International Journal of Business, Human and Social Sciences
ISSN: 2517-9411
Vol:8, No:11, 2014

Strategic Management of a Geoscience Education and Training Program

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***Abstract*—**The effective development of a geoscience education and training program takes account of the rapidly changing environment in the geoscience market, includes information about resource-rich countries which have international education demands. In this paper, we introduce the geoscience program run by the International School for Geoscience Resources at the Korea Institute of Geoscience and Mineral Resources (IS-Geo of KIGAM), and show its remarkable performance. To further effective geoscience program planning and operation, we present recommendations for strategic management for customer-oriented operation with a more favorable program format and advanced training aids. Above all, the IS-Geo of KIGAM should continue improve through 'plan-do-see-feedback' activities based on the recommendations.

***Keywords*—**Demand survey, geoscience program, program performance, strategic management.

I. Introduction

THE success rate of the overseas resources programs has been lower than expected by the Korean government, even though investment in these programs has increased. The technology capacity, particularly for exploration and development, productivity improvement and feasibility testing, was insufficient in these programs for use in the real field of mineral resources, oil and gas. The Korean government ministry reported in a survey that the fields of resource exploration and development processing needed manpower cultivation [1]-[3]. A report on the manpower training plan for the overseas resources program said the program required 200 new people every year [4]. In this context, the above fields of resource exploration, development and processing are considered to lie within the field of geotechnology, an all-embracing technical term for earth science related to Earth and in particular to the environments surrounding human life. It consists of the steps of survey, exploration, development and application, relating to mineral resources, oil and gas. In this paper, we consider that geoscience education and training programs address the geotechnology field, and therefore, that if such programs are improved as a source of professional human resource, the ability to obtain resources and the economic capacity for sustainable development are reinforced.

The effective establishment of a geoscience education and training program takes account of the rapidly changing environment in the mineral resources, oil, and gas markets, and requires information about resource-rich countries that seek a good education. The reason for monitoring resource-rich countries' educational needs is related to the characteristics of their markets, such as resource nationalism and maldistribution. These market barriers make it difficult to enter the resource market, such that information about the market situation and resource status, as well as the political, economic and human resource status, is important. Through geoscience education and training programs, resource experts can contact and establish a network with each other.

In this paper we consider the geoscience education and training program provided by the Korea Institute of Geoscience and Mineral Resources (KIGAM), the only government-funded geoscience research and development institute in Korea. First, we consider its past performance and impact. For this high quality and prestigious geoscience education and training program, we also show the results of an international demand survey. Finally, we propose the strategic development of the geoscience education and training program to cultivate international human resources, focused on professional training.

II. Geoscience Education and Training Program in Korea

A. Geoscience Program Overview

The geoscience education and training program (hereafter referred to as the geoscience program), provided by International School for Geoscience (IS-Geo) which is a branch of KIGAM, started in 2010 when the center opened.

The scope of the program is that of geotechnology, which consists of four major subfields: geology; mineral resources; petroleum/marine; and geological environment. Geology is concerned with surveying whole territory, including land and seabed, investigating the structure of the Earth and the impact of changes in this structure on the environment, and constructing a database of geological information. The mineral resources and petroleum/marine are of practical use for exploiting strategic mineral and energy resources, and researching into potential resources for future exploitation. This program can contribute to meet the strategic target for mineral and energy resources self-sufficiently, which Korean government set every 5 years, through using technology in these fields. Geological environment is concerned with predicting and mitigating natural disasters, improving the hydro-geological environment, and sustainably reforming land to provide comfortable and safe living environments.

The geoscience program goals are:

- Professional, geoscience, human resource cultivation through cooperation with international education institutes;

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- practical geoscience manpower cultivation for land resources programs; and
- design of future emerging education and training programs to assist geotechnology research and development, and related markets.

The geoscience program is open to domestic and international participants. There are two possible courses, regular and customized [5]. The regular course starts every year with four sub-courses that are the same with four major subfields. This course is provided for international participants, particularly trainees concerned with the geoscience field, from resource-rich countries, with university degrees. The customized course starts occasionally at the request of a geoscience related organization, such as a company, university or government ministry, or KIGAM.

The geoscience program is a form of Official Development Assistance (ODA), a flow of financial resources from the central and/or local governments of donor countries and multilateral agencies to developing countries [6]. The developing countries are defined in the list of ODA recipients provided by the OECD-Development Assistance Committee. Grants include technical cooperation such as education programs as well as budget support, projects, debt relief, food aid, humanitarian aid and so on. Under resource maldistribution, resource-rich countries are found in certain regions, e.g. Middle Eastern countries (oil) and African countries (rare metals); most are considered developing or underdeveloped. They require a more advanced technology level to develop their resources efficiently. This geoscience program is considered technical cooperation, according to the OECD grant classification.

B. Geoscience Program Performance

Between April 2010 and December 2013, the geoscience program comprised 64 courses and 143 modules (see Fig. 1). Each course had several modules, separated into topics. One course could last several days or more than 1 week. The geology strand had 18 courses and 31 modules in total, mineral resources had 26 courses and 65 modules, petroleum/marine had 15 courses and 30 modules, and lastly, the geological environment strand had 17 courses and 34 modules. During the 76 courses and 160 modules, 403 domestic and international lecturers were invited to speak by IS-Geo. Each module had an average of 2.7 lecturers.

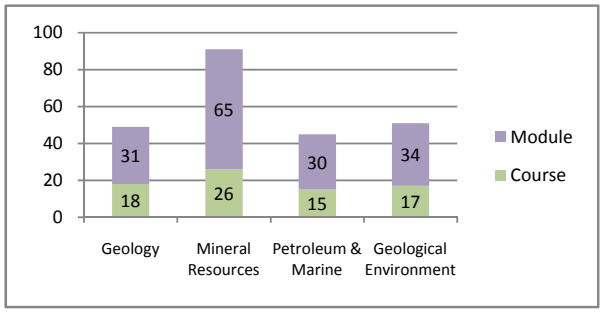

Fig. 1 Program performance

The geoscience program improved in diversification based on the module (see Fig. 2). The scope of the mineral resources strand expanded to include exploration, mining engineering, preliminary evaluation/feasibility testing, geological information systems, and remote sensing. The program was established at the request of private companies such as DaeWoo international, and organizations such as the Energy and Mineral Resources Development Association of Korea, and the Korean Society of Earth and Exploration Geophysicists.

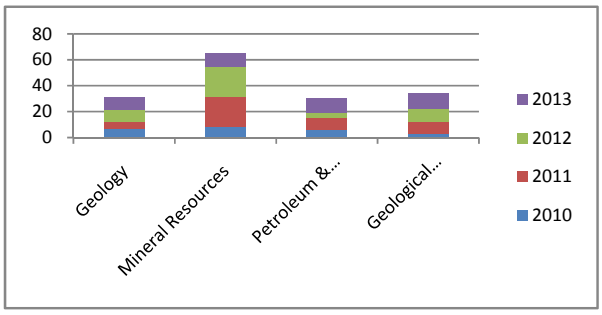

Fig. 2 Program diversification (based on the numbers of modules)

The total number of program attendees was 3,728, with 1,579 international and 2,149 domestic participants (see Fig. 3). The annual increase rate over the last 4 years was 26.5%.

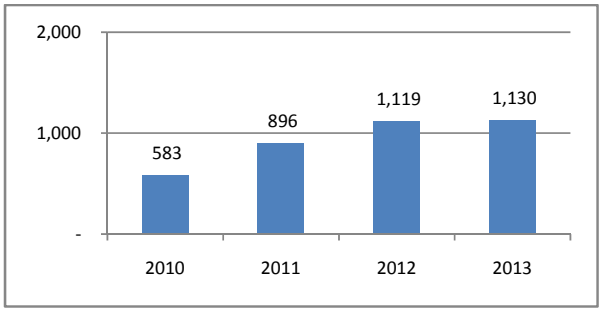

Fig. 3 Number of participants

C. Geoscience Program Impact on the Market

To analyze the impact of the geoscience program, we conducted a satisfaction survey for each course in 2013. The satisfaction survey consisted of two parts, one being lecture-related (program content) and the other lecturer-related (teaching). Both used a 5-point Likert scale. The average satisfaction level was high (4.48), with the level reported by international participants (4.52) being higher than that by domestic participants (4.44). Both groups reported satisfaction scores higher than 4 for the lecture and lecturer sections, too.

Many international geoscience experts attended the geoscience program. This opportunity facilitated a network of international cooperation between international and domestic participants, and an international expert network among lecturers, which included representatives from America, Asia, Australia, Africa and Europe (see Figs. 4 and 5).

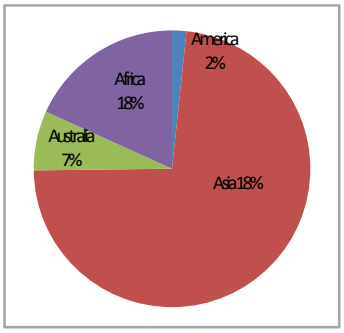

Fig. 4 International cooperation network

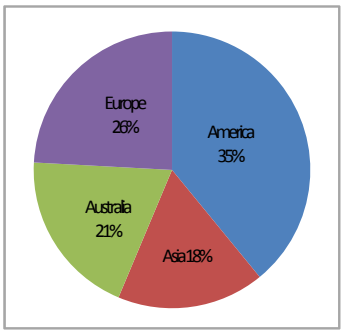

Fig. 5 International expert network

III. International Demand Survey

A. Demand Survey Overview

International education demand is an important factor that feeds into improving and efficiently setting program content. As the education program is considered a form of service, the identification of participants' demands or needs is the first step in program setting [7].

A demand survey was conducted four times in 2013. The respondents were the participants of the following four detailed courses; Exploration and Evaluation of Mineral Resources; Petroleum Exploration, Development and Production; Landslide Monitoring and Assessment; and Groundwater Theory and Application. The survey questionnaire was issued to 70 participants by email (respondent rate 60%).

B. Demand Survey Results

The demand results were examined for each geoscience course. The program consisted of theory, application SW, case study and field survey, and participants in the courses had different preferences for each. Participants in the Geology course had a high preference for case study and field survey, those in the Mineral Resources course preferred case study, in the Petroleum/marine course they preferred theory and application SW, and in the Geological Environment course preferred application SW and field survey (see Figs. 6-9).

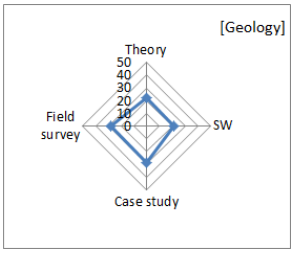

Fig. 6 Preference type in geology course

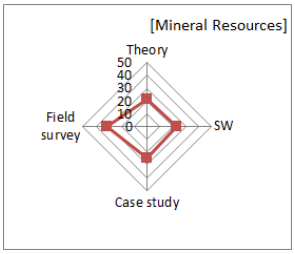

Fig. 7 Preference type in mineral resources course

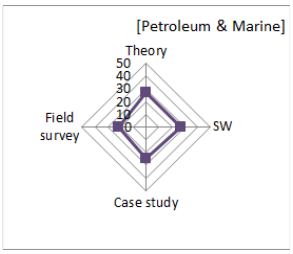

Fig. 8 Preference type in petroleum/marine course

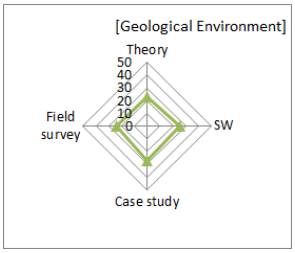

Fig. 9 Preference type in geological environment course

Participants in all courses had a strong preference for master's degree level teaching, evidencing their desire to achieve an excellent technical ability for the field, based on a deep theoretical background (see Figs. 10-13).

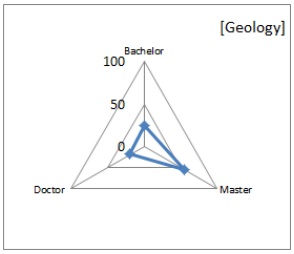

Fig. 10 Preference level in geology course

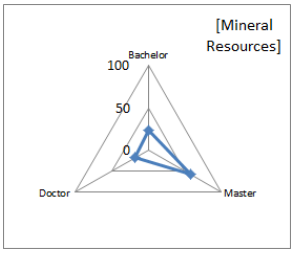

Fig. 11 Preference level in mineral resources course

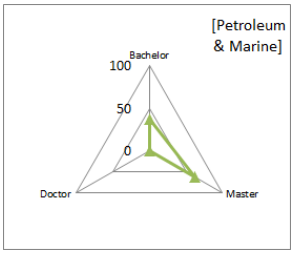

Fig. 12 Preference level in petroleum/marine course

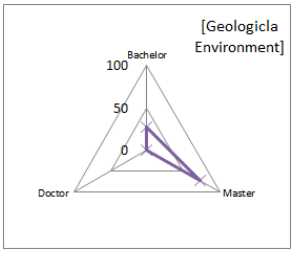

Fig. 13 Preference level in geological environment course

The preferred duration of courses was similar. Participants in the Geology course had a high preference for 5-week courses, those in Mineral Resources wanted 6 weeks, and in Petroleum/marine and Geological Environment they preferred 5 weeks (see Fig. 14).

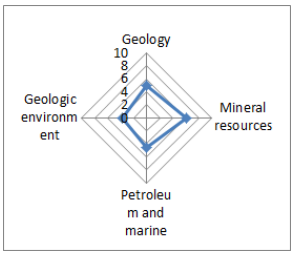

Fig. 14 Preferred duration of courses

Additional program topics wanted by participants were as follows.

- Geology course:
- Mineralogy, petrology, sedimentary geology;
- geological mapping, geologic risk and management;
- medical geology
- Mineral resources course:
- Reserve calculation techniques;
- numeration of mining information (Database)
- Petroleum/marine course:
- Marine seismic and data processing;
- marine mining
- Geological environment course:
- Geological hazards;
- risk management techniques and control

IV. Education Facilities

IS-Geo has a variety of facilities with the online and offline geoscience program. For the online program, the education room has the recording equipment as well as live webcast facilities with real time communication. The participants can access and watch the screen in the education website after the class. For experiment or test there are the microscopes, sink and humidistat. The specimen gallery of mineral rocks is fit inside.

V. Conclusion

Since its establishment by the IS-Geo of KIGAM, the number of participants in the geoscience program has increased rapidly. Particularly, the number of international participants grew and was facilitated establishment of an international network for cooperation and dissemination of knowledge. Continued attendance suggests a high level of satisfaction to the geoscience program. To improve the geoscience program, the results of the geoscience program survey indicate that the courses should be medium term, at least 4 weeks, and focused on application SW and field excursions.

Under consideration with various fact about the geoscience program we could propose the strategic management directions. First, participants want to obtain practical, experimental knowledge that can be applied immediately when they return to their home countries. Second, IS-Geo can use the KIGAM laboratories, which are fully equipped with the latest facilities. Third, through regularly analyzing the international demand survey, the geoscience program can work to meet global education needs from the perspectives of educational contents, teaching methods, and facilities, because providing an education program is a form of service. Forth, according to the survey result, “medium-term course” IS-Geo can take steps toward certificating a master’s degree as a formal education. Moreover, the geoscience program can establish a business model for a government-funded organization that emphasizes education quality as well as customer service. Benchmarking information is needed to advance such an education organization.

In this paper we introduced the geoscience program run by IS-Geo of KIGAM, and showed its remarkable performance. For the effective geoscience program planning and operation we recommended a particular management strategy for customer-oriented with a more favorable program format and advanced training aids. Above all, the IS-Geo of KIGAM should continue its improvement efforts through ‘plan-do-see-feedback’ activities, relating to the recommendations above.

ACKNOWLEDGMENT

This research was supported by the Basic Research Project (14-3614-1) of the Korea Institute of Geoscience and mineral Resources (KIGAM) funded by the Ministry of Science, ICT and Future Planning.

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