THE EFFECTS OF INDUSTRY 4.0 ON TEACHING AND LEARNING CDIO PROJECT AT DUY TAN UNIVERSITY

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ABSTRACT

The current world education trend is to associate training with scientific research and learning to experience. In that spirit, Duy Tan University (DTU) always aims to deploy a new training model for modern, scientific and creative education, serve the purpose of creating a knowledgeable human. “Education 4.0” is considered the education models that DTU is heading to. It is the future of education, which is a student-centred, peer-to-peer, active learning model, flexibility in both time and place, project-based and experience learning, responds to the needs of Industry 4.0. It is a great challenge to transform the traditional education model into a new model, but DTU is making every effort to launch, starting with the CDIO curriculum. Our students have implemented a number of CDIO projects for the practical application of the Internet of Things (IoT) in Industry 4.0. CDIO instructors use a variety of products in Cloud Computing during the CDIO training process. In this article, we will present the effects of Industry 4.0 on teaching and learning CDIO at DTU. In order to improve the efficiency of deploying IoT applications in CDIO projects, we implemented a Flipped classroom approach. Instructors act as a learning supporter, sharing aspirations, co-creating of knowledge with students. The duty of students is to read and understand the material at home. The amount of class time spent will be discussed: student issues, student-led problems, the advantages and disadvantages of the sample designs and how to improve it to suit the actual conditions in Vietnam. To evaluate the quality of students, we propose a Process-oriented assessment approach: research, feedback, and presentation. Finally, we use quantitative parameters to evaluate the effectiveness of proposed methods: percentage of students achieving proficiency or better in ABET outcomes d, e, g, i; the total studying time; the level of satisfaction of students.

KEYWORDS:

Industry 4.0, Education 4.0, CDIO project, Process-oriented assessment, Flipped classroom
Standards: 2, 3.

INTRODUCTION

In recent years, Industry 4.0 has become a trend in many countries around the world. The concept of "Industry 4.0" was launched in 2011 in Germany, to enhance their traditional industry. It quickly spread and became a strategic program by many developed countries like the US, France, Korea, China, etc. [1][2][3].

Industry 4.0 is the achievements of artificial intelligence, automatic machines, 3D printing, Internet of Things, biotechnology, nanotechnology and so on [4][5]. Its core is a digital technology breakthrough, followed by the achievement of the digital revolution that has taken place since computers and the Internet appeared. Industry 4.0 is expected to fundamentally change the way people live, work, and interact with each other. The application of new technologies allows to boost labor productivity, raise income levels and improve the quality of life for people. However, the paper [6] has shown that this revolution can bring greater inequality, especially in the ability to break the laboùr market. Many traditional business and production models in different areas are at risk of being overturned when too many human-made jobs are replaced by automated lines. The World Economic Forum (WEF) held in January 2016 predicts: From now to 2020, 5 million jobs will be replaced by robots, the rate of unemployed and the number of vulnerable areas employees in developing countries tend to increase [7]. Similar research by the International Labor Organization (ILO) also predicts, [8] in the next two decades, about 56% of low skilled workers in 5 Southeast Asian countries, including Vietnam, risk losing a job because of robots. More specifically, 86% of workers in the textile industry and 75% of workers in the electricity and electronics industry in Vietnam are at risk of losing their jobs due to automation [9]. Many studies have shown that the workforce is medium or low skilled, does low-productivity jobs, low income, poor working conditions (e.g. workers in assembly lines, manual labor) will be the most affected people.

On the other hand, although technology revolutions often spark fears of unemployment when machines do everything, researchers believe that reducing the total number of jobs is impossible. The evidence is: in developed countries, with the higher quality workforce, unemployed and the number of vulnerable area employees is expected to decrease in 2018 - 2019 [8]. Because the application of Industry 4.0 with high automation can enhance the productivity of existing jobs and create demand for entirely new jobs in automated manufacturing, cloud computing, big data. These jobs will, of course, require a more skilled workforce, and must be equipped with skills for the future "Meta-skills". (See Fig. 1) [12].

In fact, the advanced workforce can only be trained from an advanced education: Education 4.0. Education 4.0 is the future of education, which is a student-centered learning model, peer-to-peer learning, active learning, flexibility in both time and place learning, project-based learning, actual experience learning and responds to the needs of Industry 4.0. The University of Education 4.0 is not only a place for training - research, intellectual transfer but also a centre for innovation, cultivating passions, promoting the startup spirit of the students. Duy Tan University is gradually implementing Education 4.0 model into teaching, becoming a pioneer in education reform in Vietnam.

It is a great challenge to transform the traditional education model into an Education 4.0 model, but Duy Tan University is making every effort to launch, starting with the CDIO curriculum. Faculty of Electrical & Electronic Engineering (FEEE) has given some solutions in implementing CDIO teaching and learning in accordance with the impact of Industry 4.0. Our faculty has applied the “Flipped Classroom” approach in CDIO class to enhance the system of "Meta-skills" for students as Fig. 1. To evaluate the quality of students, we propose a “Process-oriented assessment” approach: research, feedback, and presentation; focus on work processes rather than exams. Process-oriented assessment helps students to continuously improve their projects, not only the instructor’s suggestions but also many other

students. Moreover, students' ability to present and criticize will be gradually improved through presentations. Students can also implement their projects anywhere, use software applications to synchronize work with their team and report to the instructor.

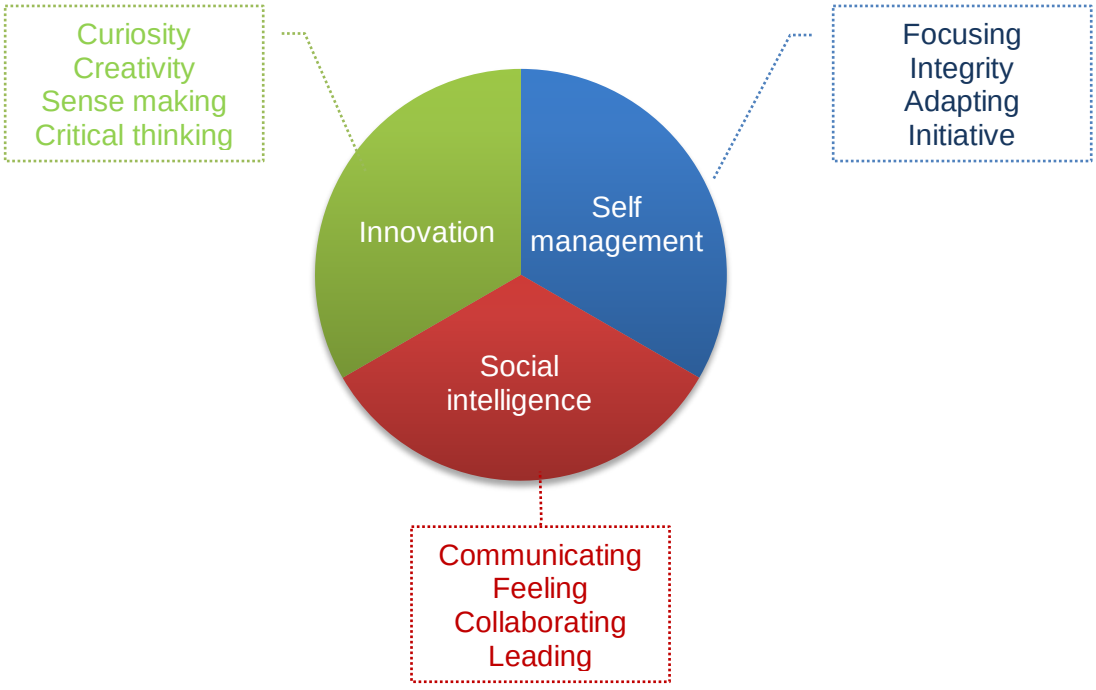

Figure 1. Skills for the future: meta-skills

To evaluate the effectiveness of the proposed method, the authors have conducted a number of surveys with the following parameters:

- Percentage of students achieving proficiency or better in ABET outcomes d, e, g, i [13]. ABET is a form of quality assurance for programs in the areas of applied and natural science, computing, engineering, and engineering technology. ABET accreditation is recognized globally as evidence that a program meets the standards set by its technical profession

- The total studying time spent on the student in the class

- The level of satisfaction of students participating in the class.

FLIPPED CLASSROOM AND PROCESS-ORIENTED ASSESSMENT DESCRIPTIONS

Flipped Classroom (FC) is an advanced educational model that is based on the development of e-Learning technology and modern training methods. The concept of the Flipped Classroom model was proposed by Lage et al in 2000 to meet the different learning needs of learners. The simplest definition of FC is one where students are introduced to content at home, and practice working through it at university [10]. Class activities will be transferred outside the classroom and vice versa. (Table 1)

Table 1. Traditional and Flipped class activities

Type	Activities in class	Activities outside of class
Traditional	Lectures	Homework
Flipped	Practice exercises Presentation Discuss	Lectures Video Lectures Quizzes

The Flipped classroom approach comes from the limitations of traditional classes. The traditional one-size-fit-all model of education often results in limited concept engagement and severe consequences. In traditional classes, students come to university and listen to lectures passively (Low thinking). After that, homework assignments will be given to students. Thus, the new knowledge that students acquire is entirely dependent on lectures by the instructors; and those lectures can only be heard once. According to Bloom's Taxonomy [11] (Figure 2), this task is only at lower levels ("Remember" and "Understand"). The task of students is to do practical exercises and this task belongs to the higher level Bloom's Taxonomy ("Apply", "Analyze", "Evaluate" and "Create"). The obstacle is low-level tasks will be undertaken by instructors, while higher-level tasks are undertaken by students!

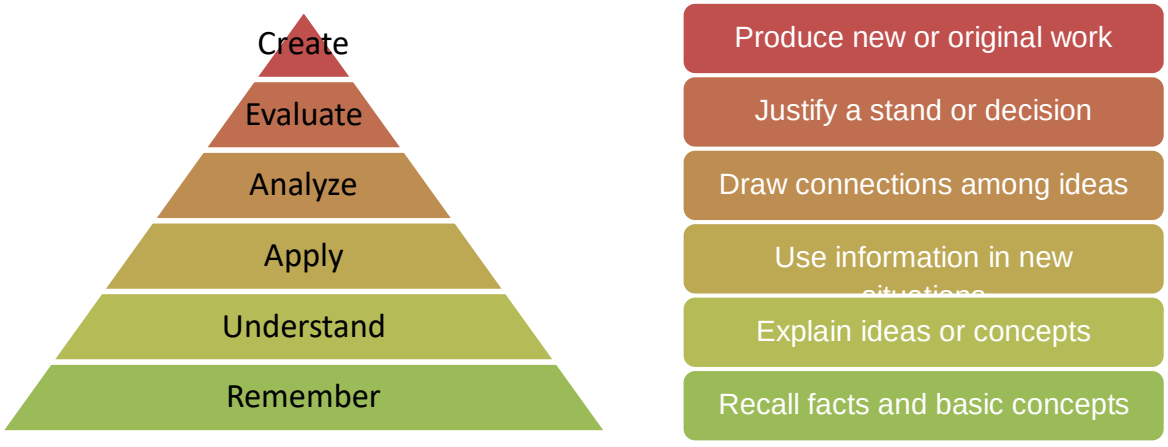

Figure 2. Bloom's Taxonomy [11]

With FC approach, instructors act as a learning supporter, sharing aspirations, co-creating of knowledge with students. Materials are provided to students through a Learning Management System Website. The duty of students is to read and understand the material (Remember and Understand in Bloom's Taxonomy), then do some basic level quizzes at home. In that way, students will be more active in researching new knowledge. They can access the video lectures at any time, can stop the lecture for notes, can review it as many times as needed (this is not possible if the instructor teaches in class). Students can study anytime, anywhere with Internet-connected devices such as Laptop, smartphone, PC... The amount of time spent on the class will be discussed: discussing student issues, discussing some of the student-led problems, discussing the advantages and disadvantages of the sample design students take and how to improve to suit the actual conditions in Vietnam, discuss the real problems from the instructor's experience ("Apply", "Analyze", "Evaluate" and "Create" in the Bloom's Taxonomy). Thus, class time will be for more specialized and interesting topics. This method does not allow students to listen to passively so that they can reduce boredom. This is a learner-centered method of education when most of the class time will be taken by students. This way of learning requires students to use a lot of mental activity

so it is called "High thinking". Thus, high-level tasks are implemented by both instructors and students.

In order to maximize the effectiveness of the FC, the Process-oriented assessment will be done to replace the exams. Specifically, students will be assessed through Quizzes, job logs, presentation skills, critical skills, direct questions with instructors, to train some Meta-skills for them.

- Quizzes: Each E-Learning lecture always comes with Quizzes to assess students' comprehension. Quizzes are divided into several types and levels and are scattered in E-Learning slides. During self-study, students tend to be distracted if the lesson is too long, Quizzes will play a very important role in strengthening knowledge and increasing concentration for them.

- Job log: Students are required to record the content and time of work performed on a regular basis during the project implementation. This work helps to train students with good habits: the ability to present writing forms, ability to arrange work, ability to work according to processes.

- Presentation: The presentations will be held regularly in class so students can practice crowd speaking skills and have the opportunity to give their opinions. After every 2 weeks of implementing the project, each group will present the problem, the direction to implement the topic, the results and difficulties that they face.

- Review: Groups of students are encouraged to raise criticism for the topic. This debate process helps students complete the topic on a regular basis, have a multi-dimensional view of the project they are participating in.

- Direct question and answer: when the topic is completed, instructors and students will exchange directly with each other in the classroom.

Process-oriented assessment can improve the student Meta-skill, meet the output standards of CDIO subjects when being content with many criteria CDIO and ABET (Table 2).

Table 2: Meta-skill is trained according to FC approach and Process-oriented assessment

Assess ment	**Meta-skill**	**Sub meta-skill**	**Satisfied with the standard**	
			CDIO	**ABET**
Quizzes	**Focusing** **Adapting**	***Sorting:*** The ability to sort information into categories and to understand the relationship between information ***Attention:*** The ability to focus on the present and deflect/avoid distractions ***Filtering:*** The ability to filter out non-essential information and focus on the essential problem at hand ***Openness:*** Being open to new ideas and	(2.4) Attitudes, though and learning	(i) Lifelong learning

		approaches – having a growth mindset ***Self-learning:*** The ability to self educate without the guidance of others		
Job-log	**Communi-cating** **Collabora-ting**	***Giving information:*** Giving written in a way that can be best understood by those receiving the communication ***Teamworking and collaboration:*** Working with others toward shared goals. Creating group synergy in pursuing collective goals	(3.2) Communi-cations (3.1) Teamwork	(g) Communi-cations (d) Teamwork
Present-ation	**Communi-cating** **Creatvity**	***Listening:*** The ability to actively understand information provided by the speaker, and display interest in the topic discussed ***Storytelling:*** The ability to tell stories that persuade, motivate and/or inspire as well as bringing the sharing of knowledge to life through examples and illustrations ***Visualising:*** Translating information and thought into accessible expressions, readable and recognisable images	(3.2) Communic-ations (3.1) Teamwork	(g) Communic-ation (d) Teamwork
Review	**Curiosity** **Critical thinking**	***Questioning:*** The ability to ask questions in order to increase understanding about a subject or experience ***Logical thinking:*** The ability to identify, analyse and evaluate situations, ideas and information in order to formulate responses to problems	(3.2) Communic-ations (2.1) Analytical reasoning and problem solving	(g) Communic-ation (e) Problem solving
Direct questio-n and answer	**Initiative**	***Self belief:*** A feeling of trust in one's abilities, qualities and judgement ***Self motivation:*** The ability to act without influence or encouragement from others ***Decision making:*** The act of making a considered choice after appropriately using intuition and careful thought	(3.2) Communic-ations (2.1) Analytical reasoning and problem solving	(g) Communic-ation (e) Problem solving

Thus, we can see the importance of regular, continuous learning and communication in FC approach. Although in FC, CDIO lab will become an open laboratory, both in time and place. Instructors allow students to be flexible about class time. It is not necessary to have full

attendance in class, only required to be present at the presentations. However, that does not mean that students can easily be with them in their study. They have to work more often, more focused so they can keep up with the discussions and criticisms in class. They can only achieve high scores when fully mastering their knowledge.

The instructor must follow the learning process. Each university usually has a tool to assist the instructor in academic management. Today, under the development of software technology and the Internet, universities easily implement a Learning Management System (LMS). The LMS consists of 3 components:

+ Learning: Instructors create courses, and distribute them to students.

+ Management: Instructors manage their online courses: create, change, arrange, classify or remove courses and content courses, and manage students

+ System: Instructors and students interact with each other through this system using the university account provided.

LMS can run on the web so learners can access learning content anytime, anywhere. Every LMS provides the same basic set of tools: directory structure content, assessment tools, group discussion tools, general bulletin boards, grades, surveys...

FLIPPED CLASSROOM CDIO TEACHING AND LEARNING PROCESS AT FEEE, DUY TAN UNIVERSITY

FEEE's development orientation is to train students with knowledge of "Industry 4.0: IoT and new energy". The course that the Faculty first aims to standardize the teaching outline is CDIO. The products of CDIO project will serve Industry 4.0: intelligent measurement, network management, handheld devices, sensor network... With our efforts, we look forward to helping students get closer to the emerging technology issues in the new era. Students, who really study hard, after finishing 4 years in university, not only hold a University degree but also some experience.

The system of CDIO projects in FEEE Duy Tan University is divided into 5 projects with increasing complexity. Each project focuses on each C-D-I-O criterion [13]. At present, the FC is applied in CDIO CR347 project - the project of focusing on design; electronic circuit design. This project is applied in the 3rd year of the student's academic program, providing knowledge and skills in the design and construction of craft and industrial electronic printed circuit board (PCB).

Specifically, the FEEE has developed a FC process as Fig. 3 and Fig. 4. The CDIO Instructor first task is to set up courses according to the curriculum of FEEE. This is done through the MyDTU system which is LMS of DTU. This work includes the following steps: entering course syllabus, scheduling class activities and managing student information. Normally, each CDIO course will take 2 months to deploy. Students have two face-to-face meetings with the instructor at CDIO Lab weekly. The schedule is public on MyDTU at the beginning of the semester. The Skype meeting schedule is also agreed upon at the first CDIO session and remains the same throughout the semester. Besides that, each week CDIO Instructors will spend 4 hours at the Library to meet students. At DTU, we call it "Academic Advisor". This time is for students who have not caught up with the previous lesson and have the

opportunity to question their problems. The second task of instructors is to prepare lectures using MS-Word and MS-PowerPoint. Besides, video lecture format is indispensable for self-study methods. Currently, almost all students have at least two devices that can access the Internet and watch videos (laptop and smartphone), so the video lecture format that is considered to be the most optimal in conveying knowledge. In our experience, lecture videos should be 3 to 7 minutes in length. Video content must be short, intuitive and portable. If video lectures are too long, we should divide them into smaller modules. The reason is that the longer videos are, the harder to follow. We think that arranging out-of-class activities and class activities should be interspersed during the week, and the Academic Advisor at the weekend is most reasonable.

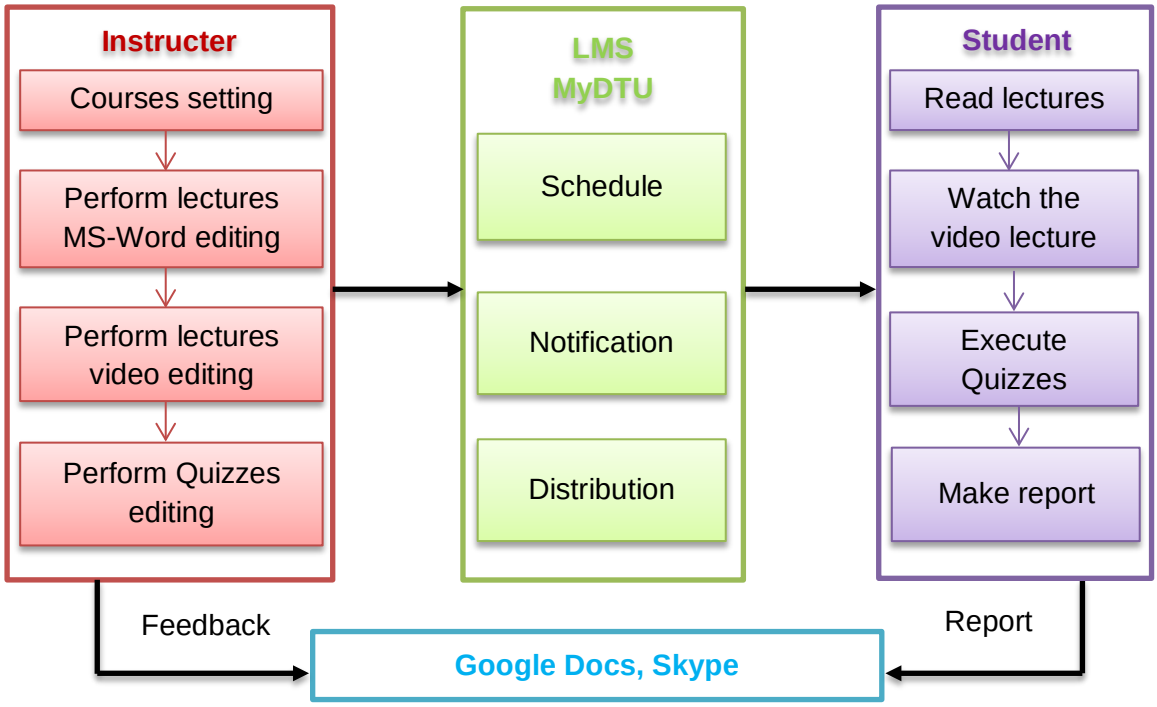

Figure 3. Out-of-class activities of Flipped Classroom at FEEE

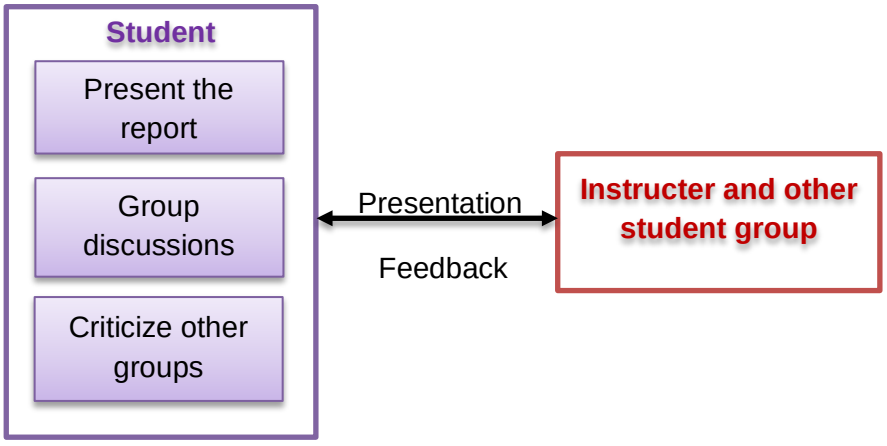

Figure 4. Class activities of Flipped Classroom at FEEE

A useful tool when writing a lecture is Ispring Suite 9.0 [14] which is an add-on for MS-PowerPoint as Fig 5. The instructor can make a summary slide with Quizzes system using

this software. This software supports packaging the presentation into web standards HTML5. This format can run on computers or smartphones and students can directly interact with these slides. Students simply need to access the website provided by the instructor without purchasing any copyrighted software.

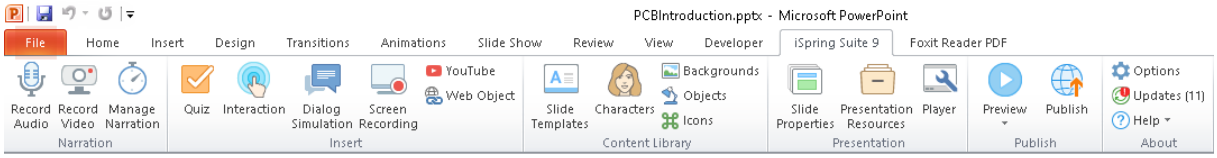

Figure 5. Ispring Suite Add-on in Powerpoint

As mentioned above, Quizzes is extremely important in reshaping knowledge and increasing student focus during self-learning. We use iSpring QuizMaker [15] to create a variety of interactive quizzes types: True / False, Multiple Choice, Multiple Response, Type In, Matching, Sequence as Fig. 6. This software will score and print the results for students after completing Quizzes. We should only use self-learning Quizzes at the first two levels of thinking: Remember and Understand.

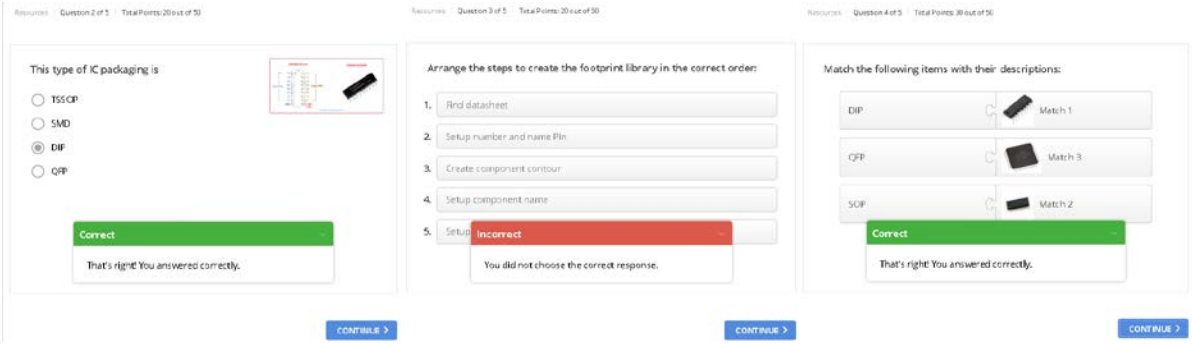

Figure 6. Several types of Quizzes questions

The entire lecture content and teaching schedule are checked by the department head before uploading to MyDTU. Students are required to follow the process: read lectures, watch videos, do Quizzes and make reports. These documents will be granted access by the Instructor as Fig. 7. These reports are mandatory for every student, and job-logs are required for each group. It must be properly formatted, submitted on time, attached Quizzes score given by iSpring. The content of this report represents the main ideas of the lectures but must be rewritten according to the student's understanding. MyDTU provides information feedback systems, but it is less flexible, so we use Google Docs and Skype as an interactive channel. Students make reports via Google Docs, allowing editing for the whole group and Instructor. Instructors easily follow up and give feedback immediately. Skype is also a good choice, which provides good group management and file reception. Group meeting via live channel allows instructors to help students quickly. At the same time, students can be evaluated more often. We can see that outside of class time, the instructors and students' interaction process have been carried out through these cloud services. This interaction process is a very important part of Process-oriented assessment. We want to evaluate students regularly, but not through exams, but through fun lecture videos that inspire students' self-study spirit. Students who successfully complete this homework are students with good academic attitudes, this is an indispensable virtue of a global employee.

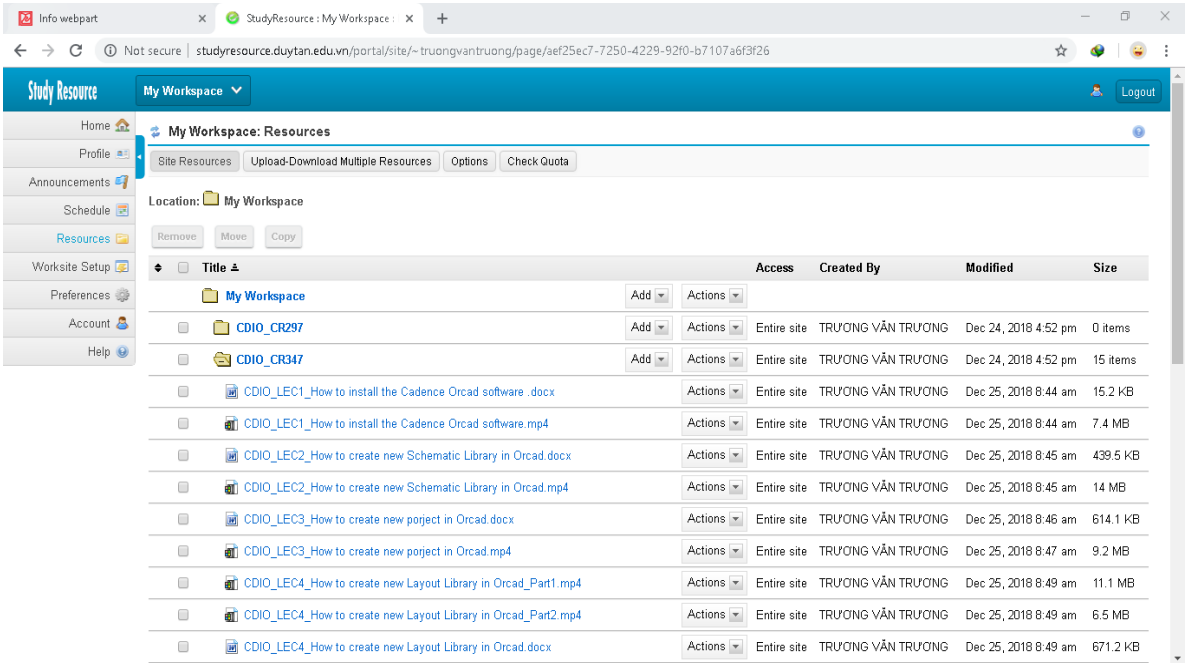

Figure 7. Learning materials are distributed on MyDTU

In class, students will be held group discussions. The time for presentations and discussions is up to 50%. Each group will give presentations and receive feedback from instructors as well as other groups (Fig. 8). This is one of the factors that help instructors assess students' comprehension and ability to express themselves. These presentations will focus on "How to improve the skills that students have self-learned at home". Specifically, in CDIO CR347 of FEEE, students are very interested in sharing methods of PCB layout and PCB anti-interference. At the end of each presentation, instructors synthesize knowledge and continue to add more advanced lectures to students into MyDTU. The process "Research, Feedback, and Presentation" are held regularly throughout the learning at home and at CDIO class.

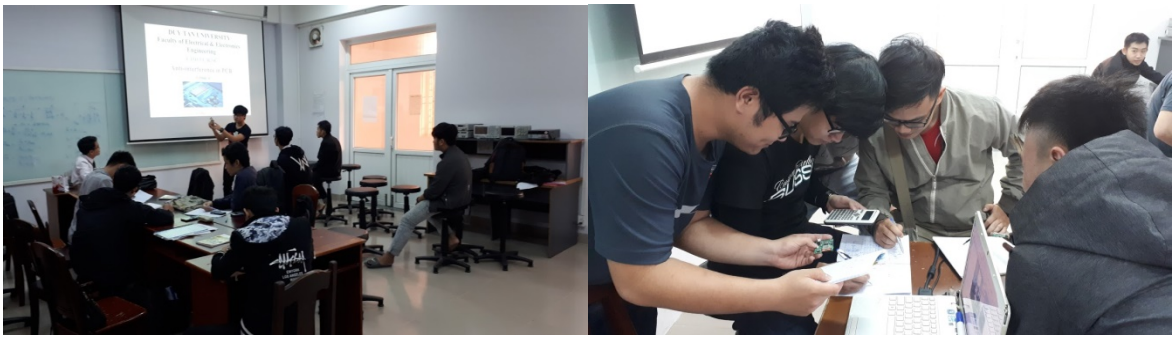

Figure 8. A presentation and group discussion of Flipped Classroom at FEEE

To finish the CDIO CR347 course, students are required to complete: the PCB is designed and executed manually, the summary report and the job-log. Students will have a presentation in front of three CDIO instructors council. This final presentation weight is up to 50% of the grading module. In this session, case questions are provided to assess the group's problem-solving skills and teamwork skills. Students must use presentation skills and all the knowledge they have to convince all CDIO Instructors. Each individual student also

discusses the technical issues of project based on job-log and is given a separate score.

ASSESSMENT

We use quantitative parameters to evaluate the effectiveness of proposed methods: percentage of students achieving proficiency or better (project score higher than 7.0) in ABET outcomes d, e, g, l; the total studying time spent of a student in the class; the level of satisfaction of students participating in the class. The parameters were collected on 4 CDIO CR347 classes in the 2017-2018 and 2018-2019 academic years. In which, 2 classes in the academic year of 2018-2019 are applied FC approach. The average number of students per class is 20.

We have calculated the composition of 82 students according to the 4 criteria analyzed in Table 2. The results show that when applying the FC approach at CDIO classes, the percentage of students achieving proficiency or better in ABET outcomes d, e, g, i increases and exceeds 80% of the total students (Fig. 9).

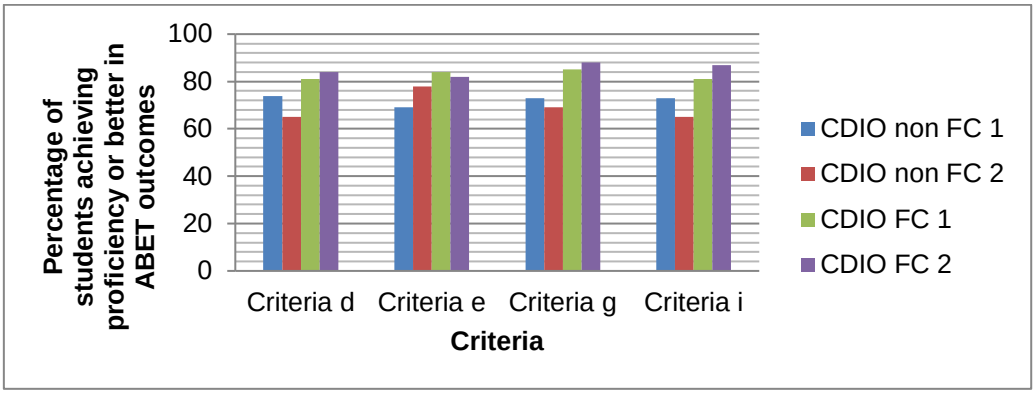

Figure 9. Percentage of students achieving proficiency or better in ABET outcomes d, e, g, i

We use a Google sheet to consult 50 students who have attended the Flipped Classroom CDIO class [16]. This survey focuses on 6 criteria: 1. Course/Unit Content & Structure, 2. Delivery Methods, 3. Training Activities, 4. Instructor/Facilitator, 5. Project execution time outside the classroom and 6. Project execution time in class (statistics according to job log).

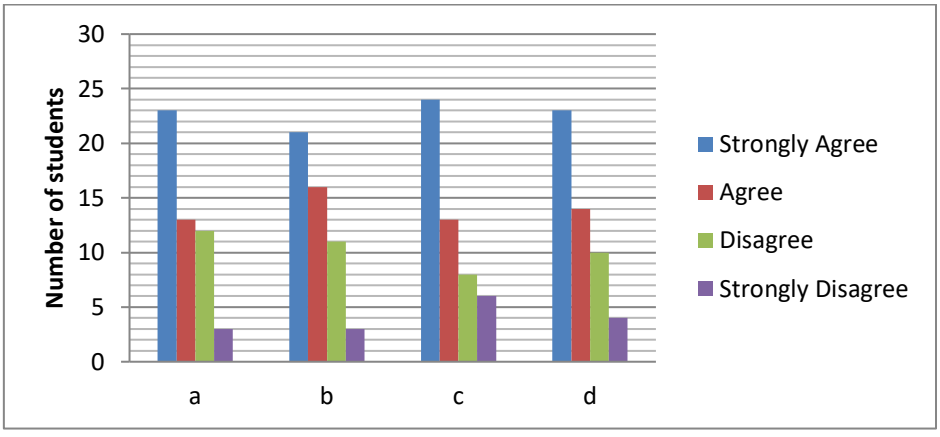

Figure 10. Delivery Methods

The statistical evaluation criteria in Fig 10 include a. The electronic media used in the presentation assisted to better my learning and understanding, b. The delivery methods were suitable for the content of this training, c. The delivery methods assisted my learning and understanding, d. The method used by the instructor made the content clear and easy to understand. As a result, more than 70% of students grasp new learning methods.

The statistical evaluation criteria in Fig 11 include a. The group activities encouraged my participation, b. The activities increased my learning, c. There were sufficient activities in the session, d. The method of assessment was a fair test of my skills and knowledge. As a result, more than 71.4% of students were interested in discussions and presentations in class. 73% of students are satisfied with the assessment method.

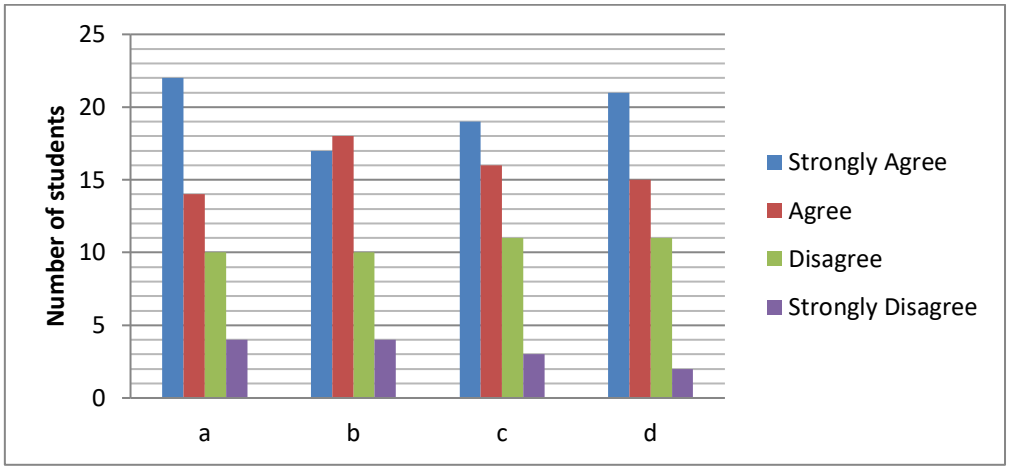

Figure 11. Training Activities

To complete the project, students have to spend a lot of time studying at home, namely, 58.3% of students have to spend >150 hours and 14.6% have to spend >100 hours (Fig. 12). This is a very encouraging parameter, as students are willing to spend a lot of time researching a new problem. They spent a lot of time to practice Electrical & Electronic Engineering skills for this subject at home: PCB design, PCB processing, component welding, measurement and testing.

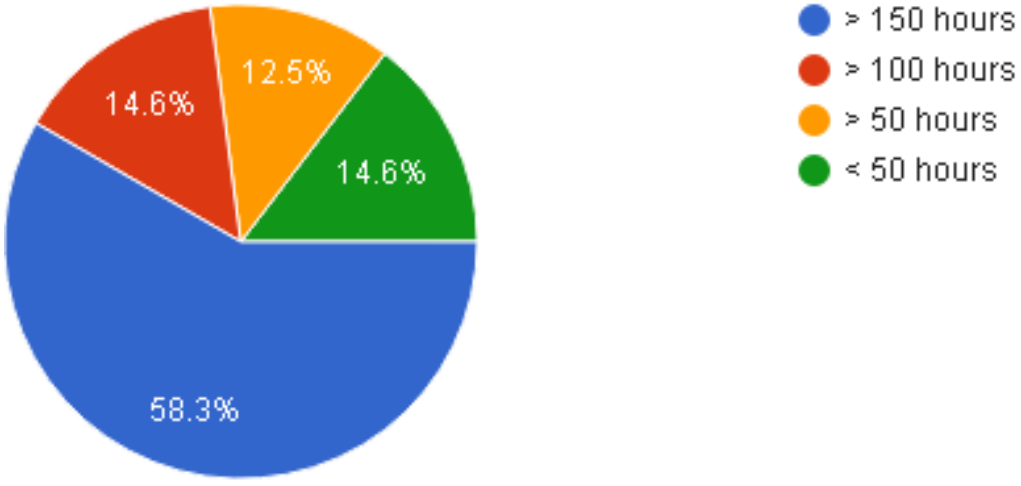

Figure 12. Project execution time outside the classroom (statistics according to job log)

Meanwhile, the class time of students tends to decrease when only 10.4% of students attend 45 hours. Most students attend class if that day is a compulsory presentation (52.1%) (Fig. 13).

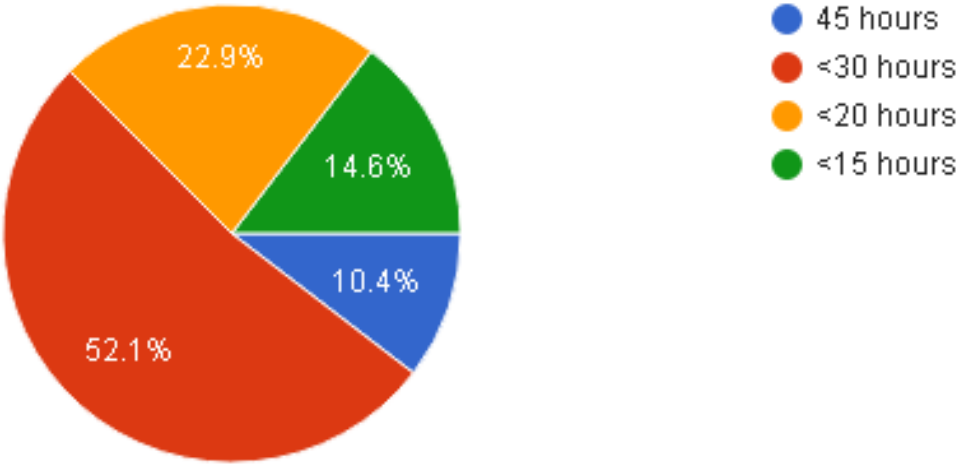

Figure 13. Project execution time in class (statistics according to job log)

The statistics show very positive results when applying the FC approach to CDIO classes. Students tend to spend a lot of time for self-learning and are interested in learning through the LMS. Class activities are exciting and of high quality, complementing the knowledge and skills for students. Class time is reduced, but the output quality of students increases.

CONCLUSION

In this paper, we presented the Flipped Classroom approach and Process-oriented assessment in CDIO CR347 FEEE, Duy Tan University. We have implemented this method for 2 semesters and conducted an effective assessment. The results were very positive as many ABET criteria (representing the Industry 4.0 employees' qualities) were improved in FC classes. Our CDIO project system has 5 subjects, currently, we have only applied this method to CR347. We want to apply this method to other subjects, but this requires a thorough review of the scientific council of my faculty. And it should be noted that not all projects are in accordance with FC architecture. In the future, we hope to continue to expand this method for subjects or some modules in the CDIO project because of its positive characteristics.

REFERENCE

[1] Kiel, D., Müller, J. M., Arnold, C., & Voigt, K. I. (2017). Sustainable industrial value creation: Benefits and challenges of industry 4.0. International Journal of Innovation Management, 21(08), 1740015.

[2] Li, L. (2018). China's manufacturing locus in 2025: With a comparison of "Made-in-China 2025" and "Industry 4.0". Technological Forecasting and Social Change, 135, 66-74.

[3] Sung, T. K. (2018). Industry 4.0: a Korea perspective. Technological Forecasting and Social Change, 132, 40-45.

[4] Hermann, M., Pentek, T., & Otto, B. (2016, January). Design principles for industrie 4.0 scenarios. In 2016 49th Hawaii international conference on system sciences (HICSS) (pp. 3928-3937). IEEE.

[5] Lu, Y. (2017). Industry 4.0: A survey on technologies, applications and open research issues. Journal of Industrial Information Integration, 6, 1-10.

[6] Brynjolfsson, E., & McAfee, A. (2014). The second machine age: Work, progress, and prosperity in a time of brilliant technologies. WW Norton & Company.

[7] World Economic Forum. (2016, January). The future of jobs: Employment, skills and workforce strategy for the fourth industrial revolution. In *Global Challenge Insight Report, World Economic Forum, Geneva.*

[8] Kuhn, S., Milasi, S., & Yoon, S. (2018). World employment social outlook: Trends 2018. Geneva: ILO.

[9] Chang, J. H., & Huynh, P. (2016). ASEAN in transformation the future of jobs at risk of automation (No. 994906463402676). International Labour Organization.

[10] Lage, M. J., Platt, G. J., & Treglia, M. (2000). Inverting the classroom: A gateway to creating an inclusive learning environment. The Journal of Economic Education, 31(1), 30-43.

[11] Armstrong, P. (2015). Bloom's Taxonomy, Vanderbilt University, Center for Teaching. Retrieved from *http://cft. vanderbilt. edu/guides-sub-pages/blooms-taxonomy/, access, 14.*

[12] Skills 4.0, A skills model to drive Scotland's future. (2018, February). Skills Development Scotland. Retrieved from https://www.skillsdevelopmentscotland.co.uk/media/44684/skills-40_a-skills-model.pdf

[13] Truong Van Truong, Binh Dac Ha, Bao Nguyen Le. (2018, June 28 – July 2). Duy Tan University, Vietnam, CDIO contribution to ABET accreditation of Electrical and Electronic Engineering programs, *Proceedings of the 14th International CDIO Conference*. Kanazawa Institute of Technology, Kanazawa, Japan.

[14] iSpring Solutions Inc (n.d.). *iSpring Suite 8 Guide.*
Retrieved from chttps://www.ispringsolutions.com/docs/display/isuite/iSpring+Suite+8+Guide

[15] iSpring Solutions Inc(n.d.). *iSpring QuizMaker Guide.*
Retrieved from https://www.ispringsolutions.com/docs/display/IQ/iSpring+QuizMaker+Guide

[16] Truong Van Truong, (2018, December). Flipped classroom CDIO course evaluation form. Retrieved from
https://docs.google.com/forms/d/1LCipQoHx7Wz3E_Q3UmZXmrWN2xivDaIQ2LvMp6OFGtk/edit

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