

Cross-border education: experiences and challenges

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ABSTRACT:

Cross-border and joint education initiative has been recognised as an important means of achieving rapid production of critical mass of skilled human capacity in Earth observation and geo-information sciences. Many international organisations notably ISPRS and GEO have indeed set-up technical commissions and working groups to fashion out modalities for achieving the objectives of the initiative. This paper attempts to contribute towards the above by sharing experiences gained in the four-year implementation of a joint education programme including some important challenges that should be envisaged and planned for in the implementation of cross-border education. The paper also describes the various categories and levels of cross-border education that can be deployed for education and training in geo-information science and Earth observation including an examination of the different models of implementing the programme.

1.0 INTRODUCTION

As rightly observed by Molenaar (2009), Earth observation and geo-information are essential for the monitoring of spatial processes which affect the sustainable development of our living environment. Also, since the beginning of the 21st century, we have been witnessing rapid advances in space and information technologies. For effective utilization in geo-information science and Earth observation, the rapid rate of change must be fully complemented by readily available skilled manpower and an enabling infrastructure. Furthermore, a number of GI-specific issues and events have brought to the front burners the need for pro-active capacity development efforts in Africa. These include increasing interest of African countries in the development of space science and technology (SST) and spatial data infrastructure (SDI) (see Kufoniyi, 2009).

At the global level, significant focus has also been given to capacity development, for example, through ISPRS (TC VI), Group on Earth Observations (Capacity building committee), Committee on Earth Observation Satellites (CEOS WGEdu) and various emerging networks in geoinformation technology education. Molenaar (2009) noted that until twenty years ago, production processes for geo-data (or maps) were quite stable and the development of mapping technology and concepts allowed time horizons for investments in the order of 15 to 25 years. But presently the development of technology requires a time horizon for investments in hardware of 3 to 5 years and concepts for information products and services have to be adjusted every 5 to 8 years which implies that capacity development should have a high priority for organizations that need to introduce new working methods and procedures.

The required human capacity can be addressed through three main options, namely: the conventional *face-to-face* on-campus education and training in a University, polytechnic, or specialized institutions, which has limited impact; e-Learning and web-based distance education the effective deployment of which in many developing countries is faced with the challenges of low human

capacity in information and communication technology (ICT), low density of ICT, narrow internet bandwidth, and slow network (usually dial-up); and cross-border education which has been noted to have great potentials for effective human capacity development (see Kufoniyi, 2006 for details).

In this paper, we present the experiences gained in the four-year implementation of the ITC-RECTAS cross-border education programme including some important challenges that should be envisaged and planned for in future implementations. The paper also describes the various categories and levels of cross-border education that can be deployed for education and training in geo-information science and Earth observation including an examination of the different models of implementing the programme.

2.0 DIFFERENT MODELS FOR IMPLEMENTING CROSS-BORDER EDUCATION PROGRAMMES

The positive roles of cross-border education and educational networks in rapid capacity building have been well articulated by various authors (see for example, Molenaar, 2009). The various categories and potential contributions of educational networks have also been well discussed (see for example Kufoniyi et al, 2002). To achieve the capacity needs at various levels, the cross-border education programme can be designed at different levels, including the following:

- (a) Master of Science course
- (b) Professional Master or Post-Graduate diploma course
- (c) Short term refresher courses and
- (d) PhD by sandwich

These can be implemented using different models. For example, the National Universities Commission (NUC) of Nigeria permits any of the following three models for the provision of cross-border university education in Nigeria (NUC, 2009):

- The Twinning/Articulation Model where a foreign university (recognised and accredited by competent authorities in its home country) [or in general any

institution in developed country] collaborates with an approved Nigerian university [or in general any national or regional institution in developing country] to offer courses, enrich curricula content and pedagogy and or offer joint or dual degrees through articulation arrangement.

- The Branch Campus Model – This comprises a situation in which a foreign university avails itself of the NUC standing procedure for the establishment of private universities, and establishes its campus anywhere in Nigeria. Such a campus must be a replica of the parent institution in the home country and must meet the standards and quality assurance requirements currently applicable to Nigerian Universities.
- The Open & Distance Learning (ODL) Model which involves the provision of quality academic programmes and courses leading to the award of degrees, without the constraints of time and space in line with the stipulations of the guidelines for open & distance learning in Nigerian Universities.

The ITC-RECTAS example in the next section falls under the first model of implementation.

3.0 EXAMPLE OF CROSS-BORDER EDUCATION PROGRAMME AND EXPERIENCES GAINED

One of the foremost institutions in the forefront of cross-border education initiative is the International Institute for Geo-Information Science and Earth Observation (ITC) (www.itc.nl) which has on-going joint education programmes (JEP) in different aspects of Earth observation (EO) and geo-information (GI) Science with institutions in different parts of the world. The primary aim of the JEP initiative is to establish an international cooperation for the transfer of urgently needed GI technology capacity to developing countries with a view to reducing the overall cost and increasing the number of beneficiaries while reducing the length of time they (beneficiaries) will spend out of their home organizations and still acquire state-of-the-art training in EO and GI Science (Thontteh and Kufoniya, 2008). For example, ITC has on-going JEP arrangements in Geoinformatics with the Indian Institute of Remote Sensing (IIRS), India (MSc & PGD levels), the Regional Centre for Training in Aerospace Surveys (RECTAS), Nigeria (MSc & PGD), Khajeh Nasirodin Toosi University of Technology (KNTUT), Iran (MSc), Ardhi University (ARU), Tanzania (Technologist-level), and Ghana School of Surveying & Mapping (GSSM), Ghana (Technologist-level). In this section, we discuss the implementation of the ITC-RECTAS cross-border education programme from 2004 to 2008 when the author was the Executive Director/Chief Executive of RECTAS (www.rectas.org).

3.1 The ITC-RECTAS JEP Courses

The programme commenced in September 2004 with courses run at the following levels:

- (a) Master of Science course with a duration of 18 months;
- (b) Post-Graduate diploma course with duration of 12 months. Although RECTAS has been running its own independent PGD for the past 20 years, the “new” PGD is being considered ‘joint’ from September 2004 because 9 of the modules of the RECTAS PGD are actually ITC MSc

modules. (This course is subject to the formal approval of both ITC Institutes council and Scientific Council).

- (c) Short term refresher courses taking advantage of the modular design of RECTAS and ITC courses.

3.2 Programme Execution Strategy

The programme was designed such that in general, each partner will be responsible for the execution of its part of the obligations resulting from the partnership; and this was adhered to throughout the four years experience reported here.

The programme was to have a Board of Directors comprising of designated ITC and RECTAS representatives to provide overall guidance and take decisions on policy matters, general strategic issues and possible conflicts that transcend the operational level. This provision was however not fully implemented, rather the ITC programme director, the Executive Director of RECTAS and the Course Coordinator at RECTAS performed the role of the Board of Directors due to logistic challenges. While this arrangement was generally adequate, a proper constitution of the Board would probably have improved the performance of the JEP in terms of the number of MSc graduates.

For quality control and degree assessment, ITC has the overall responsibility for quality assurance and adherence to the ITC rules and regulations as well as degree assessment for the MSc course while RECTAS was (and still is) responsible for the quality of the Post-graduate diploma course. For the MSc thesis, each student would have a RECTAS and an ITC supervisor at the beginning of the thesis work of the student. The supervisors from RECTAS and ITC are then responsible for the supervision of the student, and are to keep each other informed on the feedback given to the student. However, during implementation, the supervision was handled only by the ITC supervisor. Even though the qualified MSc candidates normally selected their topics before leaving RECTAS, no supervisor was assigned from RECTAS side due to limited number of academic staff with PhD degree.

Further, the two institutions were to use the ITC Blackboard site to access course materials, to give feedback and for module evaluations. This however could not be implemented due to limited bandwidth of RECTAS’ ICT (128/256kbs); as alternative, email and courier services were used for the various correspondences. This challenge reduced the opportunity for the course participants at RECTAS to avail themselves of access to academic materials like their ITC counterparts.

In the business plan, ITC and RECTAS would jointly arrange for a proper staff exchange programme for the lecturers involved in the modules at RECTAS and ITC. The programme would include missions by RECTAS staff to ITC as visiting lecturers, and ITC staff to RECTAS, to supervise students in the joint PG and MSc courses, attend mid- term presentations, and attend the final examinations while providing input in teaching modules at RECTAS where it fits into the mission plan. During the four years of implementation reported here, 10 RECTAS lecturers went for short term staff upgrading courses at ITC in various modules of the programme while one started a sandwich PhD programme under the ITC-RECTAS research agreement put in place to build the research capacity of RECTAS. However, only one RECTAS staff participated in the exchange programme and none from ITC.

3.3 Programme Structure and Formats

The PGD component of the JEP has a modular set-up with 15 modules of three weeks each. It should be noted that RECTAS has been running the PGD course many years before the commencement of the JEP. However, the former PGD curriculum was substantially changed in 2004 such that the first ten modules are exactly the same as the first ten modules of the joint MSc course. Consequently, the PGD course also became part of the JEP.

The joint MSc course on the other hand has a modular set-up with 23 modules of three weeks each as shown in table 1.

Table 1: Structure of the joint MSc Course

Block #	Description (Duration in months)	Modules
1	Common Core Block (3)	Module 1: Principles of databases Module 2: Principles of RS Module 3: Principles of GIS Module 4: Mathematics & Programming
2	Domain Block (4.5)	Module 5: Principles of Spatial Data Quality Module 6: Base Data Acquisition Module 7: Geodata modelling and processing Module 8: Visualization and dissemination of geodata Module 9: Image processing Module 10: Web technology for GIS and mapping and programming
3	Research Profiles (2.75)	Module 11: Research skills Module 12: Advanced topic Module 13: Advanced topic Modules 14-15 Research projects incl. MSc proposal Modules 12 & 13 provide a choice of in-depth subjects that equip students for MSc research
4	Individual MSc research (6)	Individual MSc research: Modules 16-23 (i.e. 8 x 3 weeks)

The joint MSc course can be executed using any of the five formats in table 2, according to the level of training infrastructure and available academic staff in the home institution (Kufoniyi and Huurneman, 2009). When the ITC-RECTAS JEP programme started in 2004, the first option was used while strengthening at the same time the capacity of RECTAS staff through short courses at ITC. The second option of running modules 1 to 10 was then introduced in 2007 and this remained the format of implementation till 2008 when the author left RECTAS.

Table 2: Different Implementation Formats of Cross-border MSc Programme

Options	Home Institution Provides	Partner (e.g. ITC) Provides
One	Block 1: Modules 1 – 4 (3months)	Remainder of course including thesis (15months)
Two	Blocks 1&2 Modules 1 – 10 (7.5months)	Remainder of course including thesis (10.5months)
Three	Blocks 1 – 3: Modules 1 – 15 (12months)	Individual MSc Research (6 months)
Four	Blocks 1,2 and 4 Modules 1-11 and 16-23 (15 months)	Block 3 Modules 12-15 including proposal writing and defence
Five	Entire programme (18months)	Quality control & staff exchange

3.4 Award of Degree and Diploma

In line with the business plan, the JEP courses resulted in PG Diploma and Master of Science Degree. The Master of Science degree is issued under the auspices of ITC as “Master of Science degree in Geo-information Science and Earth Observation with specialisation in Geoinformatics” together with a course record having logos of ITC and RECTAS and signatures from both institutions. The course record also reflected the contribution of the partners in the applicable implementation phase.

If a participant fails to comply with the conditions, which are described in the ITC MSc assessment regulations, s/he would be issued the PG Diploma (if s/he complies with the laid down conditions for the award of the diploma) or a certificate of attendance by RECTAS for the components/modules successfully completed subject to the approval of RECTAS’ Course Board. However during the period, three (3) participants were issued the Professional Master degrees because although they qualified to proceed to the 6 months research phase after the 12 months course work, their 6 months MSc research outputs at ITC were not up to the standard of MSc but higher (quality) and longer (duration) than what would have earned them PG Diploma.

The PG Diploma course results in a “Postgraduate Diploma in Geoinformation Production and Management” signed by RECTAS but with a joint logo course record.

Any participant who fails to comply with the requirements for the PG course would be issued a certificate for the components/modules successfully completed. Throughout the four years reported here, only one (1) candidate fell in this category due to ill-health.

3.5 Quality assurance

In the agreement, the entrance requirements of the courses are designed to satisfy the rules and regulations of both partners and this was adhered to. Moreover, the PG Diploma students at RECTAS underwent the same course as the MSc stream for the first 10 modules. In the plan, the students, who get the joint PG

Diploma (purely through study at RECTAS) in 2005 or later, would be allowed to enter the MSc joint course in module 11 if they fulfil the academic criteria and under the condition that the module on research skills is attended (if not already so). This entrance option remains valid within a period as described in the ITC assessment regulations.

In line with the agreement, the quality and quality assurance of the joint programme have to meet the internal requirements of both Partners as well as the criteria of the accreditation bodies in the Netherlands.

3.6 Internal quality assurance system.

In line with the agreement, the participants evaluated the course, and the separate modules. The Course Coordinator (during RECTAS component) and Course Board (during ITC component) issued the module- and end-of-course evaluation forms, and managed the results. The content, quality of teaching and teaching materials were evaluated. In addition, yearly evaluation reports (based on results of module and end-of-course evaluations, progress of participants, etc.) and also improvement plans per programme were made by the ITC Programme Director and the RECTAS Course Coordinators (but not jointly as specified in the business plan) and submitted to the ITC Programme Board and RECTAS Course Board.

3.7 Achievements of the JEP

As illustrated in figure 1, there was a remarkable increase in the total number of trainees which the JEP attracted between 2004 and 2007. The number was however deliberately kept at 25 due to limited students' accommodation. The accommodation challenge was already being addressed through the construction of a modern 20-room international students' hostel with facilities in RECTAS; upon completion of which the student in-take can be increased substantially. This translates into increase in the number of personnel trained for several GI organizations in the African sub-region.

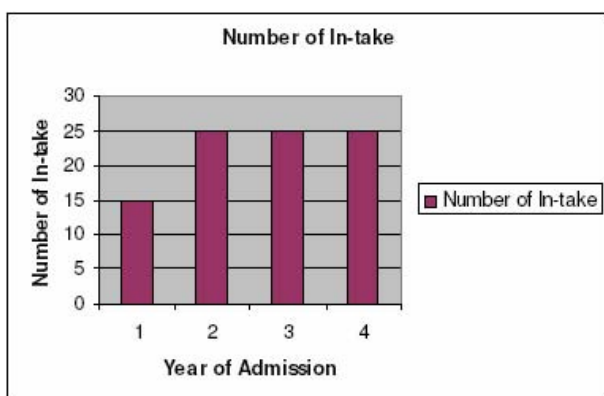


Figure 1: Graph showing the sustained increase in trainees' intake between 2004/2005 and 2007/2008 sessions (Thontteh and Kufoniyyi, 2008)

Table 3 gives the summary of the number of graduates from the JEP at various levels being run by ITC and RECTAS. It should be

noted that all the seven (7) Professional Masters and MSc graduates were funded by ITC and RECTAS and out of the 61 PGD graduates, 44 were sponsored fully by RECTAS while 17 (5 in 2005/2006, 6 in 2006/2007 and 6 in 2007/2008) were private (self-sponsored) students. The 68 graduates were from total of eight (8) different countries (see Figure 2). In addition to these diploma courses, various joint customised and refresher courses have been run while the staff of RECTAS participated in short courses at ITC as part of training-the-trainer programme of the JEP.

Table 3: Number of ITC-RECTAS JEP Graduates (2004 – 2008)

Post Graduate Diploma	(Professional) Master	Master of Science (MSc)	Total
61	3	4	68

In a study carried out in 2007 (Thontteh and Kufoniyyi, 2008) on the graduates of the first two sessions (2004/2005 and 2005/2006) of the JEP program at RECTAS, about 75% of the graduates indicated that the new skills gained from the training made much difference in their work upon their return to their home organizations. Also, about 11% of the graduates within this period are now engaged in training in African Institutions thus emphasizing the training-the-trainers benefit of the programme.



Figure 2: Map of Africa showing the African countries that have benefited from the JEP programme at RECTAS

These achievements indicate that cross-border education can contribute immensely to critical capacity development programme in geo-information science and Earth observation. By having part of the training in the home partner institution of the students thus shorter stay abroad, it follows that more people could be trained when compared to when the student carries out the entire programme abroad. It also follows that the course fee could drop by as much as 50% when the course is fully run in the home institution, which means that at least two persons can then be trained at the cost of training one person.

In addition to this is the multiplier effect resulting from the trainers in the programme training their colleagues and participating in various consultancy activities (customised training and project execution) during the period under consideration.

3.8 Other Challenges

The other important challenges faced during the first four years of implementation reported here which have not been mentioned in the earlier sections of this paper include the following:

- The frequent upgrade in proprietary software results in higher expenses to RECTAS, resulting in the use of older versions of the software whenever fund was not available for upgrading. This was the situation in the first two years of the programme. It should however be noted that the Centre availed itself of the use of educational versions of the software. The problem was also substantially reduced when ESRI started to grant RECTAS free ARCGIS software for its workstations from 2006 and free ArcView software for each of the graduating PGD course participant. Similarly, in 2007 Idrisi gave the Centre free licenses for its software for all the Centre's PGD workstations.
- Low level of power infrastructure (electricity) in the country posed a serious challenge with the Centre having to operate on back-up electricity generator most of the time leading to high overhead costs.
- In addition, the internet bandwidth (running on hybrid solar energy) of 128/256 kbs (up/down link) even though dedicated, could not meet the Centre's internet requirement; possibility of increasing the bandwidth was limited because of the high cost of the bandwidth, which has to be paid in foreign currency as the operators were all foreign-based. It is however expected that the situation would improve when Nigeria's communication satellite is re-launched.
- Being a bilingual Centre, maintaining program standards in both English and French languages also posed a big challenge especially with the translation of rapidly changing course materials from English to French. This was further compounded by the unavailability of French literature and proprietary software designed with the French language to facilitate the PGD program.
- Without doubt, the programme will rapidly increase trained manpower, but this will happen only if the user community and organizations are convinced that the graduates of the joint education programme and those that attend the full programme abroad possess the same knowledge after their education. This therefore requires the recognition and accreditation of the joint education on both sides as being at the same level as a degree obtained in the partner institution abroad. This will assure the credibility and acceptance of the course by the society and the international community. Although the courses are fully accredited on the ITC side and well recognised by RECTAS member states and indeed internationally, the Centre was still processing the accreditation of the PGD course by CAMES (Council for Higher Education in Africa and Madagascar).
- Having a uniform and standardized global curriculum will also greatly contribute to the sustainability of cross-border education. The standardization should not only be in terms of the curriculum but also in the course calendar (starting and ending at the same time) as well

as in the training facilities. This will encourage flexibility and mobility of course participants i.e. students exchange. Although the standardized curriculum was used in the two institutions throughout the four years, it was not possible to fully align the course calendar. This is because the student proceeding to ITC needs time to process his/her (long-duration) visa which could take up to one month; consequently, the RECTAS leg of the course has to start earlier than ITC to ensure that the student arrives at ITC at the beginning of the module s/he is joining.

- Marketing and publicity of the programme are also important issues that should be given adequate attention to attract self-financed course participants. Even though, a significant increase was recorded in the number of private candidates that participated in the PGD course over the period of four years compared with the situation before the JEP, no private candidate participated in the MSc course contrary to the expectation at the beginning of the collaboration.

4.0 CONCLUSION AND RECOMMENDATIONS

This paper has highlighted the experiences gained as well as challenges faced in the implementation of a cross-border education programme over a period of four years. The programme facilitated the upgrading of the home institution's (RECTAS) training facilities including provision of lecture materials and campus-wide network with full internet facility. As many as ten (10) academic staff of RECTAS also went for short-term staff upgrading courses at ITC at its (ITC's) expense. The achievements of the programme also include the production of sixty-eight (68) highly skilled manpower (about 30 French-speaking and 38 English-speaking) from eight (8) African countries. All the participants from 2006/2007 session were also given a single-user licence of ArcView software to enable them continue to practise what they have learnt during their training. It can therefore be confidently concluded that the collaboration has facilitated (and will continue to facilitate) the training and retraining of personnel at various levels in order to bridge the digital divide between the developed countries on the one hand and developing countries on the other hand.

However, to ensure that the joint education programme is sustainable and achieves its aim of rapidly increasing the human, organisational and institutional GI capacities in Africa and indeed in all less developed countries, some recommendations have been made in the paper some of which are itemised below

- That developing countries should pay greater attention to cross-border education in order to facilitate institutional strengthening of the partner institutions and lead to training of more personnel at the same subsisting cost.
- The joint education courses in every partner institution should be accredited by relevant bodies.
- Effort should be made to standardise the course curricula, training facilities and calendar with quality assurance in all partner institutions for accreditation purposes and to facilitate student exchange programme.

- Incorporation and faithful implementation of staff exchange, student exchange, and transferability of credit earned from one partner institution to another.

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