GE-001

Academia and Industry Collaboration Between School of Industrial Technology, Universiti Sains Malaysia and Nagaoka University of Technology

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Universiti Sains Malaysia (USM) and Nagaoka University of Technology (NUT) has signed a Memorandum of Agreement in March 2016 with the objective to further strengthen academic and research collaboration, as well as Academia-Industry collaboration. Since 2017, several students from School of Industrial Technology has successfully selected to join the Nagaoka Summer School for Young Engineers (NASSYE). This program offers the students opportunity to participate in research topics set by the laboratories at NUT, as well as experience cultural exchange with NUT students. In 2018, via this academia and industry collaboration, our USM students also given opportunity for an internship at A Company for duration of three months. On 6th August 2018, NUT-USM has signed a Memorandum of Understanding for Collaborative Research Agreement witnessed by B Company. It is expected that more collaboration will be take place in the near future through this mutual understanding from both parties.

GE-002

Analysis of the Effectiveness of Teaching Methods Based on the Neuroscientific Approach and the Experimental Study

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In this research, we neuroscientically verify understanding, and describe an experimental study verifying what kind of teaching methods are effective. Students often have trouble in changing the order of integration when calculating a multiple integral. First, the experiment was carried out using teaching materials based around several problems expressing the region by inequalities [1]. In this study, we made teaching materials by two kinds of teaching methods on iterated integrals. In the experiments, each teaching material are distributed to participants and answers were recorded using a Cognitive Detection Clicker (CDC), a device of our making which allows for recording of students' responses along with response times.

Metacognition is the knowledge about one's own cognitive processes [2] such as awareness or prediction. Metacognition is important in learning; therefore, detection of metacognition is useful for improvement of education methods. It has been reported that the high-frequency gamma oscillations (65-140 Hz) were synchronized when a mouse performed a learned task successfully [3]. In this study, to encourage metacognition, the participants performed iterated integrals task that simulate actual learning. The increase of the Hurst exponent appeared when the answer changed from incorrect to correct. These results indicate that metacognition is detected as the increase of the Hurst exponent.

Next, using the same teaching materials, we carried out the experiment in which the participants were 35 4th-year students of National Institute of Technology, Fukushima College. In this experiment, it was found that the new teaching method has higher correct answer rate than the usual teaching method.

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GE-003

Self-Assessment of Generic Skill for Engineering Design Education

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Through the unification of various exercises and experiments similar to active learning, National Institute of Technology, Nagaoka College (NITN) launched Engineering Design Education (EDE) as a special experiment in the first grade of the advanced course beginning in 2013. The EDE is managed by our center as a self-development subject study within the "System Design Education Program[1]." In the team which consists of those who are from different departments, students try to solve problems provided by JSCOOP (Job Contents Search with Local Companies Based on Cooperative Education). JSCOOP is a practical subject in NITN and aims at producing innovative personnel who have abilities to find problems and solve them[2]. National Institute of Technology have introduced Model Core Curriculum (MCC), which presents the subjects, abilities and their levels that Kosen students have to acquire. In order to evaluate students' abilities, especially generic skills, we conducted a survey using the generic skill indexes suggested in MCC. Students did self-assessments to check their generic skill levels before and after EDE participation.

According to the result of the survey, students recognize their improvement almost in all categories, and the values of improvement are great in "initiative", "ability to detect issues" and "understanding industry". In particular, students who succeeded to try their solution in practice scored higher value of improvement in the category of "ability to detect issues" than the others.

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GE-004

Fostering Creativity Through Disaster Education

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Disaster education (DE) is one of the important pillars of disaster resilience in disaster prone countries like Japan. The study and development of comprehensive DE teaching methodology and materials at the primary and secondary school levels is advanced, but it is still lagging in the higher education (HE) level. DE as a topic touches on every facet of society, with content from the general to the technical, spanning a wide range of disciplines that requires interdisciplinary collaboration to successfully implement. Extensive information is available in a wide variety of media which while serving as a rich reference resource, becomes a challenge for both educators and students to sift through. In HE, additional complications such as the different academic fields of the students, bring new challenges to the design of effective DE content delivery methods and materials, provision of clear and attainable teaching goals, and in keeping students motivated, engaged and receptive to the whole range of information being provided.

This presentation will demonstrate how a creativity-focused approach to DE can be utilized in HE to stimulate interest from a wider range of students without compromising on the core learning objectives. To demonstrate this approach, an example is introduced in which the author integrates a creativity technique (TRIZ: The Theory of Inventive Problem Solving) into a DE class at the university. TRIZ is utilized because of its wide use and association with intellectually stimulating keywords such as “creativity”, “patents”, “invention”, “innovation”, and “problem solving” which all elicit positive responses towards learning. The idea of using creativity as a motivator for learning contributes to the DE toolbox, and beyond this, to the general development of pedagogical methods that promote student engagement especially in cross-disciplinary scenarios.

By systematically integrating a creativity enhancing technique, the author was able to demonstrate several benefits such as: (1) Easier to clarify the context and content of the class using creativity as an anchoring point and framework bringing more coherence and better manageability of content in the widely varying topics covered in this cross disciplinary class; (2) Coupling DE content with creativity which most students are interested in and are eager to learn, resulted in a significant positive change in the student enthusiasm. This also made it possible to change the class from a teacher centric delivery model to a learner-centered model thus promoting active engagement by students and lessening the burden of lecturing and facilitation of discussions in class. (3) Added value to DE the creativity lessons learnt can be applied beyond DE in most situations that require creative problem-solving skills.

GE-005

Development of an Analysis System for Concentration Using Biometric Information
-Aiming to Apply to AL Classes –

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Recently, Active Learning(AL) has been focused as the educational method.AL is different from traditional method of the class which is teacher-centric class, namely only teacher speak and students have the class passively.AL is that is the style which students become active and they progress the class themselves actively. However, it is difficult to assess the students which have the AL, and it becomes hard about progressing the evolution of these style. The method of assess two perspectives. One is that teachers has been able to have the class well? The other one is that students quality (knowledge and skill) has been able to progress well? Generally, assessment of class is questionnaire -centric after closing the class at the end of semester.

So we cannot feedback to our students that que questionnaire's opinions. Moreover, generally the questionnaire to the students has included the issue that it is difficult to assess we want because subjectivity has strengthen. So we have advanced the investigation which can measure the degree of concentration against the class students have, using biological information as the assessment method we can measure it objectively. Using these results, we assess the degree of concentration against class of students while they are having the class of AL.

This method makes us the situation which we can realize the visualization of the degree of actively while we realize the monitoring the situation of students in which they are having the class of AL. We use GSR, blinking, motion of the head as assessment indexes. We have selected the biological information we measure mentioned above and equipment we will use in order to reduce the strain of students by wearing the equipment, although we can select and use a variety of biological information and equipment to measure the situation of students. We can progress the class while visualizing the degree of concentration of students by using our system.

As a result, we can reduce the class of AL which is imitative that is being a mere reflection of AL technique. Furthermore, we can apply our result to traditional teaching method, because we can inform the situation which the students are becoming activated while the teachers are using a variety of skills which they drive the class well.

GE-006

Awareness of Instructional Skills in Teachers of NIT -Through Activities of SDGs English Presentation in NIT and GIGAKU Education to Foster Students' Generic Skills and Integrated English Ability-

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These days Japan works in some countries to solve various problems that those countries face. UNESCO posed all over the world these problems as categorized 17 agendas called SDGs (Sustainable Development Goals). Nagaoka University of Technology and National Institute of Technology, Ube and Miyakonojo College have held events and classes in English to let students stimulate their thoughts regarding SDGs agendas and foster generic skills and integrated English ability simultaneously. Not only students of generic skills and but also teachers of instructional skills are improving from these activities. Good presentation need some factors which include understanding organization, making a plot of argumentation, eye contact, postures, readiness, and so on. When we, teachers, teach the contents and impose the presentation activities to the students, the sequence of steps of problem-solving learning is effective. Therefore, now, we, specialized and general culture called liberal arts need to cooperate each other. In this research, we report the practice and its effectiveness of these activities, in particular, of fifth grade students in Nit, Ube College.

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GE-007

Glocal Problem-Based Learning for the Engineer to Achieve SDGs Through the GIGAKU Network

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The importance of generic skills is increasing in addition to general and expertise knowledge as abilities required for the engineer. Our group developed the educational materials and method to increase the generic skills and to facilitate the group and active learning though the GIGAKU network collaborated between Nagaoka University of technology and National Institute of Technology, Kosen college [1-3]. The "Sustainable Development Goals (SDGs)" adopted by the United Nations in 2015 is an international goal for the realization of a sustainable society and 17 goals and 169 goals are presented. Because Engineers play a major role in achieving these goals, the promotion of engineering education incorporating SDGs is particularly needed. As an SDGs education which can be done by Gigaku network, we propose educational model to improve necessary generic skills for engineers who can achieve SDGs through project-based learning on the theme of regional issues where each NIT, kosen college is located. In this study, we repot on the approach of the problem-based learning related on the regional issues in Ube city and discuss on the educational effect for the generic skills.

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GE-008

Tips for Implementing Some Active Learning Methods for KOSEN Mathematics Class

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Active Learning is generally defined as any instructional methods that engage students in the learning process, such as collaborative learning, the flipped learning, the Jigsaw method, debate, role playing and the like. However, we often hardly find appropriate materials for these methods depending on the subject and the method. We have conducted mathematics classes with several active learning methods in KOSEN. In this poster, we will introduce useful active learning methods for mathematics classes and how we put them into practice in our classes. The combination of collaborative learning and the flipped learning instead of teaching some mathematical techniques and questions in our classroom keep students proactively. Note that students need the environment of watching videos, and we have to prepare lecture videos of the E-learning courses for flipped learning. Jigsaw method is useful for solving problems which needs several mathematical knowledge. The proof of Euler's formula, which needs the knowledge of imaginary unit and Taylor series of sine, cosine and exponential function, is a good material for Jigsaw method [1]. The combination of brain-storming, KJ-method and poster tours method is put to use in making a concept map that describes which mathematical techniques are connected with a certain mathematical content, such as double integral calculation, differential equation, the residue theorem and so on. Problem based learning in which students find the scenes in engineering subjects that involve using mathematical method and know what kind of mathematical techniques are especially used in engineering, encourages students' interest in mathematics. We collaborate the engineering teachers and the advanced course students. Students interview them what kind of mathematical knowledge is needed in engineering, then summarize them, and present in their class.

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