

# **The Effect and Evaluation of Active Learning and creative teaching in Micro-Credit Course Modules**

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## **ABSTRACT**

With the development of information technology as well as the constant expansion of knowledge scope, people's learning needs have also increased continuously, such as the development of technology and knowledge of robot, 3D printing technology, Internet of things, intelligent life, etc. Besides, the life cycle in the field of professional skill becomes increasingly shorter. How to encourage students to learn independently and provide the relationship between effective active learning model and interdisciplinary integration links has become the topic we must consider and challenge presently.

In order to improve the situation, we combine the micro-credit mechanism and course design with the standard 3,8 of a CDIO program, The micro-credit course can provide various course modules with concept of 18 hours learning as 1 credit is used to consider taking 9 hours learning as 0.5 credit and even 0.1 or 0.2 credit corresponded to the proportion of learning hours. Thus, it is necessary to master the following 5 principles to take the course (1) introduction to theory and knowledge system; (2) practical case sharing and experience analysis; (3) implementation (grouping or personal operating); (4) report or publication; (5) lecturer's comment and appraisal. This research aims to know how to make up the shortfall of special course and improve the aesthetic educational ability of student in this school, so as to give play to the efficiency of interdisciplinary integration. According to the research results, the thinking on the basis of social care enables students to enter the actual project of interdisciplinary learning rapidly and meanwhile the micro-credit course mechanism is used to import the problem-oriented interdisciplinary implementation stage show constituted by "creative thinking strategy" and "design aesthetics". In terms of its scale, 7 special courses, 10 teachers and at least 200 students are involved and it is supplemented by the operational model of series of micro-credit course, so as to give play to the efficiency of CDIO creative teaching model, change the traditional teaching method and course mechanism and intensify students' problem-solving ability and interest in autonomous learning.

## **KEYWORDS:**

**Creative teaching model, Active Learning, design aesthetics, interdisciplinary integration, Standard: 3. 8.**

## 1. INTRODUCTION

Since the transnational study of the MIT engineering education mode CDIO in 2000, the education reform concept of Conceive, Design, Implement and Operate (CDIO) has been constantly evolving. Taking the lifecycle from product development to operation as a carrier, it allows students to study engineering proactively, practically, and in an organic and interdisciplinary manner. The capabilities that CDIO aims to cultivate are divided into four areas of engineering fundamentals, personal skills, interpersonal team skills and engineering system capabilities, with the goal to break the traditional mode of subject-based learning to avoid the dilemma where students only learn knowledge but not able to apply. Through the concept of “hands-on inquiry based learning” to practice the curriculum objectives, it highlights the integrity of practical skills courses to encourage students to learn independently and strengthen self-learning ability, and eventually achieves the goal of learning and application.

This study, in the spirit and concept of CDIO, cultivates students’ ability of interdisciplinary collaboration and innovation through micro-credit curriculum module. Apart from the diversity of module choices, the most important concept of the micro-credit curriculum module is to divide the time of courses as 18 hours for 1 credit, 9 hours for 0.5 credit, and it even provides students with courses down to 0.1 credit or 0.2 credit. When the credits are accumulated beyond the prescribed range for the micro-credit hours (for a two-credit course, the accumulated credit must be 1.6 credits or above), students must plan their own integrated assignments and then, with the assistance from their teachers, publish the results, so as to offset with integral credits. The learning outcomes of this micro-credit curriculum must be consolidated systematically. For example, the course photos and films, extended reading materials, patents, competitions, and substantive results in entrepreneurship, creativity, industry-academia cooperation and other fields, together with their feedback and evaluation, are to enter the database for follow-up course and teaching resources analysis.

From the perspective of the relationship between school and students, college students show many dissatisfactions with the passive acceptance of the training objectives, models, contents and methods provided by the school and criticize the outdated and monotonous traditional training methods; in terms of students’ relationship with employers after their graduation, it is found that that the overall ability, development potential, self-awareness and employment expectations of graduates do not match the actual talent recruitment situation of the employers, which is also a worldwide problem. Under the circumstances of the development of information technology, the continuous expansion of knowledge areas, the increasing demand for learning, the technologies and knowledge development such as robots, 3D printing technology, the Internet of Things, intelligent life, etc., and the shorter lifecycle in the area of professional skills, it has become our subject and challenge to find a way to encourage students to learn independently, and provide an effective model for independent learning and interdisciplinary integration.

## 2. THE FORMING OF INTERDISCIPLINARY STAGE DRAMA

The traditional curriculum design of liberal education often arranges course for aesthetic literacy, and organizes different forms of art performances and art exhibitions, which is the usual model of our school. For example, in “Becoming an Artist”, the building aisles are transformed into art exhibition venue, where a variety of media art works are exhibited at the end of semester; the “Creative Study on the Art of Life” presents works of painting, photography and multi-media creation by students, and invites students to share the process of artistic creation and explanations of their works. “Dance: Performance and Reflection” takes place in a small-scale film exhibition to display film works combined with dance and media production. “European Stage Drama Performance” performs the classic drama *Le Nozze di Figaro* with the semi-open script that demonstrates students’ creativity. “Youth Together” and “Good Time” associate theaters tell the story of life through the theater performance, and “Good Time Gathering” also invites elders from the senior age college to join the performance. “Musical Practice” brings the popular classic musical such as *Jekyll and Hyde* and *Les Misérables* at the dedicated venue in the school. To enhance students’ aesthetic accomplishments and their ability of art appreciation, we also require them to attend at least 2-3 arts and cultural activities each semester, and relevant art stage is required to plan 25-30 concerts, art performances and film review discussions with directors each year, so as to enhance the students’ aesthetics, and with the promotion of these courses to improve the humanistic and aesthetics attainments absent in the industry and commerce disciplines(). However, the interdisciplinary integration has shown little effect.

Therefore, in the 2016 academic year, we introduced CDIO logic and the divergent thinking of “creative thinking strategy” and “design aesthetics” to begin planning for the “inter-school interdisciplinary musical life theater program”, mainly advocating life education-oriented performing arts, and taking life-care as the principal axis and stage performance as a platform, caring for the growth of each individual through theatrical practical experience. In terms of the concept of artistic aesthetics, apart from emphasizing the linkage of localized cultural and artistic features in Taiwan, a special focus was placed on the interdisciplinary integrated creative arts concept. Therefore, the liberal education center of Feng Chia University established a series of courses related to professional performing arts (Table 1), in which students were able to choose to accumulate credits through elective courses, or through the method of micro-credit to strengthen their capacity required by large-scale stage play. Meanwhile, we also combined the curriculum of the operation, management and design of the culture and arts in the creative industry, which not only fitted the future trend of arts and creative industries, but also integrated the multi-element art forms mentioned above in the interdisciplinary practice, so as to build the innovative teaching model for the construction of the future arts and creative industries. This curriculum consists of seven specialized courses, 10 teachers and at least 200 students. We also supplement the operation model of the micro-credit curriculum, to take advantage with the efficiency of CDIO innovative teaching mode, so as to change the traditional teaching methods and curriculum mechanism, and strengthen students’ problem-solving ability and interest in self-learning. All findings on the curriculum survey are above 4.0 (Appendix 1).

Table 1: Inter-school interdisciplinary musical courses

| Course title                      | Number of lessons | Course outline  |
|-----------------------------------|-------------------|---|
| Musical Practical Performance (2) | 08-09             | Solo, chorus and dance training   |
| “Good Time” Associate Theater (2) | 03-04             | Actor training  |
| Performance and Theater           | 11-12             | Performance capability training, rehearsal play<br>(Selected actors and singers are required to take this lesson) |
| Theater Practice (2)              | 08-09             | Stage, sound and light training   |
| Becoming an Artist (2)            | 06-07             | Prop production   |
| Art and Design Special Topics     | 08-09             | Clothing design and makeup  |
| Introduction on Show Design       | 11-12             | Curatorial planning, theater management   |

(2) : Advanced Course

At the same time, all the courses were integrated to conduct the “Character Selection Concert for Feng Chia University Musical Life Theater”, to encourage students from different fields or other backgrounds to participate, implement the art education philosophy of lifestyle arts and artistic life through the integrated art performance, and to cultivate creative and innovative talents in the future society through the promotion of art performance. In order to successfully carry out the “inter-school interdisciplinary musical life theater program”, we have assisted with the scriptwriting of “Awakening Heaven”, and collaborated with Department of Ethnomusicology, Nanhua University in songwriting of 10 pieces with lyrics and melodies, which were performed by the college students in the school. A grand school-wide open character selection concert was also conducted. In addition, a variety of experiments on art performing education and micro-credit courses such as limb development were offered in school, with the hope to develop students’ individual creativity through performing arts and to encourage all students in school to participate in performing activities, so as to effectively enhance horizontal links among different disciplines. In the process, the school also organized the “Character Selection Concert”, and a large-scale public performing of “inter-school interdisciplinary musical life theater” after the completion of the courses.

### 3. THE CONCEPT AND PRINCIPLE OF MICRO-CREDIT CURRICULUM

Kuo (2011) argues that the liberal education center in the past might lack the power to integrate teaching and research, as well as the connections with various disciplines. However, the liberal education center is a regular institution with regular teachers and personnel who can accumulate experience and inheritance. Feng Chia University, in order to strengthen students’ development of interdisciplinary integration ability, its liberal education center has also planned various courses and conducted study through team interaction. However, due to the relatively inflexible existing education system, students may also be rather passive. Although provided many choices, they are still not able to achieve the interdisciplinary learning effectiveness within the framework of the old education system. In order to enable students to have more choices and to provide rich and diversified courses to facilitate the achievement of autonomous learning objectives, in terms

of curriculum innovation and reform, the school is rendering students more flexible mechanisms to guide students to self-measure and challenge autonomous learning so as to enhance their interest and effectiveness in learning. This innovative teaching model is a micro-credit curriculum, with which we hope to help students find problems, intrigue their thinking capability and apply in actual situation, and make problem solving become a norm and a habit. In addition to obtaining the basic professional abilities, we also encourage the study of special subjects and the learning of teamwork, such as innovation, communication, teamwork, self-management, and problem solving, which are interpersonal and will become the most competitive new value in the future workplace (Alex & Greg, 2015). As a result, the concept and principle of our micro-credit curriculum are also moving toward challenging interdisciplinary learning goals and autonomous learning.

#### (1) Interdisciplinary learning effectiveness

Currently, academia and industries attach great importance to interdisciplinary talents, expecting students or employees to have more than two kinds of background knowledge and professional capabilities, as well as the ability to break through self-boundaries, which is a result of the development of science and technology and the increasingly complex working environment. The nature of work no longer depends on the work of the single employee but rather the integration of each person's expertise and specialty. Therefore, the strength of the team plays an important role, and the enterprise organization requires the innovative model combined with different teams to work efficiently (Anderson et al., 2004). We expect students to simulate the operation methods in the industry and, during team discussions, to share information, discuss and solve problems together, and find knowledge innovative plan and teamwork atmosphere throughout discussion. Currently, in promoting interdisciplinary learning, we encourage students to think outside the box and cultivate their own independent thinking and critical ability, and most importantly, to enable each independent sector to go beyond the interdisciplinary limitations and boundaries, cooperate with each other to provide multiple information and communication, and create more diversified flexibility and learning reciprocity (Phalaunnaphat, 2015).

Chatenier et al. (2010) argues that different professional backgrounds and knowledge can lead to differences in perceptions, and the interdisciplinary learning obstacles also come from the differences in students' cognition which define the different preferences for communication channels or different thinking methods of team members, and will form communication barriers through friction. But the trait of extensive learning remains the common feature of interdisciplinary learners, and if learning through positive attitude, it will result in great learning effective. In addition, by taking examples from the animation film industry, Tsao (2015) explores the effectiveness brought by the innovative operation of an interdisciplinary design team, and apart from analyzing that product design must rely on the innovation of overall business model to enhance the competitiveness of enterprises, it is also found that more and more success cases show that product operation innovation must include interdisciplinary design talents so as to take advantage of interdisciplinary integration effectiveness. In probing into the factors that affect students in science and technology universities in pursuing credits of interdisciplinary elective courses, Huang (2014) finds that students are taking interdisciplinary elective courses out of personal interest, and that they hope teachers of these courses have the expertise in the field to stimulate their interest in learning.

## (2) Challenge autonomous learning

Autonomous learning itself is an independent cognitive style, an ability to enable students to apply what they learn, integrate the theory and skills students have learned, exert their imagination and creativity, and transform their knowledge into key competencies to deal with the challenges in life and work (Li, 2003). On another note, while self-learning has drawn much attention recently, how to maximize the learning effectiveness through the learning activities related to the integration of school resources is another important topic. Wang (2015) argues that, when learning no longer serves the specific purpose of learning, but rather begins to “question”, “reflect critically” and “transform”, such learning becomes an attitude which will continue to become a self-conscious learner. By using the contract learning method to improve the autonomous learning tendency of elementary schoolchildren, Huang (2014) finds that contract learning allows students to, before attending middle school, master the learning theme and connotation, review the learning content, understand their own efforts are required in the process, at the same time inspire students’ sense of responsibility to take initiatives to solve problems and seek learning resources, enable students to learn more about their own interests through study while gaining a sense of accomplishment, and become confident and able to continue learning for life. Khaled (2016), based on nursing education, analyzes the autonomous learning attitude of 142 students from Department of Nursing and Emergency Medical Services, and finds that the self-positive attitude is conducive to the development of learning, and that students’ perception of the learning environment does determine self-directed learning and academic performance, encouraging students to learn independently so as to improve their academic performance. Therefore, systematic planning can be beneficial in enhancing students’ willingness of autonomous learning, which will also be adopted in the adjustment of the liberal education micro-credit curriculum in order to strengthen students’ autonomous learning in a more systematic way.

Therefore, in addition to encouraging students to pursue interdisciplinary learning in the creative design process of micro-credits, we are actively motivating students to conduct their own study, and conducting prudent appraisals of teaching staff and their expertise, and hope to effectively design micro-credit curriculum. Meanwhile, it is clarified that in the implementation of micro-credit curriculum, the following (1) the introduction of theory and knowledge systems; (2) practical case sharing and empirical analysis; (3) practical work (group or individual operations); (4) report or publication; (5) lecturer comment and score (pass/fail), and other principles should be adopted to eliminate the possibility where presentations or activities can replace the method of micro-credit interdisciplinary integration.

## **4. INNOVATION MICRO-CREDIT CURRICULUM OPERATION**

In order to improve students’ independent study, team work and the unity of learning and application, the curriculum is divided into micro-credit program, lectures (activities), experiments (internships and visits), distance education (online teaching), practice camp, workshops or related activities, in which micro-credit application module is executed as 18 hours of practical work equals to 1 credit. In studying the micro-credit curriculum, when the credits are accumulated

beyond 1.6 credits, students must plan their own integrated assignments and then, with the assistance from their teachers, publish the results, so as to offset with 2 credits (as shown in Appendix 2). On the school-wide interdisciplinary study day (every Monday and Friday), all core courses will be excluded and the school will mainly provide courses of school-wide interdisciplinary integrated study or activities to offer more micro-credit courses.

In addition to the inter-school interdisciplinary musical courses, we also arrange the commonly required micro-credit courses, for example, cosmetic courses that will be required for all courses and final rehearsals, such as Skin Care, Modeling Aesthetics - Drama Makeup, Modeling Aesthetics - Special Makeup; “Creating Art - Out of Box” course designed for the props production, stage planning and design so that students will understand the basic principles and methods of installation art, and every student will be able to discover creative materials from everyday life, understand the material characteristics and perform art creation. The focus of the course is placed at helping students develop their imagination and using their own unique artistic expressions to enhance their aesthetic experience; the course of “Installation Art Creation” focuses on using the paper art of folding or stacking to fold out paper in various specific shapes and patterns; “Linear Torsion” is guide students to learn how to solidify the plane lines, and by the observation of the natural shape of the organic body, to transform it into a three-dimensional modeling. The course of “Showcase Dresser” is to practice the showcase display through thematic planning and aesthetic decoration design, demonstrating the visual aesthetics of the brand and space, highlighting the visual information transmitted, and thereby enhances students’ ability in props production and stage planning. The following table displays the courses of micro-credit curriculum.

Table 2 Courses and credits of micro-credit curriculum

|  |  |  |
|--|--|--|
| Skin Care<br>(0.4 credit)  | Modeling Aesthetics - Drama Makeup<br>(0.4 credit) | Folding out Wonders<br>(0.2 credit * 4 times = 0.8 credit) |
| Modeling Aesthetics - Special Makeup<br>(0.2 credit)             | Micro-credit Curriculum                            | Linear Torsion<br>(0.4 credit)                             |
| Creating Art - Out of Box<br>(0.2 credit * 4 times = 0.8 credit) | Creative Arts<br>(0.2 credit)                      | Showcase Dresser<br>(0.2 credit)                           |

At the same time, in order to better understand students’ learning satisfaction, we collected information through questionnaires. For example, while all students from inter-school interdisciplinary musical courses can take these courses, the students in charge of props will almost all choose “Linear Torsion” to learn how to construct a three-dimensional figure through plane lines and transform the knowledge into props production. All participating students voted in the aspects of course content design, teaching quality and self-learning. The results show that the satisfaction degree of course content design is over 83%; the teaching methods and content are also positively supported with the number over 87%, in terms of the students’ self-learning attitude, it is considered that it will deepen students’ existing knowledge and help them with interdisciplinary study or even team work, thus the satisfaction also reaches 87%. Such

satisfaction is the result of students' choice on courses as, relatively speaking, their own will, based on their own needs, rather than compulsory requirements. Students will choose inter-school interdisciplinary musical course if they are taking part in yet thinking they are still insufficient for it.

In other courses (Table3): Skin Care (>88.8%), Modeling Aesthetics - Drama Makeup (>87.5%), Folding out Wonders (>72%), Modeling Aesthetics - Special Makeup (>91.7%), Creating Art - Out of Box (>77.5%), Creative Arts (>70.0%) and Showcase Dresser (>95%), results all show that the students' satisfaction of micro-credit courses is high, in terms of course content design, teacher's effective guidance in practical works, and the students' positive recognition of self-study, all of which are highly supported by students because of the specific purpose, skills offered and self-selectivity.

Table 3 Micro-credit curriculum satisfaction - Linear Torsion

| Item                              | Content of questionnaire   | 1 | 2 | 3   | 4   | 5   | Total |
|-----------------------------------|--|---|---|-----|-----|-----|-------|
| A.<br>Course<br>content<br>design | 1. The course content design is clear.   | 0 | 0 | 3%  | 26% | 61% | 87%   |
|                                   | 2.Learning hour arrangement of the micro-credit courses.                               | 0 | 0 | 17% | 44% | 39% | 83%   |
|                                   | 3.Course content is tailored to individual needs.                                      | 0 | 0 | 17% | 44% | 39% | 83%   |
| B.<br>Teaching<br>quality         | 1.Overall teaching methods and content.  | 0 | 0 | 9%  | 39% | 52% | 91%   |
|                                   | 2.Interaction with students.   | 0 | 0 | 4%  | 39% | 57% | 96%   |
|                                   | 3.Clear expression, easy to understand with case studies.                              | 0 | 0 | 13% | 39% | 48% | 87%   |
| C.<br>Self-<br>learning           | 1.Intuitive to enhancing the existing knowledge and interdisciplinary study.           | 0 | 0 | 4%  | 48% | 48% | 96%   |
|                                   | 2.Helpful to the professional growth.  | 0 | 0 | 0   | 57% | 43% | 100%  |
|                                   | 3.Substantial achievement of my learning of team work through discussions or practice. | 0 | 0 | 13% | 48% | 39% | 87%   |

Description: (1) 1 Strongly disagree; 2 Disagree; 3 Fair; 4 Agree; 5 Strongly agree  
 (2) Total percentage is the result of 4+5, representing the degree of consent.

## 5. CONCLUSION

Under the traditional learning environment, students tend to be passive and choose whichever courses that school offers in order for smooth graduation, leaving themselves no opportunities for challenges. As long as they can obtain credits to graduate, the learning methods hold not much importance to students. It is also because of this logic that we are not able to cultivate students who are capable of problem solving and critical thinking (Chou, 2012). While we try to change the learning environment so that students can lead the entire learning process, teachers, at the same time, must also change the traditional teaching methods. In addition to stimulating students' interest, teachers should reverse the traditional education methods so as to substantially enhance the learning effectiveness. Therefore, through the integrated "inter-school interdisciplinary musical life theater program", we are to systematically cultivate students' individual professional ability and teamwork ability, and guide teachers to work independently in course design but to cooperate in the public performance. The courses of inter-school interdisciplinary are all regular

credited courses. In addition, in order to improve students' learning initiatives, they are asked to select courses based on their own demand while each teacher will assign various tasks to different groups, including performance, makeup, prop, stage design, etc., allowing students to think and solve problems according to their own needs and choose applicable courses to strengthen their own abilities.

This study is the first to adopt CDIO, and based on the previous case studies, it attempts to guide students to practice and demonstrate what they have learned through the stage show, in which it reveals that when students are willing to take the initiative to learn, the learning effectiveness will extend and expand, and that it remains a critical task for the current course designers to intrigue learning interest through providing interesting micro-credit curriculum. Especially, affected by the cramming education in Taiwan, our students are often receiving courses and related arrangements passively, most of whom not able to measure their own demand or not enthusiastic about it. In the future, we expect students to have the cognition and willingness to take the initiative in learning, hence the micro-credit curriculum must provide more diversified courses so that students are willing to take the initiative to learn more with bigger scope of breadth and depth in self-learning, in which way their learning outcomes will be more diverse and multi-leveled.

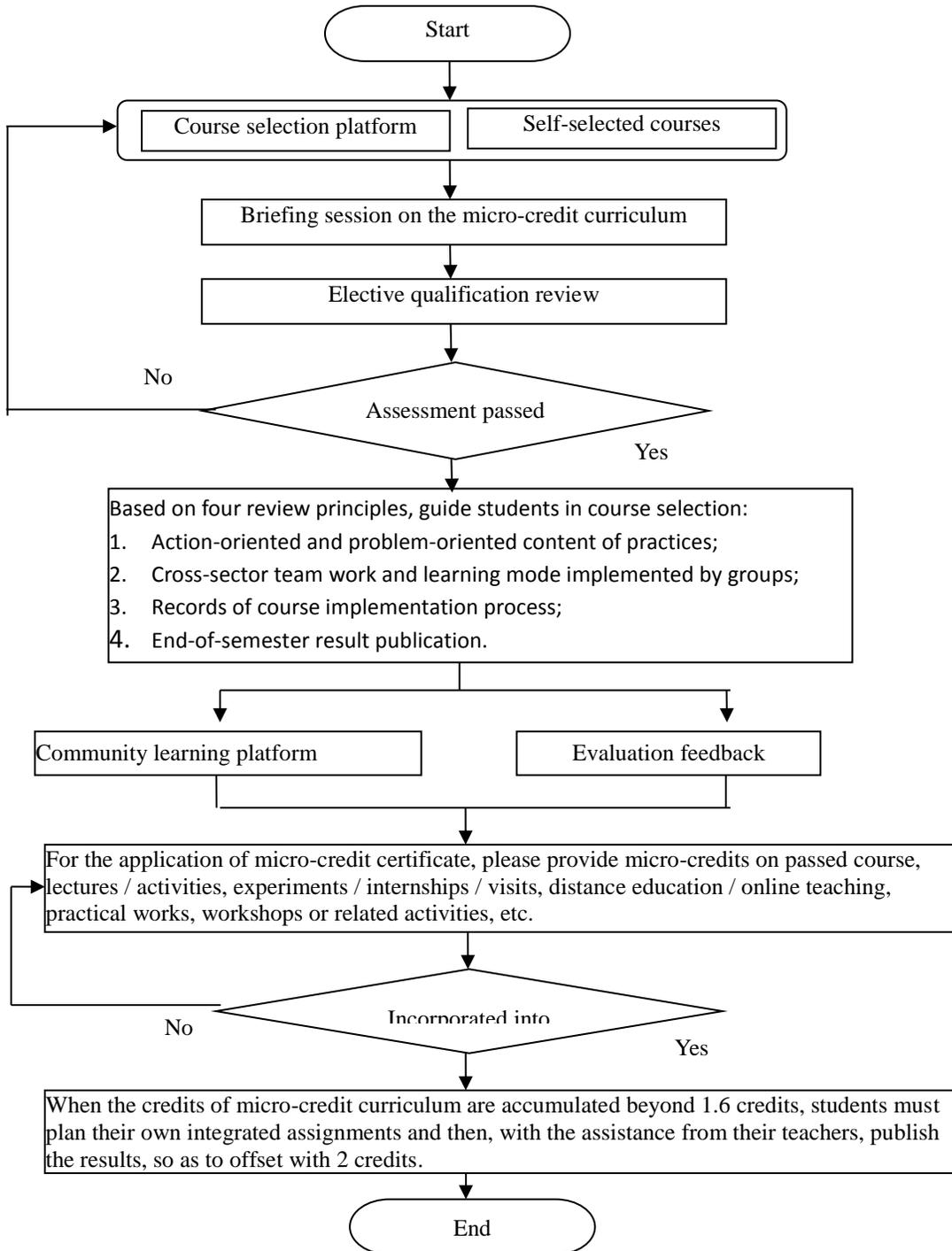
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### **Appendix1:Course Questionnaire Items**

1. The textbook content of this course is appropriate.
2. The contents of this course meet the teaching objectives.
3. The teacher is fully prepared.
4. The teacher is concerned about the learning of students.
5. The teacher is not late, leaving early or absent from class for no reason.
6. The teacher has explained the teaching objectives, progress, methods and performance assessment, etc. of this course.
7. The teacher's expressions and explanations are articulate and organized.
8. The teacher's teaching methods are flexibly adjusted to help enhance the learning effectiveness.
9. The teacher gives feedback on the homework and exam results to students to help with their study.
10. The performance assessment of this course is objective and impartial.
11. The assessment methods and the credit proportion of this course are able to measure my learning outcomes.
12. If given a chance, I am willing to attend other courses offered by this teacher.
13. The teacher of this course teaches well.
14. Overall, I have accomplished a lot from this course (e.g. expertise, skills, attitudes or values, etc.).

## Appendix 2: Implementation Process Diagram of the Micro-Credit Independent Learning Curriculum



## **BIOGRAPHICAL INFORMATION**

**Shuhui Chen**, Ph. D. is an Assistant Professor in the Center for General Education at Feng Chia University. She is also the Secretary of the Center for General Education. She is a planning participant in the general education curriculum. Her current research focuses on the micro courses and on curriculum development of general education.

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