

CDIO Initiative on Student Engagement by Effective Syncretic (Lectures – seminars)

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Abstract: New trends such as globalization, knowledge economy, and information technology revolution have become essential factors affecting the development of universities in the new era. These trends have had a profound impact on the survival and growth of universities. First, universities need to shoulder the knowledge creation work in many fields related to human survival and development in the era of the knowledge economy. Secondly, they must adapt to the influence of the technological revolution on human knowledge acquisition methods and change traditions. I will further explore the new requirements for talents in the new era and adjust our talent training concepts, values and models. How universities respond to challenges through operational changes and explore new models of higher education in line with social development in the new era is a topic that universities worldwide need to think about. The study aims to create an effective model to improve the interaction between the lectures and seminars objectives and activities based on CDIO standards 3 and 8. The integrated curriculum and active learning are crucial for improving future students' engineers' skills. Consequently, students will participate efficiently in the learning process. The study will focus on the concept of a "student-centered" learning environment based on the active learning model by using the research to create a compelling student engagement in the learning process. The positioning, goals, and learning model of the work promotes the improvement of the student's engagement and learning mode in this context, pays attention to the course-student interaction in the process, stimulates students' learning initiative, and promotes the teaching reform of participating colleges. The study aims to Increase the students' work and outcome towards creative results.

Keywords: Students' engagement, Educational resources, Course ILOs, Learning environment, CDIO standards

Introduction

The term "globalization" has become popular in the past ten to twenty years and has become a hot topic in the academic world (Bakhtiari, S., & Shajar, H. (2006)). The idea of a public knowledge space is the foundation of UNESCO and its administrative regulations, but people have not entirely accepted it. UNESCO aims to ensure that all countries have access to the best educational facilities necessary to prepare young people to play a full role in modern society and to contribute to wealth creation (Anderson, J. (Ed.), van Weert, T. (Ed.), & Duchâteau, C. (2002). However, the era we live in is an era of turbulence. Some people even do not hesitate to think that we are going through the third industrial revolution, a new technological process in information and communication, accompanied by changes in the knowledge system. Educational technology implies the disciplined use of knowledge to improve learning, teaching, and performance (Brahm Prakash Dahiya, Balkar Singh, 2021). Global trends in modern education are one of the central system-forming institutions of society that implements a wide range of socially significant functions and is influenced by ongoing social transformations. Education must take the initiative to integrate into the information society and realize education fairness. From a technical perspective, technological development will bring about changes in teaching tools, learning tools, test evaluation tools, and changes in the shape and structure of the classroom. Learner-centered teachers do not employ a single teaching method. This approach emphasizes a variety of different types of methods that shifts the role of the teachers from givers of information to facilitators in student learning (Endang Darsih, 2018). The boundary between universities and enterprises will be further broken, and the university's lifelong learning and innovation. The function will be further highlighted (Oya Tamtekin Aydin, 2014). The impact of technology on educational forms covers concepts, mechanisms, infrastructure, learning activities, and open and integrated ecology. The future-oriented educational reform always adheres to the learner-centered approach, follows the law of academic growth, reconstructs the process, mechanism, and model of talent training explores new forms of school and helps modernize the school's governance system and governance capabilities (Necmi Aksit, 2007). To cultivate application-oriented and skilled talents in the mass education stage, it is necessary to comprehensively develop students' hands-on, design and innovation abilities through strengthening experimental teaching. CDIO (conceive, design, implement, operate, conception, design, implementation, operation) engineering education concept advocates "learning by doing" and "project-based learning".

Students in professional programs must practice what they have learned in the classroom. In many cases, students ask to find an objective connection between the theoretical part of the course and the practical materials, where the students work, where the output depends on a deep understanding of the course materials, aims ILOs, and the skills required (Lokanath Mishra Tushar Gupta Abha Shree, 2020). In courses evaluation, we can find several students' comments regarding the inadequate connection between the theory and the practices, between the lectures and the seminar. Others say that the lecture does not support the seminar activities. Consequently, a negative interaction between the lecture and the seminar activities can create a paradox in the learning process and negatively affect the students' outcomes. In this case, we limit the students' creativity. That will contradict the CDIO standards (3,8) proposal regarding students' development skills.

The study aims to present a multifaced reading of the students' dilemma regarding the interaction between the lectures and seminars' objectives and activities. The study will focus on the concept of a "student-centered" learning environment based on the active learning model by using the research to create effective student engagement in the learning process.

Learning Models Challenges and "CDIO" Standards (3,8)

To drive the change of learning models, we need always to consider whether learners are the center, whether it is beneficial to strengthen learners' autonomy, interaction, and innovation, firmly grasp the motivation and drive learners to learn independently, emphasize different learning methods, etc. (Serdyukov, P. (2017)). Basic principles such as value. The new scientific and technological revolution requires the creation, transformation, and dissemination of knowledge to be gathered in the same process and provides technical conditions for the unification of innovation scenarios. (Zou L, Zhu Y-W (2021)). The CDIO engineering education model is the latest achievement of international engineering education reforms in recent years. Since 2000, the Royal Swedish Institute of Technology has received huge funding.

The CDIO standards define special requirements for CDIO programs, which can act as a guide for reforming and evaluating educational programs in engineering and technology, creating conditions for their continuous improvement and integration into the global educational space. The CDIO Initiative adopted 12 standards for describing CDIO programs. These principles were developed in response to requests from program managers, alumni, and industry partners who " needed specific criteria for CDIO programs and their graduates. In modern education, more and more attention is paid to the so-called "soft skills" of speaking publicly, working in a team, etc. One of the areas of modernization is the CDIO initiative. Personal and interpersonal skills and product, process, and system-building skills depend on the context they are taught and used. Personal and interpersonal skills in engineering research design courses, such as teamwork and communication, are often generic skills.

According to CDIO standard 3, the research design course mutually supports explicit connections among related content and learning outcomes (Collins, C. S., & Stockton, C. M. (2018)). The research design course guide plan identifies ways to integrate personal and interpersonal skills, and product, process, and system building skills with multidisciplinary connections are to be made. It is essential to recognize that an integrated curriculum requires a dynamic and meaningful integration throughout the curriculum. According to the recommendations of CDIO standard 8, active learning methods are included in the curriculum according to the requirements of the Swedish university. The main question is, how do active learning and experiential learning methods promote professional goals in the CDIO environment, where standard 8 debates the role of active learning methods related to student engagement directly in thinking and problem-solving activities(<http://www.cdio.org>). As a result, CDIO standards have defined specific requirements for CDIO programs that can guide the reform and evaluation of educational programs, create conditions for benchmarking and set goals in an international context, and serve as a starting point for continuous improvement. The teaching model of active learning has apparent advantages in cultivating

students' creative thinking, critical thinking, and collaboration ability (Asefi, Maziar, and Elnaz Imani (2018)). To learn has a goal, change passive acceptance into active learning, change straightforward narration into the joint discussion, and change after-class homework into in-class testing, which provides an effective way to implement quality education. (Alanah Mitchell, Stacie Petter, Al Harris, 2017).

The Method and Material

Teacher Role and Students' "Enthusiasm" in Active Learning and Engagement

Students are characterized as passive learners during lectures when they sit behind screens and desks, listening, jotting down notes, and where necessary giving brief answers to questions asked by the teacher or completing assignments, tests, and examinations, making them passive learners (Fapohunda Funmilayo Diepreye and Jonathan Adedayo Odukoya, 2019). Students need to come well equipped for future professional life, which requires that they be able to connect different subject areas, be skilled creative problem solvers, and find methods to absorb new knowledge (L. Brunzell och M. Ståh 2021). The teacher needs to activate the student by using active learning concepts in lectures and seminars. The teacher-student relationship and interactions can be classified in active and passive form as shown in Figure 1. That will directly affect the student's learning attitude and enthusiasm. When the teacher-student relationship is harmonious, and the students feel that the teacher likes him and appreciates him, they will learn very vigorously (Almusaed, A., Almssad, A. (2020). On the contrary, they will have rebellious psychology and oppositional emotions. The teacher must take the initiative to approach the students, understand their interests and hobbies, grasp the students' ideological trends, and conduct unfettered exchanges with the students equally. After clarifying the students' difficulties and perplexities in the study, life, employment, and even emotions, take practical actions to give them effective help and establish a trusting relationship. The teacher needs to help students to develop critical thinking skills (Tracy Douglas, 2019).

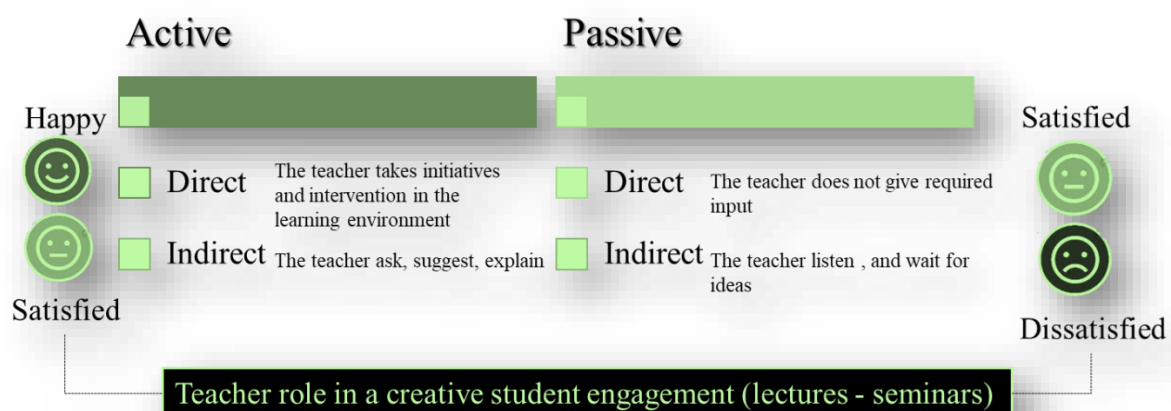


Figure 1. The Relation between Teacher Role, Course Activities, and Learning Satisfaction

Students and teachers in twenty-first-century academic in science, technology, engineering, and mathematics (STEM) classrooms face significant challenges in preparing for academic education and career (Keiler, L.S.

(2018)). The role of teachers is the focus of colleges and universities. All requirements must be clearly stated when students meet for the first time in class, and when talking about it, try to be as artistic as possible and use methods acceptable to students (Hew, K.F., Jia, C., Gonda, D.E. et al. (2020)). The role positioning, connotation, and extension of university teachers are constantly changing with the changes in the times the modern education system teachers have experienced changes in their roles to be the leader of contemporary social thought change, and then to the role of knowledge innovator in modern society integrating education, research, and social services. At present, to promote the transformation of the role of university teachers and adapt to the changes and development of the times, it is necessary to further improve the relevant policies of the construction of the teaching staff of universities; establish a scientific and reasonable incentive and evaluation system; appropriately adjust the role of teachers according to the requirements of social development; handle teaching, scientific research and serving the society, etc (Lenkauskaitė, Jurgita, Remigijus Bubnys, Erika Masiliauskienė, and Daiva Malinauskienė. 2021). The teacher needs to remember the names and personality characteristics of the students and pay close attention to their every advantage and every progress (Almusaed, A., Almssad, A., & Cortez, M. R. (2021) (see Figure 2). When students hear the teacher call her name, they will have a sense of closeness, and it is easier to feel the teacher's attention and appreciation. As for those students who love to violate discipline, once they find that you remember his name, he will have some scruples and will not dare to break the field arbitrarily.

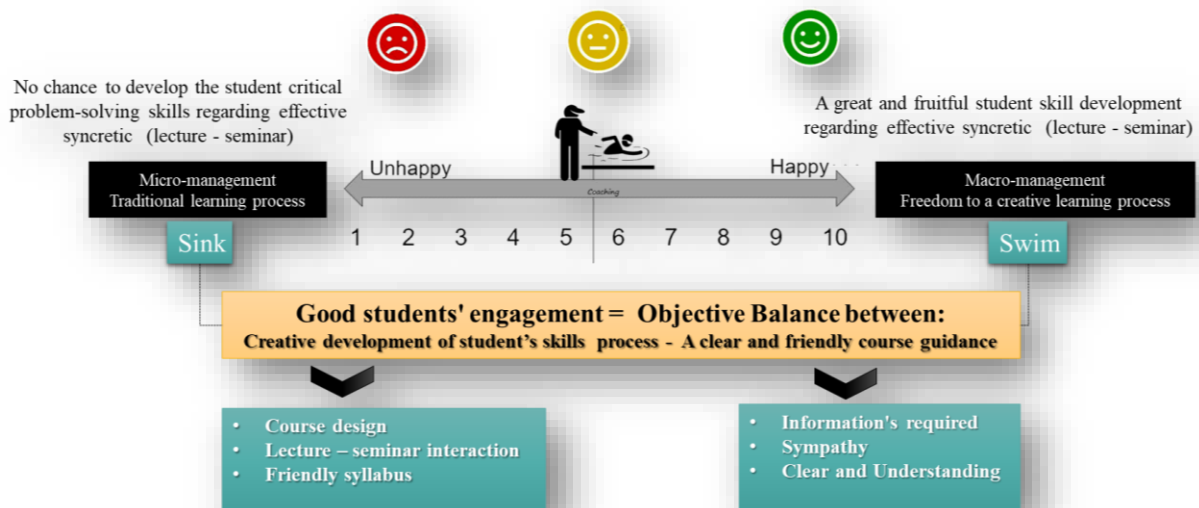


Figure 2. The Teacher Steering Process in Active Learning

Teachers' Activities between Active Learning and Learning Outcomes

Consolidating the Concept of Active Learning and Professional Needs by a Clear Learning Goal

Many students are not interested in learning; a big reason is that they think that what they have learned will not be helpful to society. Therefore, to mobilize students' enthusiasm in education, we must start with the needs of students. Consequently, I pay much attention to the connection between the teaching content and their actual lives (Filgona, J., Sakiyo, J., Gwany, D. M., & Okoronka, A. U. (2020)). When students realize the significance of this

knowledge for their future work and life, they will be motivated to learn, and then promote the students to follow the teacher's rhythm consciously and actively, and actively acquire knowledge.

Professional Project of the Course Design, Students can successfully Experience in Learning

Everyone has the need to be recognized and appreciated. This is true for students with good academic performance, even more so for students with poor performance. They usually receive less attention and appreciation. If the teacher can praise them, their learning enthusiasm will be higher. Therefore, in classroom teaching, I pay much attention to the design of classroom questions. As a result, most students can participate in discussions and interactions (Gasell, C., Lowenthal, P.R., Uribe-Flórez, L.J. et al., 2021).

Activation the Role of Group Teaching in Mobilizing Students' Enthusiasm.

Teachers need to use the group teaching method by application of "PBL" model, by mobilizing students' learning enthusiasm (Li, L., et al. (2021)). It can be created by combining a good foundation with a poor foundation and combining students with different personalities and abilities, to avoid excessive disparity in strength between groups because this requires the teacher's level, ability, and personality characteristics of the students. That will have a good effect on stimulating the enthusiasm of the student team for learning, triggering the students to discuss the atmosphere independently, and improving the teaching effect.

Activate Feeling of Teachers' "Sense of Accomplishment."

Many hours of lectures and seminars weekly bring teachers physical and mental fatigue, far from being in class. Teachers give lessons with witty words, cheers in the room, and a warm atmosphere (Dernowska, U. (2017)). But turning around to look at the reality, it's strange not to be disappointed or frustrated. Looking at every small progress in the class, the teacher will have a slight sense of accomplishment and this sense of accomplishment. It will become a kind of confidence and motivation to push yourself to continue working in this direction and find ways to get more students to participate in classroom learning. And over time, small progress accumulates into significant improvement. Comparing the state of the initial class, teachers will find that we are one step closer to the highest goal unknowingly.

The Lecture and Seminar - Conflict and Harmony (Overview Reading)

Students have difficulties understanding the differences and the goals and objectives between lectures and seminars from time to time. Therefore, it makes sense to talk about the features of various forms of education briefly. Learning in higher education can be very different from previous learning experiences. While at college, the information imparted in classes is often geared towards passing exams (Ruth Doughty, Deborah Shaw, 2008). A lecture is a teacher's monologue accompanied by slides or a visual presentation on a whiteboard. In this case,

the main task of the listeners is to receive and memorize new information. The overall goal is to convey information or teach participants about a specific topic. For example, a university or university faculty teaches courses in a particular case. The lecturer will usually introduce the history, background, and other important information of any subject or topic being discussed. A seminar is a thoughtful and prepared dialogue on a given topic. (Robert J. Nash Kathleen Manning Kathleen Manning, 1996). Seminars are held to review and consolidate familiar material (see Table 1). At the seminar, the teacher discusses the most pressing issues under discussion, focuses on the subtleties and nuances, and explains problematic points. Students consolidate the information received earlier (during a lecture or practical activity) and get an idea of applying knowledge in practice. For the same reason, most universities today focus on practical alternative teaching methods for most of the courses they offer. Some people criticized it because it is a one-way communication method that does not involve many audiences' participation but focuses on passive learning.

Table 1. Lectures and Seminar Interaction and Differences

<i>Criteria's</i>	<i>Description</i>
<i>Durations</i>	<i>Compared with seminars of short duration, the length of lectures is very large</i>
<i>interactivity</i>	<i>Compared with lectures, seminars are more interactive. Lectures involve formal discussions, while seminars mainly involve informal talks, but adequately.</i>
<i>The plan</i>	<i>Lectures are the main content of any study plan, but seminars are optional.</i>
<i>Cognition</i>	<i>Lectures provide a better way to cover and understand information, while seminars are designed to allow participants to develop their skills and knowledge.</i>
<i>Rolls</i>	<i>In lectures, the teacher presides over the course, but in seminars, he or she guides the participants.</i>
<i>Working model</i>	<i>Lectures use theoretical methods, while seminars use professional and practical techniques. The purpose of lectures is only to introduce and analyze information, while the purpose of seminars is to emphasize discussion and interaction.</i>
<i>Working area</i>	<i>Lectures focus on a single idea or topic, but more thoughts and ideas are being discussed in the seminar.</i>
<i>Presentation form</i>	<i>the lecture, the lecturer's thoughts, and opinions are introduced in presentations and lectures. However, in the seminar, these contents are presented in interactive tools, visual materials, and presentations.</i>

Unlike seminars, lectures, presentation meetings, or any other learning methods, every participant participates in the ongoing discussion in workshops (see Figure 3).

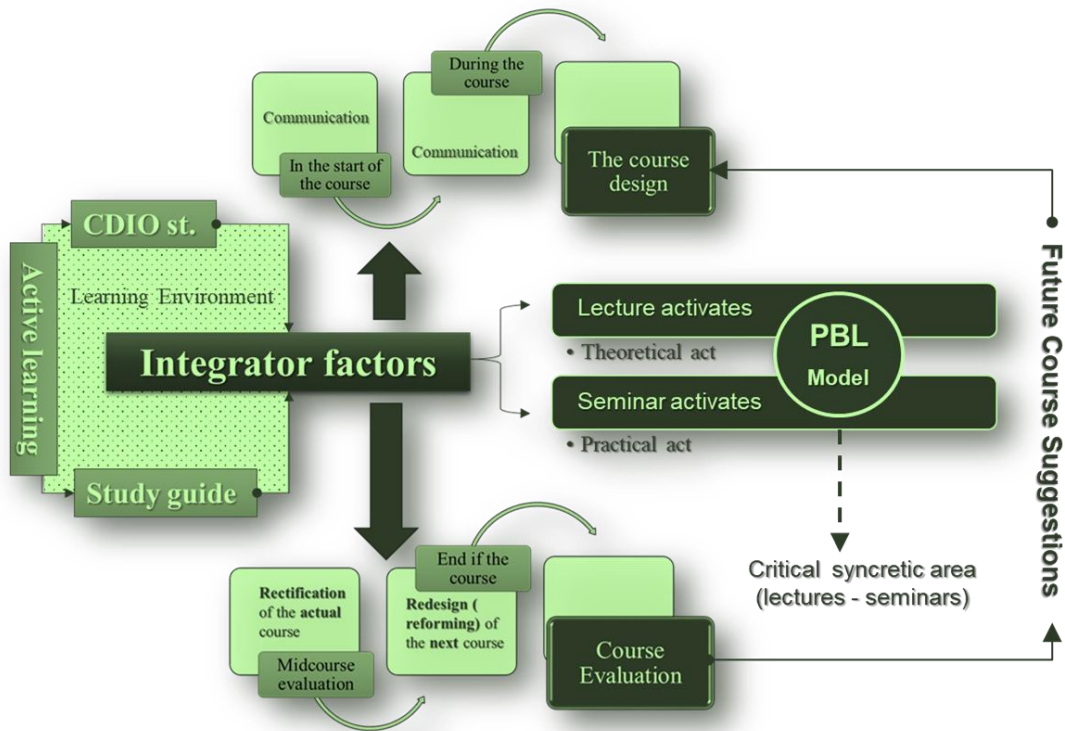


Figure 3. The Course Cycle Life and Learning Environment

Project-Based Learning (PBL) - The Research Design Course (Case Study)

The course description

The course gives students a tool and experience for the degree project, but to make a thorough and systematic analysis based on a well-defined problem is a skill that you benefit from in many professions.

The Course ILOs

INTENDED LEARNING OUTCOMES

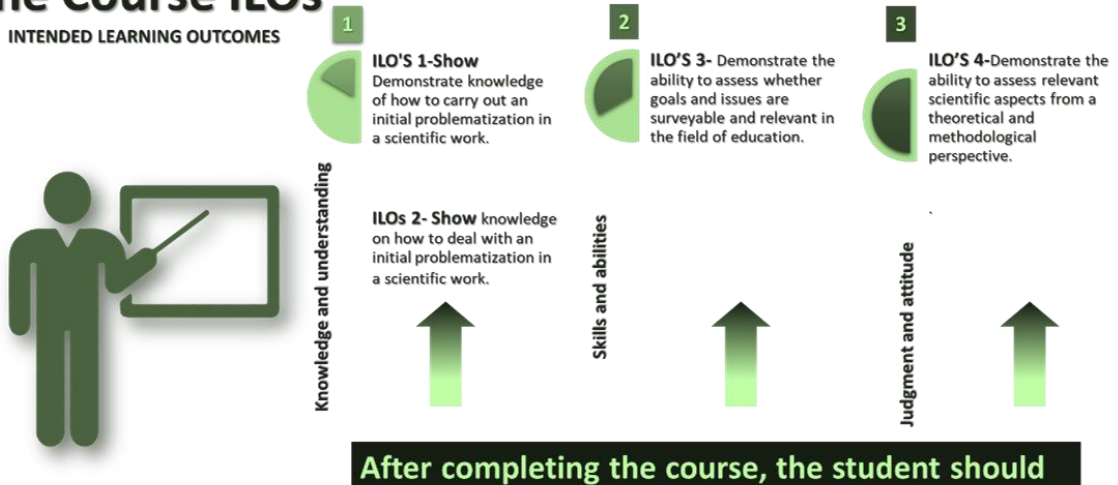


Figure 4. The Course Guide and Intended Learning Objectives

As a common thread throughout the course, there are three critical elements in scientific work methods and investigative work:

- Identification of substance, problem formulation
- Method and implementation
- Information retrieval, theoretical framework

These elements are dealt with in detail during the course, theoretically in lectures and more practice during the seminar where the student's active learning is at the center. Project-Based Learning (PBL) is also called inquiry-based learning (David S., Sharon F., 2013). It is a systematic teaching method, exploring complex and real problems, meticulously designing project works, planning, and implementing project tasks. Although PBL has various models and techniques, the research design at the Swedish university takes the initiative to establish the relation between course lecture and seminar based on the PBL model and course ILO'S (intend learning outcome) (see Figure 4).

The Course Activities and Process

Students become objective researchers. Students have to use various resources to find answers and methods to solve their research problems based on two phases as follows:

- Phase I: Knowledge-based lecture. Rich projects examples support it from lectures
- Phase II : Creativity-based seminar. It is supported by active communications and synchronized with the consensual approach

The seminar will take three steps as follows:

Before the Seminar Start

The students work at home to create their research thesis proposal, based on objective reading on the practical manner in solving research Dilemma and challenged problems related a wishing objective research topic based on a previous lecture treated the research title and problem statement, and research questions, which was full of practical projects (bad situations VS good examples).

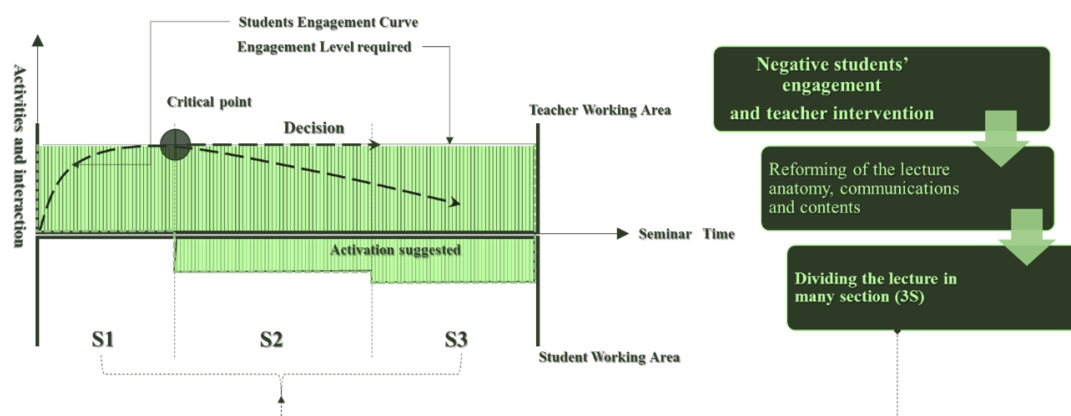


Figure 5. The Students' Activities and Engagement in Lecture and Seminar

Learning in real projects, students' initiative will be inspired by the need to solve problems (see Figure 5). Practical students' engagement in classes and workshops should be a priority for teachers as it contributes to retention and provides a sense of group teaching and community that is important to the student.

During the Seminar

- First hour (S1): The students take the role of the critics. They start to read their peer assignments and evaluate them through three areas - the topic validity, proposal suitability, and convenience of research questions, based on the practical examples from lectures, and their experience from their proposal work, by noting their comments and feedback.
- The second hour (S2): students start in objective interactions and discussion with their peers in an open mind.
- The third hour (S3): The teacher reflects and gives students his comments and feedback regarding their proposals. The teacher cooperates with the students on a personalized level.

After the Seminar Finishing

The students revise their proposal according to peers and teacher comments and feedback according to PBL model as shown in Figure 6.

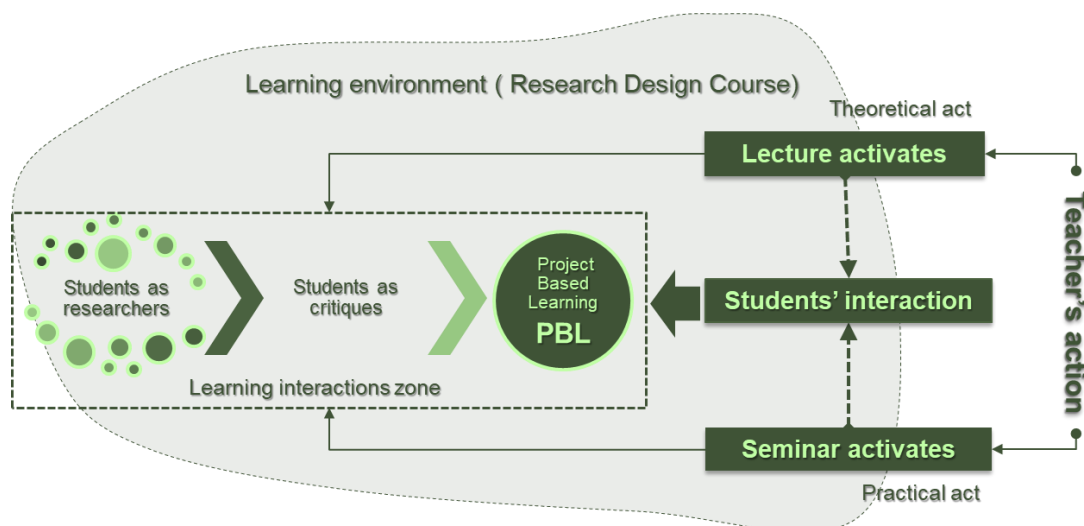


Figure 6. The Course Learning Environment using (PBL) Model

Conclusion

The unification of the scene means that the learning process is "fighting on the real battlefield", and it also means that the learning process is a process of constantly creating and enriching scenes. This determines that in the new dimension of time and space, reshape the process steps of talent training, the main body of spatial connection, etc., it is necessary to set learning goals based on real innovation needs, reshape the learning process based on the ability growth streamline, and use curriculum modules Organize learning resources for basic units, so that

teaching, scientific research, management, and services are closely centered on the mainline of ability growth, and realize the integration, interaction, and open evolution of physical space, and virtual space. The new role of teachers is to create effective correlations between course components (lecture - seminar), where a good harmony between these components will support the CDIO INITIATIVE, related to standards 3, and 8, and consolidate the course ILIO'S. The purpose of CDIO is to provide an opportunity to train engineers so that their innovation can be in the industrial technology system of "conception, design, implementation, and operation." The continuous acceleration of the technological revolution has brought huge challenges and opportunities to education. Future-oriented education should take the initiative to recognize, seek and adapt to changes. Good-oriented learning supported by a sustainable and well-course syllabus and organization will support interactivity, and innovation and reflect the design of mechanisms that encourage and drive learners to learn independently; future-oriented teachers will be in the knowledge transfer. At the same time, it will promote the overall growth of students and cultivate their innovative spirit; the future-oriented campus is no longer a closed system but a gravitational center of knowledge and information.

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