carried out based on the CDIO framework as pilot programs and then more courses will come in the next years. So far, the 12 CDIO standards have been carefully considered by the school in order to cover the adoption process fully. At the end of each year, the school runs the self-evaluation process to assess the current status of the school and finds out what to do next in the coming years.

The following sections will describe in detail the work we have done in the past two years and what for the coming years. In addition, discussions on the problems we have encountered are also mentioned.

THE ADOPTION PROCESS IN THE LAST 2 YEARS

In the last 2 years, we have learned the CDIO framework and tried to apply it into the school of Information Technology. In the first stage, the learning outcomes of the school, the integrated curriculum, and the new syllabi for the courses. All lecturers have also participated in different training workshops and programs to build up their technical, professional knowledge and the teaching skills.

The school learning outcomes

In the first year of the CDIO adoption, the main objective of the school is to revise the current learning outcomes and re-build a new, detailed and CDIO-based learning outcome. The new learning outcomes must be verified by all of the stakeholders, such as lecturers, alumni, and industrial partners. It is, then, approved by the school scientific committee and by the university.

The process of revising and building up the new learning outcomes for the school is described in Figure 1. The process consists of 5 main steps:

- Step 1: based on the existing learning outcomes and CDIO syllabus [4], we build the 1st version of the learning outcomes for the school up to the details of X.X.X.
- Step 2: The learning outcomes were presented in front of the school scientific committee for feedback and comments. The revised version is then prepared.
- Step 3: The new learning outcomes were then verified by different stakeholders, such as the lecturers, the alumni, and the industrial partners.
- Step 4: The CDIO team collects all the survey data to make adjustments in the current version of learning outcomes. This version was then presented in front of the scientific committee again for feedback and discussions.
- Step 5: The final version of school learning outcomes was approved by the school scientific committee and then the university committee.

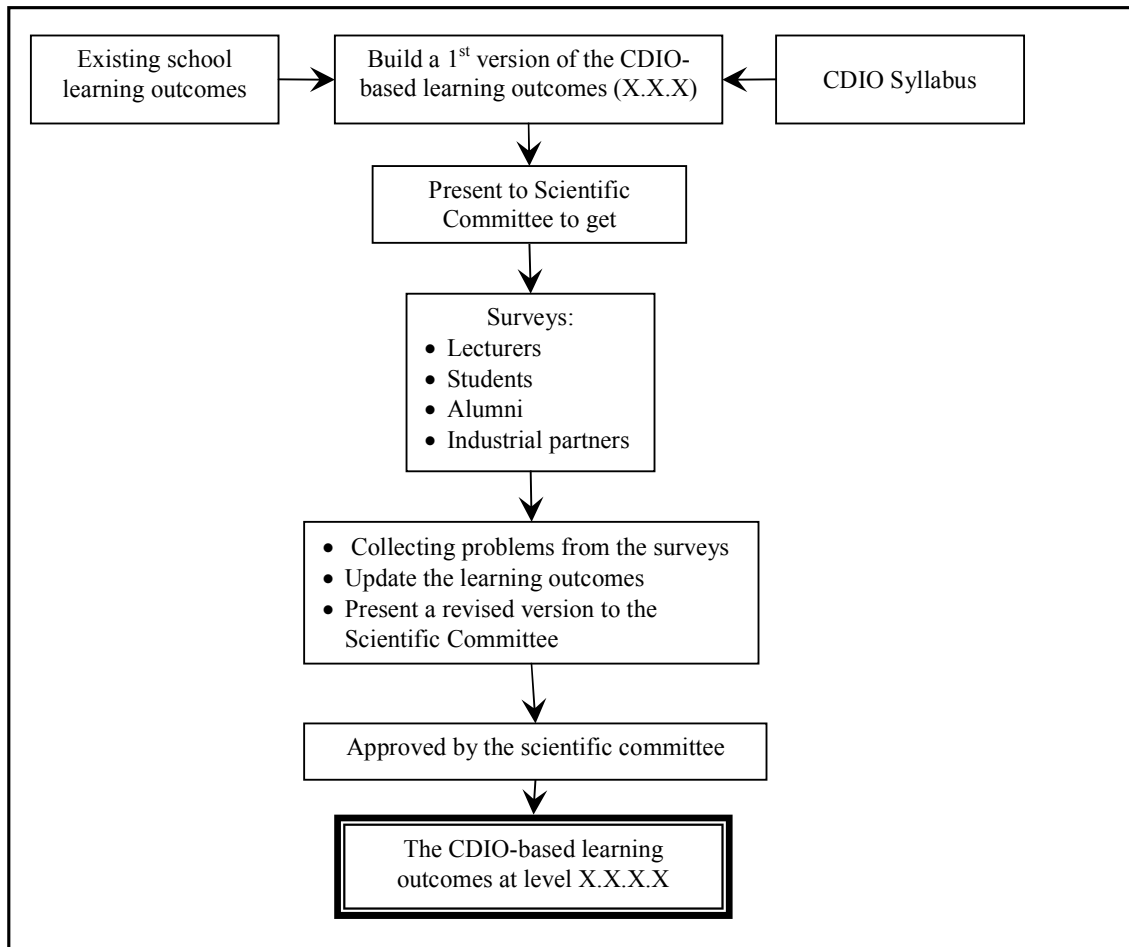


Figure 1. The process of building new CDIO-based learning outcomes

Throughout these steps, the new CDIO-based learning outcomes have been created based on the characteristics of the school, the CDIO syllabus and the verification of all the stakeholders. In the process of revising and re-building the school learning outcomes, we noticed from the surveys that there was a strong agreement among stakeholders in most of the entries in the learning outcomes.

An updated and integrated curriculum

Besides the process of building up the school learning outcomes, the curriculum have been also revised and updated. The process is shown as in figure 2.

In the process of revising and updating the school curriculum, we have done the following main steps:

- Step 1: based on the existing curriculum and the new CDIO-based learning outcomes, we asked all lecturers to do the blackbox exercises for all the courses that they have taught and then do the ITU mapping for those courses.

- Step 2: With the results from the blackbox exercises and the ITU mapping, the school realizes the gap between courses, the missing learning outcomes and the learning outcomes that are not covered by any course.
- Step 3: The head of the departments and the school scientific committee were sitting together and discussed to propose new courses, modify the courses to make sure that they have covered all the learning outcomes of the school. In addition, the continuation of courses in different levels is also considered to avoid gaps and overlaps. In particular, the personal, inter-personal and CDIO skills have been carefully considered in each course.
- Step 4: Finally, the new list of courses with their learning outcomes are presented in front of the school's and university's scientific committee for approval.

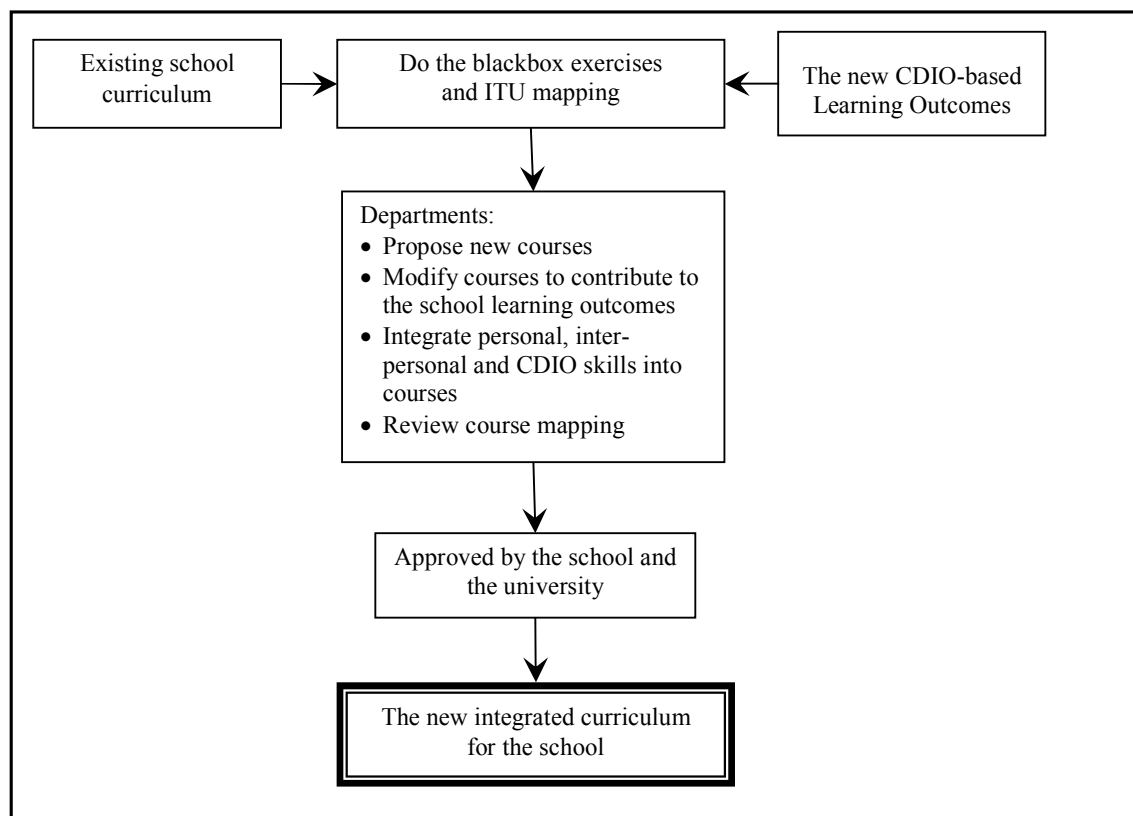


Figure 2. The process to update the school curriculum

In the new curriculum, each course has clearer pictures of what it will contribute into the overall learning outcomes of the school. Most of the gaps and the overlaps between courses have been addressed. Lecturers who teach the same course or the previous or the next courses in the course map were sitting together to share their courses' syllabi and teaching information. They tried to arrange the level of contributions in overlapped learning outcomes.

Staff training

In addition to the effort in revising and re-building the school learning outcomes and the integrated curriculum, all of the staff members have participated in different training courses to improve their professional knowledge and teaching methodology. These kinds of activities will take place every year. In the last two years, there have been a total of 120 staff members who took part in the training courses. They are now ready to teach the students the new course syllabi in which personal, inter-personal and CDIO skills are seriously considered.

Furthermore, in the last two years, our school and the Vietnam National University – Ho Chi Minh have invited different CDIO experts and leaders to verify what we have done. They also gave us more insights of the CDIO adoption process. Especially, at the end of each year, we have invited external examiners to evaluate the CDIO implementation at our school and give out comments and feedback on what to improve.

Last year, we have organized a group of 15 lecturers to visit other schools in the region which have also applied CDIO in their teaching and learning activities. The visit built up our motivation for the CDIO implementation at the school. It was also a great opportunity for the lecturers to see other CDIO-based programs in person. The lecturers have learnt from other colleagues in those schools on carrying out CDIO-based courses.

Implementing in a few courses

In the last two semesters, we have implemented the CDIO-based teaching and learning activities for 5 different courses. In parallel, the lecturers have prepared updated syllabi for the courses in the coming years. Those syllabi have been reviewed and then approved by the school scientific committee. Up to now, we are expecting to have a total of nearly 20 new course syllabi.

After each semester, we have also run different surveys to summarize the effects of the CDIO adoption in each course and as a whole program. According to the surveys and feedback so far, both students and lecturers are very happy with the changes. Students are more active and learn new knowledge more deeply based on the new teaching and learning activities. However, the lecturers are very worried for the coming years when there are more courses to be implemented. The pressure on each lecturer will increase much due to the shortage of human resources.

Student assessment and program assessment

The student assessment is also one of the hottest topics in the process of CDIO adoption. In the past, each lecturer assessed his or her students in his or her own way. However, the new course syllabi show very clearly which learning outcomes we need to assess for the courses and at what level. The assessment methodology is also mentioned in detail. Thus, different lecturers who are teaching the same course are expected to transfer similar knowledge and skills to the students and evaluate their ability similarly. This guarantees the teaching and learning quality at the school.

In addition to the student assessment, the whole program has been reviewed and evaluated by external examiners every year. The evaluation process is to guarantee the correctness of the CDIO adoption process. It is also an opportunity to listen to the CDIO experts' advice and to find out what we will need to do next to improve the current situation.

WHAT IS NEXT

We are currently in the 3rd year of the CDIO adoption project. At the end of each year, we have done a self-evaluation on 12 CDIO standards to find out where we are now and what to do next. In the 3rd year, we planned to do the followings:

- Continue the staff trainings on both professional knowledge and teaching skills (Standard 9 and Standard 10)

- Revise and improve what we have done so far on the school learning outcomes (Standard 2), the integrated curriculum (Standard 3), introduction to IT (Standard 4), active learning (Standard 8), learning assessment (Standard 11) and the program evaluation (Standard 12).
- Prepare new workspaces (Standard 6) to enhance experiential learning and design-implement experience
- Enhance the students, lecturers and university awareness of the CDIO adoption (Standard 1).

In addition to the list of tasks that need to be done in this 3rd year, the plan of implementing CDIO-based courses in the coming semesters also needs to be reviewed carefully. Especially, the shortage of lecturers is a big problem that needs to be resolved.

THE SELF-ASSESSMENT

To keep track of the development of the CDIO adoption process, we have done the self-evaluation for the school regularly, such as after 6 months, 1 year, 2 years. The table below shows the self-evaluation of the 1st year and the 2nd year.

Table 1. Rubrics self-evaluation after 1 year and 2 year of CDIO adoption

	CDIO STANDARD	EVIDENCE OF COMPLIANCE	RATING 1 year	RATING 2 years
1.	CDIO as Context	<ul style="list-style-type: none"> • New CDIO-based learning outcomes and the integrated curriculum has been approved • 5 courses have been implemented • Staff members got trained on professional knowledge and teaching skills 	2	3
2.	CDIO Syllabus	<ul style="list-style-type: none"> • The CDIO-based learning outcomes have been approved and integrated into courses • The curriculum is revised to integrate the school learning outcomes. 	2	3
3.	Integrated Curriculum	<ul style="list-style-type: none"> • Curriculum has been re-designed to integrate personal, interpersonal and CDIO skills. • Courses have been revised to ensure the smooth link between courses along the 4-year training. • The first 5 courses have been carried out. 	1.5	2
4.	Introduction to Engineering	<ul style="list-style-type: none"> • The introduction to IT has been introduced to the curriculum • The course has been run in the last 	1	3

		and current semesters		
5.	Design-Build Experiences	<ul style="list-style-type: none"> • There is a plan for all first year students to take the introductory course. • There is plan to arrange the courses so that the students can take basic and advanced design-implement courses in their later years. 	2	2
6.	Engineering Workspaces	<ul style="list-style-type: none"> • Starting to build new workspaces for CDIO-based courses 	1	1.5
7.	Integrated Learning Experiences	<ul style="list-style-type: none"> • 10 courses have been revised and integrated personal, interpersonal and CDIO skills. • The first 4 courses have been carried out. 	1.5	2
8.	Active Learning	<ul style="list-style-type: none"> • There are 4 pilot courses to apply active learning. • There is a plan to carry out the active learning for all the courses in the school. 	0.5	2
9.	Enhancement of Faculty CDIO Skills	<ul style="list-style-type: none"> • Young lecturers took part in professional courses to improve skills. • Lecturers of the same course have been sitting together to discuss about the course syllabi and professional knowledge. 	0.5	2
10.	Enhancement of Faculty Teaching Skills	<ul style="list-style-type: none"> • All lecturers have to study and pass a course on teaching skills. • Each year, there is a workshop for lecturers to discuss about the teaching skills and methodology. • Most of the lecturers have participated in the training on the teaching skills for CDIO. 	1	2.5
11.	Learning Assessment	<ul style="list-style-type: none"> • There are assessments on personal, interpersonal and CDIO skills. They have been implemented on a couple of courses. 	1	2
12.	Program Evaluation	<ul style="list-style-type: none"> • A program evaluation has been done a couple of times by the external people. • It is planned as the end of each year 	1	2

CONCLUSION

The paper has presented what the school of Information Technology, University of Science, Vietnam National University – Ho Chi Minh has done in the past 2 years of CDIO adoption. The paper also shows the next steps to do in the 3rd year of the 7-year project. Seeing the program self-evaluation after each year, there are some improvements on different CDIO Standards. Up to now, the school has paid much attention to the project and spends a great effort in improving teaching and learning quality.

In the 3rd year of CDIO adoption, we plan to revise the tasks that we have done in the last 2 years and continue to carry out the CDIO implementation on more courses. The remaining standards, such as standard 5 and 7, will be considered and put into the plan.

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Biographical Information

Dr. Dinh Ba Tien is currently the Head of Software Engineering Department, Faculty of Information Technology, University of Science, Vietnam National University – Ho Chi Minh city. He graduated from the University of Huddersfield, United Kingdom in 2007. He is one of the key members of the CDIO team of the school who participates in a 7-year project with the goal of teaching and learning improvement.

Prof. Le Hoai Bac is the Vice Dean of the Faculty of Information Technology. He is monitoring and controlling the progress of the project and the deliverables. He is an active member in adopting CDIO in FIT. Prof. Bac research interests are in Data mining, soft computing and expert systems.

Prof. Tran Dan Thu is the Dean of the Faculty of Information Technology. His current research is on Software Engineering processes and management, and design patterns. He is also interested in improving teaching methodology and course syllabus to encourage students in learning and practising.

Corresponding author

Dr. Dinh Ba Tien
Faculty of Information Technology
University of Science
Vietnam National University – Ho Chi Minh
227 Nguyen Van Cu Street, District 5
Ho Chi Minh city, Vietnam.
(+84 8) 38354266 (ext. 802)
dbtien@fit.hcmus.edu.vn