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NEW APPROACHES AND TRENDS AIMING AT ACHIEVING BETTER RESULTS IN EDUCATION

Prof. DSc. PhD. Katia Vutova[1], Assistant Prof. PhD. Tomomi Tanioka[2], Prof. ABD Viktoria Basham[3], Associate Prof. PhD Masayuki Yamauchi[2], Associate Prof. PhD Yoshihiro Masui[2], Prof. PhD Takeshi Tanaka[2,4]

Institute of electronics, Bulgarian Academy of Sciences, 1784 Sofia, Bulgaria[1]
Hiroshima Institute of Technology, Hiroshima 731-5193, Japan[2]
Hampden- Sydney College, Farmville, VA 23901, USA[3]
Visiting Professor, Research Institute for Nanodevice and Bio Systems, Hiroshima University, Higashihiroshima 739-8527, Japan[4]

katia@van-computers.com, tanaka@cc.it-hiroshima.ac

Abstract: *Rapid globalization requires for students, teachers, and researchers to have good education, logical thinking, problem-solving, comparative, and research skills, excellent expressiveness, and broad scientific knowledge. This work outlines some of the newest and most important approaches and trends in the universities' education system aiming at achieving better results. Some of the latest main projects and examples of good practices related to the application of these approaches and to the international education in Japan, Bulgaria and the United States are also introduced in the paper.*

Keywords: EDUCATION, NEW APPROACHES, LOGICAL THINKING, COMPARATIVE SKILLS, RESEARCH SKILLS, PROBLEM-SOLVING SKILLS, ALTERNATIVE FORMS OF LEARNING AND EDUCATION, CONTEMPLATIVE WORKSHOPS

1. Introduction

Rapid globalization requires for students, teachers, researchers and experts to have good education, logical thinking, problem-solving ability, expressiveness, and broad scientific knowledge. To improve these skills and to help students advance in their abilities faculty needs to keep improving and developing the educational environment and to apply new educational approaches aiming at achieving better results. Globalization requires for a specialist who wants to go beyond the borders of their own culture to know at least English in addition to their own language.

In the Age of Globalization, international education has been rapidly improving in Japan, mainly instructed by the Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT). The teaching of English as a foreign language plays an important role in various educational sites in Japan since not only English is recognized as the international official language but also Japanese as the native language in Japan is quite different from the English language with the respect to linguistics. There are not that many opportunities for people to use English in their daily lives in Japan, so the way they learn English in school becomes crucial for developing their English language skills. Recently many new attempts have been made across the nation, corresponding to the globalizing world [1-4].

In this paper, the latest main projects related to international education in Japan and some specific approaches in the Hiroshima Institute of Technology (HIT), based on projects promoted by MEXT, are presented. Some of the newest and most important approaches and trends in the universities' education system aiming at achieving better results and some examples of good practices related to the application of these approaches in the education in Japan, Bulgaria and the United States are also discussed.

2. International education in Japan and in Bulgaria

Education in Japan is generally classified as having two parts: elementary and secondary education and higher education. According to the International Education Division, Elementary and Secondary Education Bureau of MEXT, the policy is expressed as follows - it is necessary to educate people who can act independently with a global point of view in a society that is becoming more international. MEXT is working comprehensively on measures such as (1) enhancing education to deepen international understanding and teach foreign languages, (2) promoting international exchange, (3) enhancing education of Japanese children overseas, and (4) enhancing education for returning Japanese children from overseas and foreign children in Japan [1].

In addition, they proposed "English Education Reform Plan, corresponding to Globalization" in 2014. As the Olympic Games will be held in Tokyo in 2020, remarkable reforms have been conducted by the whole nation in Japan. At first, MEXT sets English Language Activities classes several times a week in elementary school, and classes will be conducted in English in principle in secondary school. Also, they suggested "Constructing Necessary Frameworks for New English Education" in order to empower teachers in both elementary school and secondary school. Finally, MEXT aims at such goal as to "Enrich English education throughout each stage in elementary, lower/upper secondary schools and improve students English ability (aim to pass Grade 2 or above in the Test in Practical English Proficiency, score over 57 in the TOEFL iBT test, etc.)" to improve the students' practical English language skills [2].

In Bulgaria, following their initial exposure to foreign languages in kindergarten, the students continue to study at least one foreign language such as English, German, French, Spanish, Russian, Italian, Japanese, etc. in elementary school. In high school the students continue their foreign language education and sometimes a second even a third foreign language is added to their curriculum. Knowing languages gives the students a lot more opportunities to communicate and exchange ideas and experience and to search and use information from global databases. In Universities, the students continue their studies in at least one foreign language as relevant to their field of specialization (engineering, mathematics, physics, biology, medicine, etc.). During the first 2-3 years students have mandatory classes in basic subjects concerning their education field. There are also programs in which all classes are taught in a foreign language (in English, German, etc.).

In Japan, there are such policies concerned with international education as "International Issue in Higher Education," "Support for Internationalization of Universities," "Designation of the "Locations in Japan of a Foreign University"," and "Promotion of International Student Exchanges" proposed by MEXT. For example, in 2012, "Project for Promotion of Global Human Resource Development" has been launched in order "to overcome the Japanese younger generation's" inward tendency "and to foster human resources who can positively meet the challenges and succeed in the global field, as the basis for improving Japan's global competitiveness and enhancing the ties between nations." [3]. Then, according to the Office for International Planning, Higher Education Policy Planning Division, Higher Education Bureau of MEXT, "Global 30 Project" has been requested to establish University network for

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internationalization. Finally, "Re-Inventing Japan Project" has been suggested, which is "a funding project that aims to foster human resources capable of being globally active, and to assure the quality of mechanisms for the mutual recognition of credits and grade management through an international framework, by giving financial support to efforts for the formation of collaborative programs with universities in such countries as Asia and US, that conduct study abroad programs for Japanese students and undertakes the strategic acceptance of foreign students." [4].

At the same time, Japan has promoted to exchange students more than before as the project called "Promotion of International Student Exchanges" indicates. In 2010, Student Support and Exchange Division, Higher Education Bureau of MEXT has introduced "Study in Japan" establishing the exchange system to support foreign students who would like to study in Japan such as Japanese Government (Monbukagakusho: MEXT) Scholarship, Young Leaders' Program, and Japan Student Services Organization (JASSO).

The Erasmus Programme is the largest European initiative that has been enriching lives for the past 30 years. It started as a student mobility programme in 1987 and it has grown into something bigger and enriched the lives of more than 9 million direct participants, not to mention the indirect impact it has had on so many others. Since its creation, the Erasmus Programme has developed and expanded greatly and in 2014 many programmes were combined into one: Erasmus+. The programme is no longer focused solely on academic education. The 'plus' means that it now includes workplace traineeships, staff training and teaching activities, cooperation projects between universities, research organizations, companies, non-governmental organizations, local, regional, national authorities and other socio-economic actors – within Europe and beyond. Erasmus+ Programme will be offering mobility opportunities from and to all European Union Member States and beyond, for more than 4 million Europeans between 2014 and 2020 providing young Europeans with the opportunity to enhance their personal and professional development. The increase is due to mobility enhancement and to education globalization. Bulgarian Universities, Bulgarian Academy of Sciences (BAS) and other organizations in Bulgaria participate in this program actively. Erasmus+ is more than just mobility - with cooperation projects, it provides organizations active in the fields of education, training, youth and sport the chance to forge international partnerships which broaden opportunities for staff and students and drive reform.

3. New approaches in the universities' education system, examples of good practices and discussion

Institutions all over the world such as companies, scientific institutions, research centers, universities, etc. need personnel that can work abroad. It is of crucial importance to keep improving and developing the educational environment and to apply new educational approaches aiming at achieving better results and help students advance in their skills and abilities.

Some of the newest and most important approaches in the universities' education system aiming at achieving better results are:

- incorporating alternative forms of learning and education into the traditional classroom model such as study abroad programs, internships, field trips;
- working across fields and disciplines to provide information to the students and track their progress on comparative skills, research skills;
- incorporating contemplative workshops giving the students the skills and tools to deal with time management, stress, happiness, change, and many other aspects of emotional, psychological and physical well-being and health which are crucial for the successful outcomes of the education process.

This is one of the latest and most popular trends in education in the United States. Researches just recently discovered the concept of neuroplasticity and most colleges and universities are developing and implementing classes and workshops on it. For many years we all believed that with age our brain deteriorates and our brain cells decrease in both size and number, which means we get much worse at processes such as learning, memorizing, problem-solving, paying attention, focusing, etc. This theory, however, was just recently proven wrong. Neuroplasticity means that our brain cells are very 'plastic' and flexible. Their size and number has no correlation with age; it is very much relate and responds to stimuli such as one's lifestyle, emotional state, physical state, etc. Our brain cells can be trained just like we train our muscles at the gym. For example, we can teach our brain how to, instead of constantly scanning the environment for the negative which is its natural state, scan the environment for the positive through journaling, gratefulness, random acts of kindness, forgiveness, mindful meditation, healthy diet, and exercise. Our brains scanning for the positive every day will have a tremendous impact on our serotonin and dopamine levels, which would lead to a much better emotional and physical health, increased productivity, longer attention span, a better ability to focus and solve challenging problems, decreased level of chronic anxiety and stress and absence of the health complications associated with them.

- one on one coaching and mentoring by experts in the students' fields of interest.

A good example of this important approach aiming to improve the education system and to achieve better results is the National Program "Internships for students" in Bulgaria. This program funded by the Bulgarian Ministry of Education and Science started again in September 2016 after the excellent results that the 2013-2014 program showed. This Program is for individual training for students in academic organizations such as research institutes in the Bulgarian Academy of Sciences (BAS), in companies, etc. The program offers each student 240 hours of individual training under the coaching and mentoring of experts (mentors) in the students' fields of interest. The mentor works with each of them to design an individual schedule for the internship, keeping in mind the students' schedules. The mentors help students gain new knowledge and specific professional skills. The Institute of Electronics, BAS (IE-BAS) participate actively in this program. For example, mentors from the Laboratory "Physical problems of electron beam technologies", IE-BAS work under this Program with students from different universities such as Technical University – Sofia, University of Mining and Geology is "St. Ivan Rilski", University of Chemical Technology and Metallurgy in Sofia, etc. in the field of electron beam technologies - processes at e-beam treatment of materials, modeling, optimization and process control.

HIT has kept developing and promoting the new systematic approaches as higher education in order to improve students' skills and abilities, based on social needs and the school's foundation idea and spiritual legacy that "education is love." In 2016, the newest educational project called "HIT 2016" that aims at better education for students has been launched. The project includes introducing portfolio-system to care students, active learning in classes, and follow-up program to have students acquire their basic knowledge of mathematics, physics, and English. Now, main projects have been carried out, which aim to improve students' communication ability, logical thinking, problem-solving ability, and expressiveness, corresponding to globalization such as The Center of Project for Educational Development, The Center of Project for Research, HIT 2016, etc.

The Department of Electronics and Computer Engineering in HIT is trying to develop new systematic approaches both in research and education for students, adding to the existing programs. Research approaches and incorporating other students in such activities are taught in each seminar in their senior grade. Students can learn and improve not only their academic skills but also their logical thinking, problem-solving, communication ability, and expressiveness, through their research projects in seminars. There are three main fields (Electronic Devices, Electric and Electronic Circuits and Computer and Electronic Information) and

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nine laboratories for graduation research in the Department. Usually, students select areas of interest after completing two years of courses covering engineering fundamentals and liberal arts. They pick up their topics they would like to research among these subjects, and belong to one laboratory among nine. In addition to this seminar system, mainly these three new projects are working now: Techno-club and Tech-ners Jr., Active learning in the class "Basic Electric Circuits" and Hosting international or domestic workshops in HIT.

Usually, Japanese university students in science and technologies do research and attend scientific conferences and workshops in fourth grade and graduate schools. By doing research, students are able to acquire problem-solving, logical thinking, presentation and discussion skills. Research activities and presentations are very important for active learning. Active learning is one of teaching methods that strives to involve students more directly in the learning process. Students can acquire many abilities by active learning that cannot be learned in traditional classroom lectures. On the other hand, almost first and second grade students take traditional classroom lectures and tend to be passive learning attitude. Many students tend to study only to memorize knowledge, and they cannot expect great growth. Therefore, we have adopted active learning elements in lower grade class so the students are able to learn actively earlier.

The class "Basic Electric Circuits" for first grade students with active learning has been carried out [5]. The adopted active learning methods are flipped learning, group learning, and peer support. Before the class, students should study what was taught during the previous class, and prepare for the next class with textbooks, lecture videos, handouts. These educational materials are delivered via internet, and students can learn anytime and anywhere by using smartphones and tablets. At first, students take an assessment test. We encourage the students to study on their own and prepare for class by having the test. Subsequently, a teacher gives a short lecture about main points only. Students study the next contents beforehand for the class so that lecture time can be shortened. After the lecture, the students practice individually and at that time, senior students support the first graders. The number of supporters is about 7 for 70 first graders. Thus, the students can teach exercise problems each other in groups. The groups are a mix of students with various levels of knowledge and skills. Students with poor knowledge in electric circuits can overcome their weak points with classmate supports. At the same time, the good students get a better understanding by teaching others. Teaching is one of the best learning methods. Furthermore, the students can improve communication and presentation skills. Finally, the students take a confirmation test. Not only the results of the individual tests, but the average points of each group are also evaluated. By evaluating the average points of the groups, we encourage students to teach each other.

The following questionnaire was used for students' evaluation of the class utilizing active learning method and the results are shown in Figures 1-5. *Question 1* (to students): Do you think that teaching or being taught is useful for your study? *Question 2* (to students): Compared to the traditional lectures, was this class useful for you? *Question 3* (to students): Will you consider becoming a supporter next year? *Question 4* (to support students): Was your participation in this program useful for improvement of your skills and abilities? *Question 5* (to support students): Was supporting junior students rewarding for you?

Fig.1 shows that 82.4% of students think that teaching to classmates or being taught by classmates is useful for learning. There are students of quick understanding and poor students in the same class. It is difficult to obtain high satisfaction among all the students using one lecture method. However, by adopting teaching each other, we can obtain high satisfaction level among many students. In addition, students who play roles as teachers can get a better understanding by thinking about how to teach. Fig.2 shows that 70.6% of students think that the class utilizing active learning is more useful than traditional classes. Some students said that it was easier to ask classmates than to ask a teacher. We were able to get a good evaluation for the class. However, this method requires seniors who support juniors. As shown in Fig.3, 20.6% of students said they would cooperate with the class, and this method can be continued with new supporters. We also surveyed support students. The results in Figs. 4 and 5 indicate that the supportive students were satisfied and that supporting others improved themselves. The results confirm that classes can be improved better by introducing active learning elements in traditional classes and we will continue to work for improvement our classes.

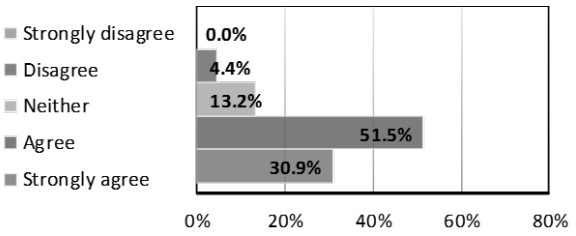

Fig. 1 *Results for answers of question 1.*

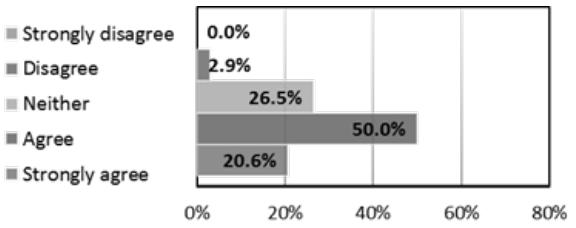

Fig. 2 *Results for answers of question 2.*

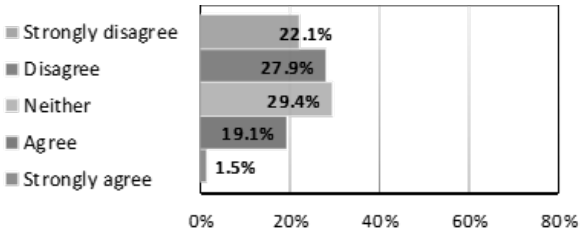

Fig. 3 *Results for answers of question 3.*

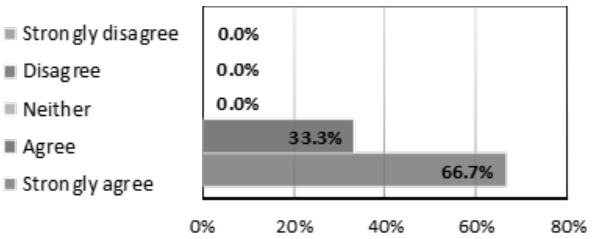

Fig. 4 *Results for answers of question 4.*

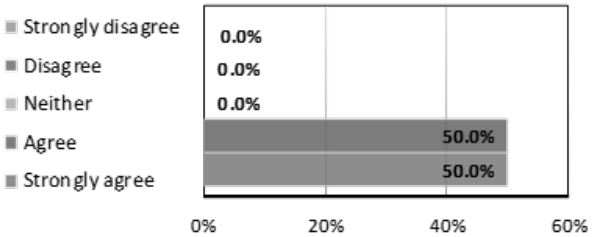

Fig. 5 *Results for answers of question 5.*

Recently, graduates, who have abilities of making presentations, debating, good communicating, etc., are desired in many companies in Japan. Universities have to turn out successful graduates for society. To acquire experiences of making presentations in scientific forums (conferences, workshops, etc.) is one of the effective learning methods for helping students advance in their practical communication abilities and for improving their

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expressiveness, logical thinking and problem-solving abilities. In engineering faculties of many national universities in Japan, students belong to a laboratory while at fourth grade and many of them take master's courses while at graduate school and start to work after completing their master's degree. So, these students have a chance to attend scientific forums during three years. In HIT, many students after graduating from the undergraduate course start to work in the society (Fig.6). These students do not have experience in attending conferences, because they have only a year and a half before graduating. It is expected that all students have experience in attending scientific forums, which sometimes can be challenging.

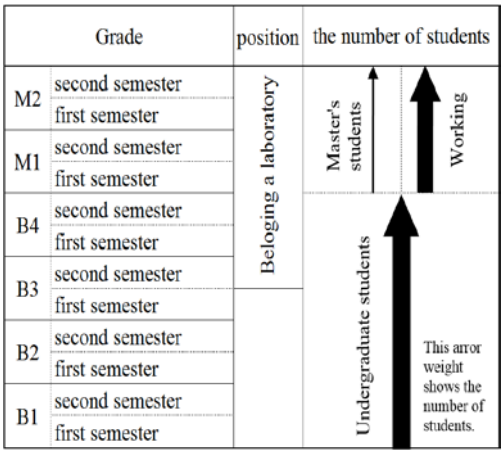

Fig. 6 *Flow of students in the Dept. of Electronics and Computer Eng., HIT.*

Faculties in the Department of Electronics and Computer Engineering and in the Department of Electrical Systems Engineering in HIT organize a domestic scientific forum - Education and Research Workshop of Electronic Devices, Circuits, Illuminations, and Systems (ECIS), which is held twice a year. The sponsor of ECIS is "The Illuminating Engineering Institute of Japan: The Regional Branch of Chugoku District." Since the homepage of ECIS is opened people can apply their research presentations and attend the workshop. Because ECIS is convened in our university HIT, many students in HIT are able to attend the workshop easily and to make presentations.

The 4th ECIS took place on November 26th, 2016, a questionnaire for participants was prepared and the results were considered. There were one keynote speech, one special speech, four oral presentations, and fifteen poster presentations. The number of participants is shown in Table 1. The students are almost 73% that shows high students' activity and around 40% of them made presentations. The questionnaire included the following questions: *Question 1*: Is this your first participation in a workshop? *Question 2*: Do you have a presentation / presentations in this workshop? *Question 3*: If you have a presentation in this Workshop, is it an oral or a poster presentation? *Question 4*: If you have a presentation in this Workshop, in which language it is – in English or Japanese? *Question 5*: If you have a presentation in this Workshop, how many authors are there in your paper? *Question 6*: In which level of your education you are now? *Question 7*: In which areas you heard and learned new knowledge at this Workshop? *Question 8*: Did you participate in the Workshop in HIT in November 2015?

The results of the questionnaire are shown in Table 2. Almost 62% of the students participated for the first time, and almost 54% of students heard and learned new knowledge at this workshop The results show that some students are interested in scientific forums and students learn not only from the presentations made by themselves, but also they learn new knowledge from presentations made by others. Many students, who do not belong to any laboratory yet, participate in this workshop. Based on the results, we can conclude that it is important for students both to make a presentation and to get good experiences. One of the graduates from our department says, "I learned technical way of making presentations, and this experience is very useful for improving practical skills in my work."

Table 1: *Number of participants in the 4th ECIS.*

Number of participants	Number of students	
	Made a presentation	Just audience
66	19	29

Table 2: *Results of the questionnaire.*

Number of answered persons	Number of answered students	Number of students who heard and learned new knowledge	Number of persons of first-time attendance	Number of students of first-time attendance
50	37	20	26	23
Number of student in each grade				
B2	B3		B4	M1
2	14		18	3

Bulgarian Universities and research institutes of BAS have well established traditions in organizing and hosting scientific forums such as conferences, workshops, training sessions, etc., in which students can participate and deliver presentations [6]. Some of these forums are organized specifically for students in order to improve and develop their skills and abilities - expressiveness, logical thinking, problem-solving and decision-making abilities, etc. For example, the following scientific events are organized by the IE-BAS: (i) the International Conference on Electron Beam Technologies (EBT) starting in 1985. Students from HIT lead by Prof. T. Tanaka participated in the last EBT conferences (in 2014 and in 2016) and presented their results. (ii) The International Summer School on Vacuum, Electron and Ion Technologies and the 2017 edition is the 20th in a series of events; (iii) the International Conference and School on Quantum Electronics, organized biennially since 1980.

4. Conclusion

Some of the newest and most important approaches and trends in the universities' education system aiming at achieving better results such as: (i) working across fields and disciplines to provide information to the students and track their progress on comparative and research skills, (ii) incorporating alternative forms of learning and education into the traditional classroom model such as field trips, study abroad programs, internships, exchange programs for students, teachers and researchers, (iii) one on one coaching and mentoring by experts in the students' fields of interest, (iv) incorporating contemplative workshops giving the students the skills and tools to deal with stress, time management, happiness, change, and many other aspects of their emotional, psychological and physical well-being and health which are crucial for the successful outcomes of the education process, are presented in the paper. Some of the latest main projects and examples of good practices related to the application of these recent approaches and to the international education in Japan, Bulgaria and the United States are also introduced and discussed.

Institutions all over the world such as R&D centers, companies, scientific institutions, universities, ministries, etc. need personnel and experts that can work abroad. It is of crucial importance to keep improving and developing the education environment and to experiment with new education approaches to help students advance in their skills and abilities, so that the quality of their education can ensure the success of their future careers either in their home countries or abroad.

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