

COMMUNITY SERVICE AND SCHOLARSHIP: PROSPECTS AND CHALLENGES FOR LEBANESE ENGINEERING INSTITUTIONS

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Abstract — *This paper is concerned with the utilisation of community based service learning programmes as means for advancing scholarship in all its forms. It examines how, in the absence of other alternative modalities, such student centred programmes may be exploited to stimulate academic research and development activities particularly where funding opportunities are scarce. Supportive examples are drawn from the experience of the University of Balamand in Lebanon. Two case studies are presented and are used to highlight the methodologies used to direct student learning efforts within these programmes not only to fulfil the requirements of the community partner, but also to realise original academic output. Also in this paper, is an analysis of the challenges and difficulties that have to be considered when using such programmes.*

Key words — *Aeronautics, Community Service, GIS, Lebanon, Service Learning, Problem Based Learning.*

INTRODUCTION

Lebanese universities are homes for some very talented and competent scholars. For the majority, academic experience is gained at highly reputed American or European institutions with set traditions in research, teaching and academic administration. At such institutions, scholarship in all its forms is governed by national needs and is generally outlined, funded and regulated by central governments through national councils for education and research. Additionally, academic activities enjoy the support of industrial establishments and the private sector for which knowledge generation is of extreme importance for economic prosperity. As such, future needs for research and development are forecast and provided for well in advance, not only thematically but also along the lines of policy, strategy and resource allocation.

When at home, Lebanese scholars are eager to exercise their know-how by teaching what they learnt and research what they investigated. Although this is relatively easy in some areas such as Medicine, Humanities or Social Sciences, it is surely more difficult in the applied fields of technical nature like sciences and engineering. This is easily attributed to many reasons, amongst which is the absence of an efficient national framework for research, lack of funds or industrial interest. The result is frustration on behalf of the academic, particularly that there are pressures of

academic achievement and competition from other institutions, both local and international. Under the circumstances, research output could easily be compromised in terms of either quality or quantity.

A major aspect which is usually overlooked by Lebanese academics is the opportunity to contribute their expertise through community service to the well needed national development. Development, whether local, national or regional requires the generation and the mitigation of some base-line knowledge for its proper and sustainable achievement. To a considerable extent, community service could provide academics with the means for supporting their interests. It helps them establish links with external establishments and stimulate their interest not only in academia but also in newly emerging technologies. More importantly, it could be used to generate knowledge that could bridge a geographical gap that may exist in international wisdom. It could also provide the grounds for directing students' talents to a good cause, and building their capacities in new ways. In short, and if properly managed, community service could easily provide a win-win case for academics, community partners and students.

This paper, will build on illustrations of how community service concepts, methodologies and mechanisms were successfully applied at the Mechanical Engineering Department of the University of Balamand to generate some original work in the areas of Aeronautics and Geographical Information Systems (GIS). It will examine and deliberate the challenges, prospects, and pitfalls, of using community service as vehicle for advancing scholarship and will seek to put in perspective the relevant points of emphasis which need to be addressed for its successful implementation within engineering schools both methodologically and practically.

COMMUNITY SERVICE AS AN ACADEMIC VEHICLE

Community service programmes are not new at academic institutions. Since their early inception, they have been used as virtuous mechanisms in which students of different levels of experience contribute their time, skills and capacities on a voluntary basis towards their direct community. Despite their "soft" academic nature, they remained very attractive since they ensured a visible presence for a university within its society as enhancing good citizenship among the

youth. There are endless examples in the literature of successful community service programmes throughout the world [1]-[2]-[3], in which students have made irreversible positive changes in the operation of community partners. It has to be emphasized, however, that such programmes were generically geared towards students and the society with minimum input or concern from academics.

Community Service and Service Learning

In order to ensure that an academic feature is maintained, *service learning* concepts started later to emerge and became formalized. Such concepts relied on the clear identification and definition of the learning components and outcomes of a student undergoing a community service experience in the same manner community partners' requirements were defined [2]-[3]-[4]-[5]. However, these learning outcomes remained by far practical and to a large extent experiential receiving minimal interest from the academic research community.

The fact remains that community service and service learning programmes have rarely been directed, whether by design or relevance, to be used as vehicles for advancing research and development, particularly in engineering, technology or innovation.

The projection of community based Service Learning methodologies towards the fields of engineering and technology will no doubt involve major challenges for the academic. Such challenges begin at the early level of problem identification which should not only be of relevance to the community partner, but also needs to incorporate components well worthy of scholarly investigation. Care should also be exercised to identify the problem components that could be delegated to students and are of a level commensurate with their capacities, in addition to the specification of the resources, tools and equipment that are needed to fulfil the required tasks. Many a times, these are not available at the partner establishment and must be carried out at the institution itself. Once these steps are achieved, continuous monitoring of student progress must be maintained in order to ensure that objectives are met to standards acceptable by both the institution and the community partner. It is to be mentioned that such supervisory responsibilities are rarely accounted for within the list of duties of any one academic.

Consequently, both students and academics are confronted with very specialized and challenging learning opportunities in which practical solutions are to be found for very specific problems. It is here that Problem Based Learning (PBL) methodologies are to be exercised, manifested and harnessed to their fullest extents.

Community Service and Problem/Project Based Learning

It must be emphasized here that PBL is not envisaged here as a technical tool for information

gathering or skills mastering. It is considered as being a learning methodology, based on the cognitive approach, and whose objective is conceptualization and knowledge acquisition. The specificity of this methodology is in the dialectic relation between doing and concept building. Constructivism is integral to the process of knowledge acquisition and action is an integral part of each specific concept [6].

The learner's experience in his social environment or through laboratory experimentation, are of equal value in the learning process. Theoretical results are to be reached as a conclusion of an adequate chain of dialectical exchange between doing and deducing. Problems raised by a community life and projects aiming to serve the community are the occasions given to students to gather information, build schemes and reach new knowledge through a didactical road map.

Such an approach is a three fold responsibility: i) the learner who will have to devote himself to go through this personalized process, ii) the community who will have to offer the ground for such experience and to play a fundamental role in its evolution, and iii) the academic supervisor/tutor who will have to manage the whole process by making the adequate choices and supervising the evolvement of the knowledge building.

It is for these reasons that the community service scheme was for the University of Balamand team a perfect modality to implement such a new methodology of learning knowing that this is a very difficult challenge.

COMMUNITY SERVICE AT THE UNIVERSITY OF BALAMAND

In 1997, the University of Balamand initiated an innovative cross-faculty learning programme designed to nurture the civic responsibility in its student, namely service. The programme is based on the philosophy of service learning; the pedagogical method which unites classroom theory with practical community work. The program is referred to as "Service Experience, Education through Doing", SEED for short [7]. SEED seeks to meet the real needs of the nation by building partnerships between the University and the community. It is a voluntary programme which could easily be integrated within students' plan of academic study, such that they get academic credit in return for their community service work. This is in addition to providing them with professional training as well as enhancing their civic concerns. A student registered for a SEED course has to serve a community partner for a minimum of forty hours in order to get one free academic credit. A student completing three SEED courses is relieved from a three credit elective course.

The SEED programme is considered as a main vehicle for enhancing the presence of the University of Balamand within its society. On the other hand, it is a very important tool for exposing the community partner, as potential employer, to students as future employees. Many community partners have benefited from SEED amongst which are the Lebanese Red Cross, various

municipalities and local authorities, the Lebanese Air Force, the Chamber of Commerce and Industry in Tripoli, and many more. The powers of the SEED programme are elaborated hereunder through two case studies.

Case Study I: The Rayack-43

The Mechanical Engineering Department at the University of Balamand has for some time been involved in researching the Lebanese aviation heritage since the arrival of the first aeroplane to Lebanon in 1913 up until the modern times [8]. During its investigations, the Department discovered that a series of light training aeroplanes were built at the air base of Rayak in the Beka'a valley in 1943. This was a major finding which, without the efforts of the Department, would have been lost forever, thus depriving Lebanon from a main aspect of its technological history. The type was named Rayack-43 after the place and year of manufacture, and was constructed by French and Lebanese personnel during the French mandate upon strict instructions from General Degaulle. These aircraft were replicas of the Caudron C600-Aiglon and their first prototype was flown in March 1944.



FIGURE. 1

The First Prototype of the Rayack-43 on the Tarmac at Rayak Airbase in 1944

Given the historic and national values of the Rayack-43, the University of Balamand decided that it was a project well worthy of revival and qualified as a community service project. To that end, SEED students from various engineering disciplines were brought in to help in the construction efforts. Since there were no engineering plans for the aircraft but merely some sketches and old pictures, the team embarked on an ambitious exercise of redesign, testing, validation and assessment of the Rayack-43 aerodynamics, structural integrity and flight qualities. Students were involved in all stages of such exercise. Their skills were exploited at all levels, such as CAD, experimentation, stress analysis, simulation, workshop activity, etc.



FIGURE. 2

Wing Construction of the Rayack-43. Left: At Rayak Air Base Workshops in 1943, Right: University of Balamand Workshops in 2007

One of the valuable examples of the many original research outputs from this service learning exercise had been the improvement of the wing performance of the aircraft. Aerodynamic characterisation of the original wing, a Göttingen 735 profile, revealed that it was underperforming over a wide range of its operational envelope. The Balamand Rayack-43 team, while attempting to remain truthful to the general wing shape, suggested some minor yet essential changes to the base profile as shown in Figure 3. The new profile was referred to as the OCJ profile and reflected a twofold augmentation of the lifting capacity of the wing at the lower angles of attack. Such results were confirmed by experiments and their comparisons with those of the G 735 are given in Figure 4.

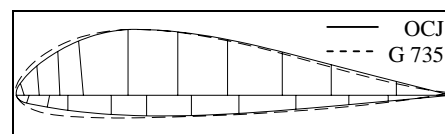


FIGURE. 3

Comparison between the original and new wing profiles of the Rayack-43 [9]

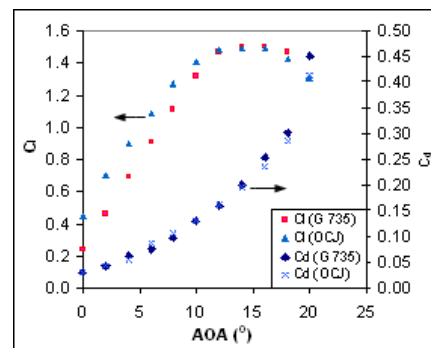


FIGURE. 4

Comparison between the lift and drag coefficients of the original and new wing profiles Rayack-43 [9]

Case Study II: The GIS Centre

The potentials of Geographical Information Systems (GIS) technologies cannot be overlooked in the management of modern day societies. Their applications are surely endless within the various sectors of any one nation as they are capable of yielding concrete indicators which enhance the decision making process at the local and global levels. Spatial appreciation and geographical attribution make it possible to answer many crucial questions which otherwise could go unanswered if descriptive type analyses were solely relied upon.

The penetration of GIS into the various Lebanese sectors has been relatively slow. Many reasons could easily be contemplated for such a setback, the most likely being financial, given the scale of the investments required in the technology, personnel and data. This low

demand level reflected negatively on the academic sector in general, restricting any progress that could be made whether in teaching or research. The University of Balamand, however, through its GIS Centre was very quick to break such a deadlock by making use of its community service program. Through SEED the University was capable of directing its students towards community based projects that not only conformed to the national priorities but also comprised some original academic components. Once completed, these GIS projects were passed to community partners who sometimes required formal training in order to operate them effectively. As such, demand was created and catered for by the University. Three examples are given here which illustrate the student involvement in community type projects and the magnitude of the academic output that was achieved.

In the first, SEED students were tasked to analyse geographically some data field data gathered from households from a number villages in North Lebanon. Of particular interest was the identification of water supply sources to individual housing units. When mapping such data some very interesting findings were established for the village of Ayyat, Figure 5. There, it was realised that the northern and eastern parts of the village did not receive any water from the national network but relied solely on the underground Artesian supply. This was base data, previously unavailable, that must be relied upon in the water network upgrade.

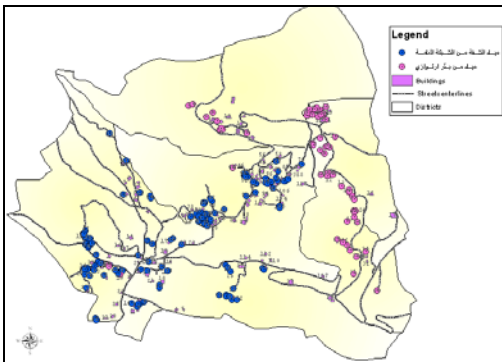


FIGURE. 5
Water distribution by source in the village Ayyat

The second example is concerned with the visualisation of obstacle clearing surfaces (OCLs) around a Lebanese airport. These are complicated three-dimensional surfaces which limit the height of physical obstructions that hinder the safety of aerial activity in the vicinity of an aerodrome. The generic extents of OCLs are defined by regulatory norms while their actual dimensions depend on the aerodrome layout, type of activity and ground based navigational facilities, Figures 6 and 7. Herein, SEED students were confronted with a very challenging task which comprised all the ingredients and criteria of both service and problem based learning. Their experience was unique and original in many ways, and culminated in their acquisition of new knowledge and skills, their

development of team spirit as well as gaining insight in a highly specialised field. Of course the academic outputs of this exercise were recognised through a number of scholarly publications [11]-[12].



FIGURE. 6
Geographical characterisation of the airport, in preparation of OCL definition

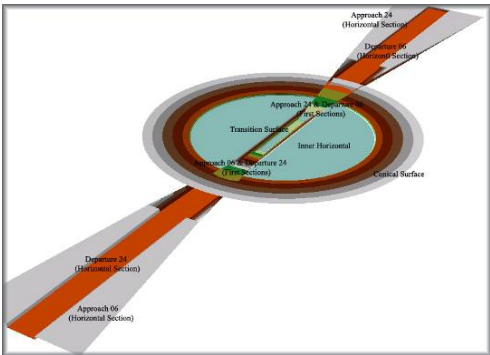


FIGURE. 7
Three-dimensional OCLs for the airport under study

In the last illustration, the GIS team was approached by the Co-operative of Olive Farmers in El-Koura region who enquired about the possibility of defining the overall areas of olive plantations. Through SEED, the GIS team used satellite imagery to define those areas and superimpose them over maps of the region. It was possible to fix to a high degree of accuracy not only the overall area, but also olive coverage in individual villages. Some of the descriptive and geographical results are given in Table I and Figure 8 respectively.

Village	Village Area (m ²)	Olive Zone Area (m ²)	% Village Area
Kfarakka	5748083	4494996	78
Bsarma	4716396	3086076	65
A'aba	1598809	1023462	64
Amioun	11965368	6175233	63
Kousba	6012392	3606831	60
TOTAL OLIVE COVERAGE IN EL-KOURA REGION: 33.7%			
TOTAL OLIVE AREA COVERAGE IN EL-KOURA REGION: 60.34 KM ²			

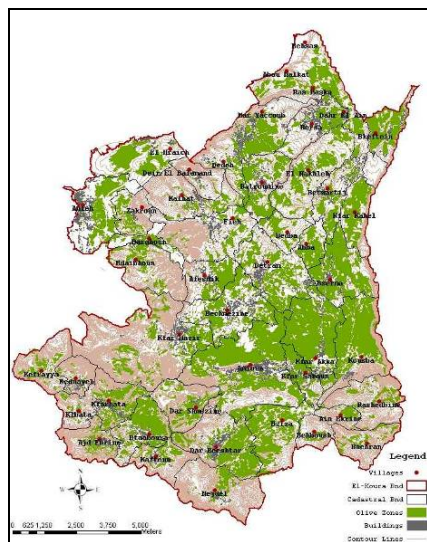


FIGURE. 8
Olive growth areas in the region of El-Koura in North Lebanon

DISCUSSION

It is clear from the previous sections that community based service learning methodologies could be successfully applied to advance scholarship in all forms. Despite the fact that the preceding arguments were made in the context of a Lebanese framework there should be no reason to doubt their universality, particularly that they are initiated at the academic level. It is realised that, if properly used, they could provide an efficient modality for knowledge generation.

However, there are major challenges associated in their implementation, and those are identified at the managerial, academic and executional levels. To begin with, a suitable structure is required for the management of students in terms of registration and progression. This structure could also be used to identify community establishments who could become potential partners in such schemes.

Perhaps the most significant challenge is conceived at the level of the academic. Here it must be highly appreciated that the criteria for success of the service experience as a knowledge generator remains with the academic directly supervising the activity. It is the duty of the supervisor to streamline the student activities towards achieving outcomes that are of academic value, in addition to keeping the student enthused about their community work. This, no doubt, will signify a change in work habits an a substantive addition to academic responsibility.

On the executional side, two points are to be made. Firstly a community partner may not appreciate the level or cost of the technology involved in project execution. However, a more serious consideration that was encountered particularly when executing GIS projects, was that companies providing GIS solutions saw in the University GIS Centre an unfair competitor when providing its services to the community at

minimal or no cost. Nonetheless, this was later realised as a valued step which enhanced the penetration of GIS technologies in the market. Many GIS companies soon joined in the University efforts in community work once they realised that it was a window to cater generated future demands.

CONCLUSION

This paper looked at the application of community service type methodologies as means to enhance engineering research output at a Lebanese institution. From the ideas presented and case studies illustrated the following conclusions may be drawn:

- Community service programmes can be very effective modalities in generating new knowledge in engineering and technology.
- The success of such modalities hinges on implementing a good student management framework and an appreciation on behalf of the academic of the dynamics of such programmes, particularly in terms of leadership and supervision.
- Community service programmes open up new paths for student learning and are the right platforms for exercising the techniques of problem and project based learning.

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