

Maxi Program at IEEE EMBS Student Club of Beijing University of Posts and Telecommunications

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Abstract—This paper presents the recently launched Maxi Program at IEEE EMBS Student Club of Beijing University of Posts and Telecommunications. The program initiates a variety of Seminar Series covering biomedical expertise and professional communication skills, forms a cooperative partnership between students, university and industry through Guest Speakers events and Industry Tours, and sets in motion Personal Consultative Services (PCS) to foster the individualized competence of students. This extended program could be an innovative model of self-development as an affiliated student chapter/club with IEEE EMBS.

Keywords—Biomedical engineering education, recruitment, competence advantage

I. INTRODUCTION

Biomedical Engineering (BME), which applies knowledge in engineering, biology and medicine to understand, modify and control living systems such as the human body, is one of the fastest growing fields of technology with astounding recent achievements [1]. The challenges resulted from the diversity and complexity of living systems require creative, knowledgeable, and imaginative people working in teams of physicians, scientists, engineers, and business people to monitor, restore, and even enhance normal body function [2]. The IEEE EMBS Student Club of Beijing University of Posts and Telecommunications, formed in November 2002 in response to the tremendous and sustained growth of BME, has recently launched quite a few novel and vibrant initiatives to promote BME professionals and foster an innovative model of self-development as an affiliated unit with IEEE EMBS.

From 2002, our Club Committee endeavors to start outreach initiatives and develop nutritious BME education programs in order to help the next generation of engineers make greater progress in the biomedical expertise with polychrome experiences. So far we have successfully commenced three programs with the purpose of attracting potential students and gathering them into the same community. Since February 2003, we have developed a one-year extended BME education program, named “Manna” [3], as a supplement for the regular BME curricula on campus. This basic education program, which provided a variety of introductory seminar series and the opportunities of

international research collaboration, won high praise at the evaluation.

BME students of tomorrow should have more and greater opportunities to solve hands-on problems and gain senior design experiences through cooperative education and industrial internships [4]. Based on this intention, we extended the Biomedical Industry Skills Education (BISE) program [5] cooperating with the regular senior medical device design and relevant curricula to foster a Win-Win relationship between the students and industry from October 2003. In this way, students can gain the necessary industry skills after graduation, and get the experience of product development in industry. On the other hand, working students’ assists in the product development, and industry could also have the opportunity to identify students as potential employees.

When students join in the BME industry upon graduation and begin to run business, they shall have more ability such as engineering management, professional communication skills, and strategy planning, in order to gain competitive advantages. Base on this motivation, we initiated from January 2004 the Maxi Program (“Maxi” stands for Maximum Individual Competence) to foster individualized competence.

II. RECENT INITIATIVES

A. Seminar Series

On November 2nd and 9th, 2003, our club organized two seminars with four presentations to address the recent advances in BME relevant fields, and to introduce students into some promising topics for study. Prof. Yixin Zhong, the Club Faculty Advisor, delivered a lecture on “An Information-Knowledge-Intelligence Unified Theory,” which broadened the scope of Information Technology. He also stressed the importance of new and emerging fields such as Genomics Engineering, Biomaterials, and Nanotechnology as well as the promising interactions between these emerging technologies and more traditional disciplines in BME such as Biosignal Processing, System Physiology and Modeling, and Medical Imaging. Yunfeng Wu, the Club Chair, offered three presentations concerning field-dependent and field-independent teamwork styles [6], critical thinking [7] and decision making [8] in engineering

projects. The focus was on how to benefit from IEEE and EMBS student membership, the necessary criteria for a recommendation of acceptance for publication, and communication skills for collaboration in projects. These events were resounding successes, with attendance and interest greatly surpassing our expectations. The room that could seat 150 guests was packed with over 400 attendees.

To cater for many guests' requests, we provided in addition two IEEE student membership consultative events to help students better understand IEEE and EMBS membership benefits. These events concentrated on how to make an informed career choice in the rapidly growing, interdisciplinary fields of Bioscience and Bioengineering. Particular emphasis was put on the current trend in scientific research communities to integrate multiple, previously distinct fields. We also emphasized the advantages for students of all backgrounds and areas of academic interest to move toward careers in Biotechnology. Yunfeng Wu also gave an example from his own experiences to underscore the need for dedication and perseverance in order to be successful in collaborating with research fellows with multidisciplinary and diverse cultural background. Most of the feedback we have received so far has been positive. In addition, we have successfully recruited 40 new IEEE student members, including nine female members and five EMBS members, by the end of November 2003.

B. Guest Speakers

The guest speakers participating in the Maxi Program are from both industry and academia. The industrial partnerships were developed through our BISE Program [5]. We focus on developing partnerships with targeted industries whereby both two parties benefit from technical exchanges and business synergy. From April 19th to 23rd, 2004, we invited representatives of Softmedical™ Inc., Canada, to give two seminar sessions for students. Project leadership, project management, medical device design controls [9], and risk management were the major topics in the first session. After the closing remarks, they provided an introductory lecture on regulatory issues [10, 11] and the standards, and then demonstrate their products and state the standards compliance in them. It helped students gain the good knowledge of Investigation Device Exemption (IDE) rules [12] with both ethical and liability concerns at these events. Besides this event, the club is currently scheduling the Dr. Barbara A. Oakley's visit in Beijing in June 2004 and will plan three lectures on how to turn student groups into effective teams [13, 14], the current blood pathogen filtering research [15, 16], and an explanation of the major aim of the IEEE EMBS.

C. Industry and Hospitals Tours

We arranged a tour of the biomedical industry and several local hospitals from March 5th to 7th, 2004, in

Fujian Province, China. Izumi Sakai and Yunfeng Wu had technical exchanges with physicians and radiologists when visiting Fuzhou General Hospital, Longyan First Hospital, and The First Affiliated Hospital of Fujian Medical University. Representatives of local hospitals demonstrated the medical imaging modalities such as X-ray, CT, CR, and MRI, and other medical instruments such as heart monitors, microelectrodes, and glucose monitoring machines. The project manager of Fuzhou Mokang Medicament Technology Co., Ltd. briefly presented the recent biochemical projects and exposed the latest developments in these emerging biomedical technologies.

D. Personal Consultative Services (PCS)

The Personal Consultative Services (PCS) are one of the novel ways to foster individualized competence in the Maxi Program. As we shall pay much attention to student individualities during the university education, we decided to have some private conversations to know the students requests. There are two steps to achieve the objective of fostering individual competence. First, the club holds party events once a month. There are large amount of information such as the latest news within the BME communities in the world, trends in both academia and industry, and so forth, to be shared and exchanged between students, just like "brainstorm", in order to conceive new ideas, motivate innovative concepts, and discover the potential needs of the participants. After party events, the club committee sets about making summaries of the topics mentioned at each party, and to track down the special requests or the potential needs of students. Then, we would invite some students to have a long (3-4 hours on average) face-to-face conversation, to cater for their individual needs, and to indicate them some well-suited expertise. Following are the topics discussed at one PCS event (January 29th, 2004) with Cathy Chen, a freshman wandering whether BME is the right career for her:

- The importance of "intuition" and "sense" during the undergraduate education, and how to conceive an "inspirational" brain for innovation;
- How to prepare and make a good presentation;
- How to read a book/paper efficiently;
- The steps to make a smart plan;
- How to communicate with others in projects;
- The right way to make an informed career choice.

Up to now, we have successfully had six PCS events which received many appreciations. The participants would be required to make notes and send their feedback for future events.

The EMBS Student Club of BUPT is conferring an "Honorable Member" designation each year for female students who made considerable progress through PCS and contributed much to the engineering education innovation in the preceding year. A small gift would be presented by the

Club Chair to appreciate recipient's endeavor and encourage others' future support.

E. Collaboration with the IEEE BUPT Student Branch

The IEEE BUPT Student Branch is one of the biggest student branches in Beijing. The Branch endeavors to integrate students with strong interests in research and activities, in order to construct an interactive platform for academic research and professional communications. The collaboration with the local IEEE affiliates could be a pivotal method to promote the BME professionals. When we first mentioned our "Manna" education program at the meeting in 2003, delegates of the Branch expressed high admiration and their desire for taking part in another similar program. On December 7th, 2003, we successfully held a session "Future Research and Activity Plan of the IEEE EMBS Student Club of BUPT in 2004,"¹ and started to collaborate with the IEEE BUPT Student Branch to promote biomedical engineering professionals. More than 100 participants enjoyed this event, and the delegates of BUPT highly appreciated the "Manna" Program [3] of the club and the progress we made in the year 2003. The planning of sponsoring more novel education programs together with the Branch in 2004 was discussed after the session.

During the winter vacation, we exchanged our notion about new education program collaboration with the Branch, who gave us a number of winged words about the implementation of the program among a group of students (up to now the Branch has 64 IEEE student members including 6 EMBS students in total) instead of handful members.

Our club also helped IEEE BUPT Student Branch with the IEEE student membership applications from February 26th to 27th, 2004, and synchronously looking for good examples of education program.

III. OUTCOMES

The membership of our club is growing steadily (depicted in Fig. 1). The membership statement is: only one club member (one EMBS student) in 2002, 10 club members (five EMBS students) in 2003, and 13 club members (six EMBS students) up to now in 2004. Unlike most of EMBS chapters and clubs, there are some oversea members actively involved in our club. We keep in touch with each other via e-mail and telephone. The latest e-news and announcements are posted on the student club website² instead of ordinary mail, which cuts large amounts of unnecessary expense in order to avoid budget deficit.

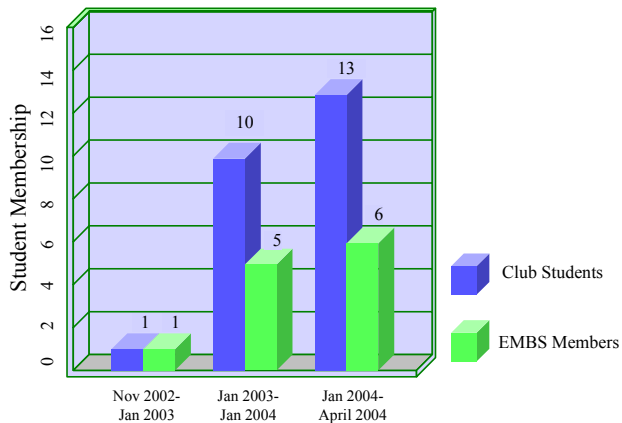


Fig. 1. Student membership statement of IEEE EMBS Student Club of BUPT.

The local and oversea students of our club are very active in some international IEEE EMBS prestigious events. Mie Mitsui, Gonzalo A. Garcia, and Yunfeng Wu participated in the 1st IEEE EMBS International Conference on Neural Engineering (NER'03) in Capri, Italy, the 4th International Symposium on ICA and BSS (ICA'03) in Nara, Japan, the 3rd IEEE EMBS International Summer School on Biocomplexity from System to Gene at Dartmouth College, Hanover, NH, USA, and the 25th Annual International Conference of IEEE EMBS (EMBC'03) in Cancun, Mexico. On the professional development, the members of our club strive hard to do research smartly, and have got eight high quality scientific papers and five related articles in total published in outstanding journals and prestigious EMBS conferences since 2003. Furthermore, some excellent students of the club received a number of awards and fellowship³ in 2003.

As an affiliated club with IEEE EMBS, we also altruistically support our society. On January 14th, 2004, when our society was preparing for the nomination of the *ASEE President's Award for the Promotion of Engineering*, we wrote for our society a supporting letter, which reinforced to the ASEE Awards Committee the impact that IEEE EMBS had made in attracting students into the discipline of engineering in 2003. We received high appreciation from Dr. Barbara A. Oakley, IEEE EMBS Vice President for Members and Student Activities from 2003-2004.

V. SUMMARY AND PERSPECTIVE

Maxi Program was initiated in January 2004, following the "Manna" Program [3] and BISE Program [5]. It is currently ongoing with the hearty cares from the

¹ <http://www.cloudswu.org/embs/activities/FRAP2003/FRAP2003.htm>

² <http://www.cloudswu.org/embs/>

³ http://www.cloudswu.org/embs/club_hall/club_hall.htm

international community. Most of us come from diverse background, and students participating in the program frequently provide some unexpected good pieces of advice for amelioration to the program.

The mission of our club is to establish an infrastructure to sustain the development of BME education in Beijing, China. As suggested by Prof. Jose C. Principe, the percentage-wise low-rate acceptance of Region 10 might be due to the language barrier [17]. In response to this, we encourage our members to master English language and plan to hold more sessions in English. In the near future, our club will continue encouraging collaboration and the free exchange of ideas throughout the world. We still keep on concentrating on the novel club management and the interactive communication model. We plan to add to our Club's web page a database with references of books, papers and links that can be useful for other students, as well as serve as a guide for newcomers. We believe that an excellent BME education program shall provide some excellent examples for others to follow.

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REFERENCES

- [1] F. Nebeker, "Golden accomplishments in biomedical engineering," *IEEE Eng. Med. Biol. Mag.*, vol. 21, no. 3, pp. 17-47, May/June. 2002.
- [2] K. M. Ropella, "Biomedical engineering: the career of choice," *IEEE Eng. Med. Biol. Mag.*, vol. 22, no. 4, pp. 23- 25, Jul/Aug. 2003.
- [3] Y. Wu and M. Mitsui, "BME Education Program at the EMBS Student Club of Beijing University of Posts and Telecommunications," *Proc. 25th Annual Int'l Conf. of IEEE EMBS (EMBC'03)*, Cancun, Mexico, Sep. 2003, pp. 3479-3482.
- [4] L. M. Waples and K. M. Ropella, "University-industry partnerships in biomedical engineering," *IEEE Eng. Med. Biol. Mag.*, vol. 22, no. 4, pp. 118- 121, Jul/Aug. 2003.
- [5] Y. Wu and J. He, "Biomedical industry skills education program at IEEE EMBS student club of Beijing University of Posts and Telecommunications," *Proc. 30th IEEE EMBS Annual Northeast Bioengineering Conference (NEBC'04)*, Springfield, MA, USA, Apr. 2004, pp. 226-227.
- [6] J. D. Enderle, K. M. Ropella, D. M. Kelso, and B. Hallowell, "Ensuring that biomedical engineers are ready for the real world," *IEEE Eng. Med. Biol. Mag.*, vol. 21, no. 2, pp. 59-66, Mar/Apr. 2002.
- [7] K. Bishop, "Scenarios for technical communication: critical thinking and writing," *IEEE Trans. Professional Communication*, vol. 42, no. 3, pp. 198-199, Sep. 1999.
- [8] H.J.W Vliegen and H.H van Mal, "Rational decision making: structuring of design meetings," *IEEE Trans. Eng. Management*, vol. 37, no. 3, pp. 185-190, Aug. 1990.
- [9] G. Bartoo, "Design controls," *IEEE Eng. Med. Biol. Mag.*, vol. 22, no. 2, pp. 112-114, Mar/Apr. 2003.
- [10] R. Munzner, "What's in a 510(k)," *IEEE Eng. Med. Biol. Mag.*, vol. 22, no. 3, pp. 157- 158, May/June. 2003.
- [11] R. Munzner, "Marketing a medical device without a 510(k)," *IEEE Eng. Med. Biol. Mag.*, vol. 22, no. 5, p. 133, Sep/Oct. 2003.
- [12] R. Munzner, "U.S. FDA rules for device investigations," *IEEE Eng. Med. Biol. Mag.*, vol. 22, no. 1, pp. 95- 96, Jan/Feb. 2003.
- [13] B. Oakley, "It takes two to Tango: How 'good' students enable problematic behavior in teams," *Journal of Student Centered Learning*, vol. 1, no. 1, pp. 19-27, Fall 2002.
- [14] B. Oakley, R. M. Felder, R. Brent, and I. Elhajj, "Turning Student Groups into Effective Teams," accepted by the *Journal of Student Centered Learning*, vol. 2, no.1, pp. 9-34, 2004.
- [15] D. K. Stiles and B. A. Oakley, "Simulated characterization of atherosclerotic lesions in the coronary arteries by measurement of bioimpedance," *IEEE Trans. Biomedical Eng.*, vol. 50, no. 7, pp. 916-921, 2003.
- [16] D. Hanna, B. Oakley, and G. Stryker, "Using a system-on-a-chip implantable device to filter circulating infected cells in blood or lymph," *IEEE Trans. Nanobioscience*, vol. 2, no. 1, pp. 6-13, 2003.
- [17] J. C. Principe, "Editorial," *IEEE Tran. Biomedical Eng.*, vol. 51, no. 1, pp. 1-2, 2004.